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Access Economics



## **Baseline Review for the Future Health Research and Innovation (FHRI) Fund – Final Report**

Prepared for the WA Department of Health

28 September 2018

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# Glossary

Acronym	Full name
AHRTC	Advanced Health Research and Translation Centre
AMA	Australian Medical Association
ARC	Australian Research Council
BTF	Biomedical Translation Fund
CAGR	Compound annual growth rate
CRF	Clinician Research Fellowship
DET	Department of Education and Training (Commonwealth)
FHRI	Future Health Research and Innovation
FTE	Full time equivalent
HMR	Health and medical research
HMIC	Health and medical innovation and commercialisation
IRIISS	Independent Research Institutes Infrastructure Support Scheme
MHRIF	Medical and Health Research Infrastructure Fund
MREA	Medical Research Endowment Account
MRFF	Medical Research Future Fund
MRGS	Major Research Grant Scheme
NCGP	National Competitive Grants Program
NFMRI	National Foundation for Medical Research and Innovation
NHMRC	National Health and Medical Research Council
NIHR	National Institute for Health Research
NIRIS	New Independent Researcher Infrastructure Support
NISA	National Innovation and Science Agenda
PMH	Princess Margaret Hospital
RDU	Research Development Unit
RGS	Research Governance System
RIS	Research Institute Support
RRF	Registrar Research Fellowship
RTP	Research Translation Projects
TAP	Trials Acceleration Process
TPCHRF	Telethon-Perth Children's Hospital Research Fund
TRF	Targeted Research Fund
TTR	Teaching, training and research
WACHS	Western Australian Country Health Service
WAFF	Western Australian Future Fund
WAHTN	Western Australian Health Translation Network
WAPHA	Western Australian Primary Health Alliance

# Executive summary

## WA's health and medical research and innovation ecosystem

The establishment of the Future Health Research and Innovation (FHRI) Fund signals the State Government's recognition of medical research and innovation's potential to improve health outcomes, drive job creation, and deliver broader benefits to the State economy.

In a world where the rising demand for health services and the cost of delivering those services continues to rise and where the nature and burden of disease is changing, the Future Health Research and Innovation (FHRI) Fund is an important initiative to improve the delivery of sustainable health services in Western Australia.

Deloitte Access Economics was engaged by the Department of Health in Western Australia to undertake a review of the health research and innovation environment to inform the establishment of the FHRI Fund. The review incorporates two major components:

- A **current state assessment** of existing sources of health and medical research (HMR) and health and medical innovation and commercialisation (HMIC) funding available in Western Australia, the State's strengths and weaknesses in HMR and HMIC, and an overview of the national HMIC environment in Australia
- Recommendations for the **future state**, including the ultimate structure and governance arrangements of the FHRI Fund, based on the outcomes of the current state assessment and best practice review.

In undertaking the analysis an extensive stakeholder engagement process has been completed including a **best practice review** of Australian and international HMR and HMIC funding bodies. Over 40 local stakeholders and global opinion leaders have been interviewed as part of the study to identify best practice administration of HMR and HMIC funding.

## Current State Assessment

The current state assessment identified that:

- **Western Australia has a long history of achieving national and global excellence in research, in particular in areas such as data linkage and clinical trials.** WA has utilised its challenges of being relatively isolated to build strong local collaboration to produce world-class research output
- **The Department of Health is a source of consistent, stable funding for health and medical research in WA, however is only a small piece of the total research pie.** As system manager the Department also supports independent institutions and alternate funders in directing funds to areas of priority. However, funds available for the Department to disburse are significantly lower than those disbursed by, for example, the NHMRC
- **While there are other significant sources of funding outside of WA, the State has had limited success in successful applications.** For example, WA's current share of NHMRC funding is low relative to its population and has grown at a slower rate than every other jurisdiction since 2000; while the MRFF is only in its second year of operation, WA researchers are already receiving a significantly lower share of funds disbursed than the State's population share; and, no funds have been received through the BTF
- Current health research and innovation funding, utilising annual disbursements through the Department's budget process, combined with other funding sources, means there **is no uniform strategic allocation of HMR and HMIC funds provided by the State Government.** The Department of Health and other agencies and statutory bodies provide funding over different time periods, through different assessment processes, and with differing degrees of evaluation and impact assessment

- **Proposed changes to the NHMRC’s research funding streams and the introduction of the MRFF presents a key opportunity for WA researchers to position themselves to win a higher share of national funds in the future**, especially to address the current gap in funding for early- and mid-career researchers. However, support may be required to support WA researchers to become more competitive in the application process
- **There is significant space for improving WA’s research culture**, most critically by prioritising research as a meaningful use of time and resources within WA hospitals and among clinical professionals.

Despite the challenges the future for health and medical research and innovation in Western Australia is bright. The creation of the FHRI Fund is an investment ‘game-changer’ for the State’s research and innovation community. It has the potential to fund new and advance existing opportunities in order to improve the health outcomes of Western Australians.

This report makes a number of recommendations regarding the FHRI structure and governance arrangements and future research and innovation funding prioritisation.

Importantly our recommendations reflect the FHRI Fund’s ability to achieve its proposed mission of: **Providing a secure source of funding to develop WA’s research capability to improve the future health and prosperity of all Western Australians.**

## Future State

### Governance Arrangements

Deloitte Access Economics identified six potential FHRI governance options for consideration:

Figure E-1: Governance options for the FHRI Fund

#	Option
<b>A</b>	FHRI funds to be managed by the Department of Health using existing mechanisms
<b>B</b>	FHRI funds to be disbursed by the Department of Health on advice from an independent Strategic Advisory Board
<b>C</b>	Establish a FHRI Office within the Department of Health to disburse all new and existing HMR and HMIC funds
<b>D</b>	Establish the FHRI Fund as a Schedule 2 statutory authority
<b>E</b>	Establish the FHRI Fund as an independent organisation external to government
<b>F</b>	Appoint an existing external organisation to disburse FHRI funds

Source: Deloitte Access Economics

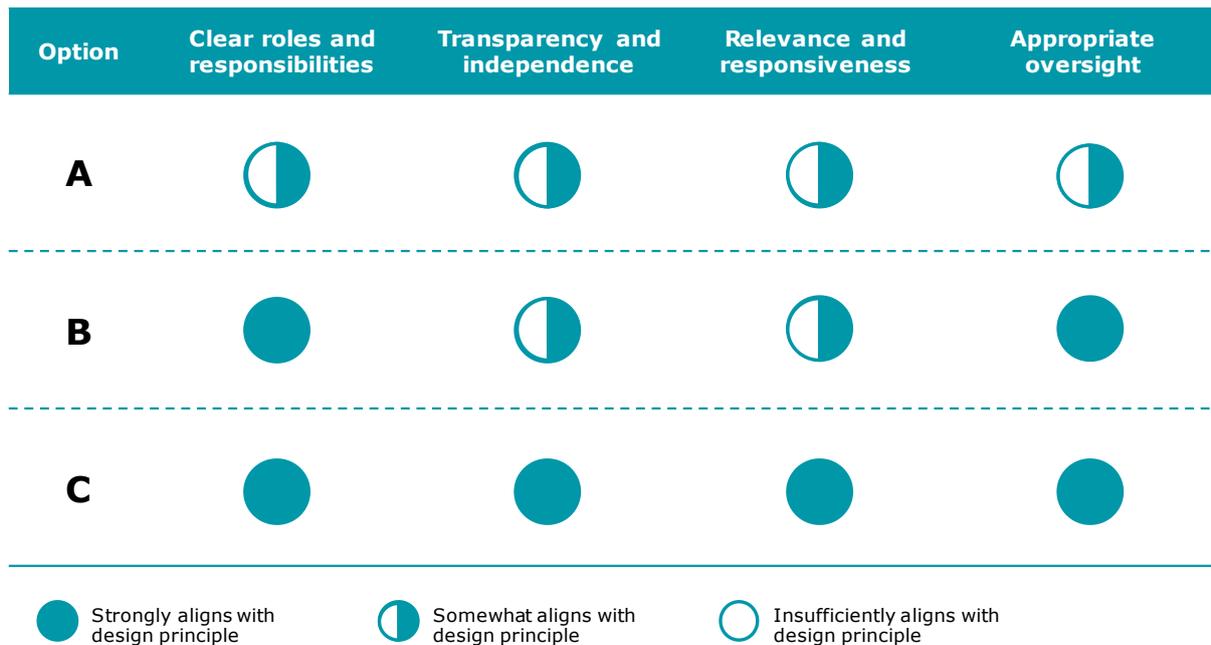
Options D, E and F were eliminated for the following reasons:

- the costs associated with establishing a statutory body similar to a Health Service Provider or an external organisation given the quantum of funding associated with the FHRI Fund is difficult to justify
- The Fund’s strategy for directing funds needs to be aligned to the broader strategy of WA Health, and the ultimate decision-making for disbursement of funds to (at least initially) sit with the Department of Health, as system manager
- Stakeholders strongly felt that misaligning the Fund’s priorities and those of WA Health would reduce the likelihood of funds being directed to highest-impact projects.

While options D, E and F have not been considered for further assessment for the reasons outlined, it was recognised that they should not be ruled out for further consideration in the future. As the WA health research and innovation ecosystem becomes more mature there may exist alternative governance models better suited to address the FHRI Fund priorities for the State, including the potential for independent governance arrangements outside of the Department of Health.

Four governance design principles were identified. The remaining three Options A, B and C were evaluated against each.

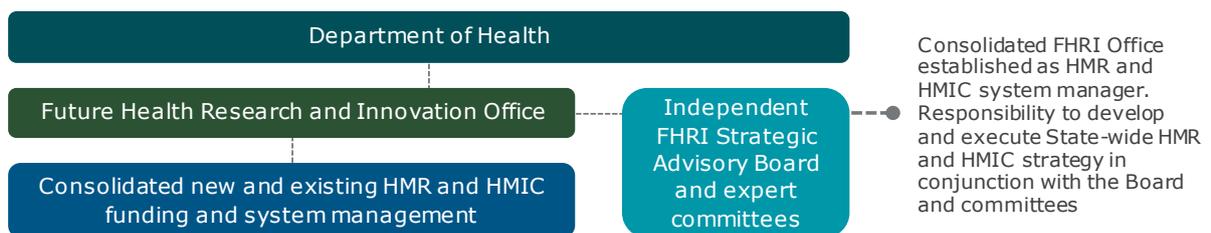
Figure E-2: Options and governance design principles



Source: Deloitte Access Economics

**Based on the analysis the recommended governance arrangement is Option C.**

Figure E-3: Option C structure



Option C represents a simple structure that will enable fast decision-making and minimises red tape where possible. The option proposes the creation of a FHRI Office within the Department of Health. The option recommends the creation of the Independent FHRI Strategic Advisory Board (IFSAB), to be made up of ten leading public and private sector figures in health research innovation, including an independent chair. While the Department of Health will make final funding decisions to ensure the FHRI Fund's activities are aligned to government policy the IFSAB will be responsible for overseeing the evaluation of funding applications and recommendations to the Department. The IFSAB will also be responsible for providing recommendations on the development of a long term health research and innovation strategy for the State, including ongoing input into its development and refinement.

The composition of the IFSAB is integral to the success of the FHRI Fund and should carry the confidence of the community. As such, its membership should be weighted towards those with strategic acumen, noting that it can draw on additional scientific and technical ability through the expert committees that assess individual applications for funding. This enables the IFSAB to consider funding recommendations in the context of the State-wide HMR/HMIC strategy and the Fund's mission, rather than considering specific areas of research activity.

To ensure that the full benefits of the FHRI Fund are realised, both the Independent FHRI Strategic Advisory Board and FHRI Office will need to **develop and implement a State-wide Health Research and Innovation Strategy**. The importance of such a strategy cannot be underestimated. It can become the catalyst that opens up significant opportunities and approaches for patient and public involvement and accelerate the translation of innovation research across the state.

## Funding

Once the FHRI Fund has been activated and the governance structure is in place, an important role of the FHRI Fund is to allocate funding per its mission. The FHRI Fund should adopt a set of funding objectives that support and guide its funding decisions, enabling it to best achieve its mission, including:

- **Promote disease prevention and create a sustainable WA healthcare system** by targeting areas of unmet health need in WA, enabling the Fund to be agile in supporting research relating to local priorities within the WA Health system. This includes involving the community in setting priorities. The Fund should also support WA researchers to increase their competitiveness at winning other grant funding
- **Grow our research talent and strengthen WA's research and innovation culture** by increasing the prominence of research in clinical environments within the WA Health system. The Fund should invest in excellent early- and mid-career researchers. While WA boasts a strong cohort of experienced and senior researchers, there is a risk that this will be diminished in the future if there is not a sufficient pipeline to replace them
- **Maximise the global potential of WA's research and innovation ecosystem** by supporting WA's best and brightest to implement and commercialise their research output into tangible products and services. This includes accelerating opportunities that are 'stuck' at a particular point on the research and innovation lifecycle due to a lack of funds
- **Support research translation to improve the health and wellbeing of people in WA** by funding projects and programs that demonstrate a strong likelihood of delivering tangible health benefits to patients and the WA community. This provides value for money for taxpayers by ensuring that FHRI funds flow into activities that ultimately benefit the future health of Western Australians. The Fund should support platforms and infrastructure that underpin research activity, including access to data and support staff services such as biostatistics, equipment operation and maintenance, and research assistance.

It is not possible to specify the precise allocation of funding to specific initiatives with respect to these objectives. Rather, the funding objectives should guide the Fund in making funding decisions

as the health research and innovation strategy is developed. The Fund should focus on filling gaps in the current HMR and HMIC funding landscape.

In order to achieve transparency of the expenditure and funding decisions associated with the FHRI Fund, it would be useful for the IFSAB to **develop a set of funding principles in close collaboration with health service providers, clinical professionals, universities and medical research institutes, health industry partners and consumers of health**. These funding principles would then carry the confidence of the health research and innovation community and clearly present a unified basis for the distribution of the FHRI Fund investments. A suggested set of funding principles includes:

- Focus on outcomes
- Complement existing funding schemes
- Address the whole research and innovation spectrum
- Recognise the need for and promote access to digital platforms and data
- Recognise that innovation may come from within and outside the health sector
- Involve and have support of the community
- Address unmet health need in WA
- Recognise balance of risks and potential benefits
- Encourage collaborative behaviour
- Support the research workforce pipeline
- Support research and innovation with potential for commercialisation.

Figure E-4: Funding objectives and funding principles

Funding objectives	 Prioritise disease prevention, improved clinical outcomes and creation of a sustainable WA healthcare system	 Grow our research talent and strengthen WA's research and innovation culture	 Maximise the global potential of WA's research and innovation ecosystem	 Support research translation to improve the health and wellbeing of people in WA
Funding principles	Address unmet health need Focus on outcomes Complement existing sources of funding Recognise innovation from other sectors Involve and have support of the community	Encourage collaborative behaviour Support the research workforce pipeline	Recognise innovation from other sectors Support research and innovation with potential for commercialisation	Address the whole translational spectrum Recognise the need for good data Address unmet health need Recognise balance of risks and potential benefits

Source: Deloitte Access Economics

## Recommendations

The key recommendations for the creation, governance and high-level operations of the FHRI Fund are summarised below:

1. **Establish the Future Health Research and Innovation Office** within the Department of Health, consolidating the existing Research Development Unit and associated funding into a new FHRI Office which will be responsible for the administration and distribution of all HMR and HMIC funding streams
2. **Establish an Independent Future Health Research and Innovation Strategic Advisory Board (IFSAB)** to support the Department of Health in developing and periodically reviewing a State-wide HMR/HMIC strategy and make funding recommendations. The IFSAB comprises ten members, with an independent chair, appointed by the Director-General of the Department of Health. The composition of the Board needs to carry the confidence of the community, and bring together the relevant

skills mix and expertise that is capable of integrating and advancing the State's health medical research and innovation ecosystem, and improve the health and wellbeing of Western Australians

3. **Convene and utilise expert committees or panels to provide specialist advice and assistance** in the grant assessment process. The purpose of the committees is to provide expert support for the IFSAB as required
4. The IFSAB supports the Department of Health in **reviewing and adopting a set of funding principles** that are informed by input from relevant stakeholders, as part of the development of a WA health and research innovation strategy. The funding principles should be reviewed at regular intervals in the future, in consultation with stakeholders, to ensure they remain relevant
5. The Department of Health should **develop a comprehensive State-wide health research and innovation strategy** in conjunction with the IFSAB. The purpose of the strategy should be to set priorities for research and innovation based on an assessment of unmet clinical need and WA's strengths in relevant research areas
6. The Department of Health should **undertake a review to establish the current utilisation of existing infrastructure** in order to determine the appropriate proportion of funding required, and develop procedures to maximise the use external funding sources
7. The Department of Health should explore the **development of an 'easy to use' applications portal** which outlines clear rules on applicants' eligibility for funding, has an efficient lodgement process, and manages the grant process until assessment is completed. Alternatives, such as purchasing such a system or outsourcing this process to a third party with such a system already in place, should also be considered
8. The FHRI Office should **develop a comprehensive set of key performance indicators** (with stakeholder input) that align with the objectives of the State-wide health research and innovation strategy. These indicators should be monitored and reported on by the FHRI Office to ensure progress against objectives. The monitoring of the FHRI Fund's key funded initiatives should be straightforward in process and transparent in design. Opportunities to co-develop performance monitoring tools, for example in partnership with the Telethon Kids Institute, should be explored
9. The IFSAB should ensure **management of intellectual property occurs in a manner that is consistent with the WA Government Intellectual Property Policy** and the National Principles of Intellectual Property Management for Publicly Funded Research
10. **Revisit and review** the Department of Health-related actions from the Data Linkage Review undertaken in 2016.

The above recommendations for the future state of the FHRI Fund, including the proposed structure and governance arrangements of the FHRI Fund and the arrangements for funding health research, commences a process of building WA's pre-eminence in health and medical research and the translation of that research into practical health outcomes for the benefits of all Western Australians.

# 1 Background and context

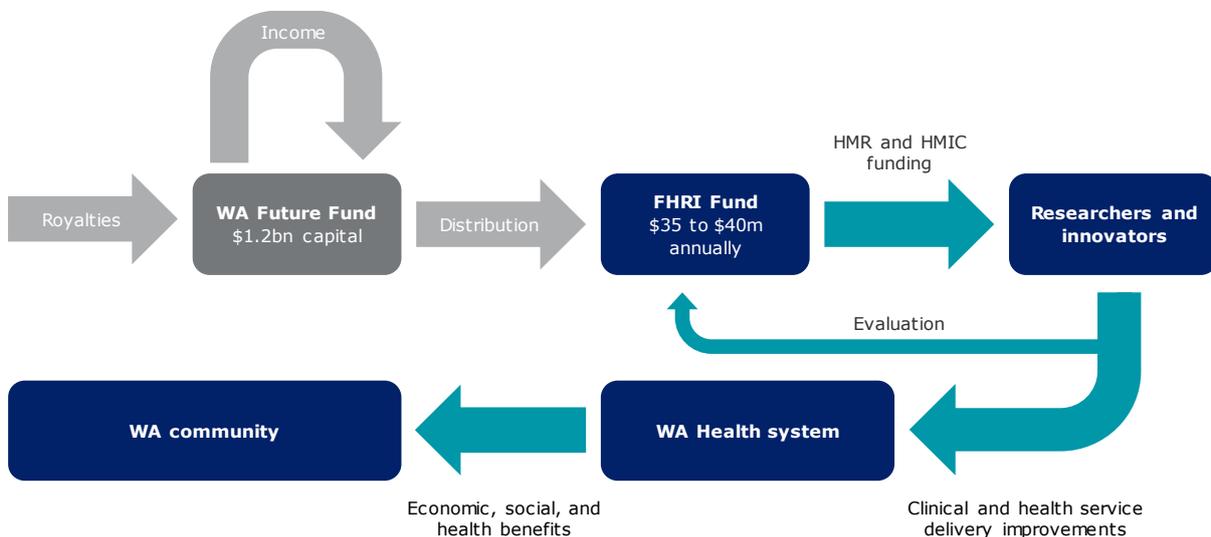
## 1.1 Future Health Research and Innovation Fund

The State Government of Western Australia has committed to establish a Future Health Research and Innovation (FHRI) Fund<sup>1</sup> to provide an additional source of funding for health and medical research (HMR) and health and medical innovation and commercialisation (HMIC) in WA. The Government’s election commitment states that the purpose of the FHRI Fund is to “provide a secure source of funding to develop a WA research capability of excellent individuals and teams, high quality infrastructure and world-first clinical studies for patients to improve the future health of all Western Australians”.<sup>2</sup>

The FHRI Fund will disburse funds distributed from income received by the Western Australian Future Fund (WAFF). The WAFF is a sovereign wealth fund established by the State Government in 2012 with an initial contribution of \$932.6 million over four years from Royalties for Regions funds. Additionally, since 2016-17 the State Government has contributed – and is expected to continue to contribute – approximately 1.0% of all mineral royalty payments to the WAFF. The Western Australian Treasury Corporation (WATC) manages the WAFF on behalf of the State Government.

As at 31 March 2018, the WAFF had a balance of \$1,205 million. Its establishing legislation prohibits the State Government from drawing down on the income for 20 years; it is expected that this legislation will be amended to allow the WAFF to make contributions to the FHRI Fund, once it is established, commencing from 2019-20. Interest earned on the balance of the WAFF was \$43 million in 2016-17<sup>3</sup> and is forecast to be \$36 million in 2017-18<sup>4</sup> and \$41 million in 2018-19.<sup>5</sup> On this basis, it is estimated that distributions to the FHRI Fund will be in the order of \$35 to \$40 million per annum.

Figure 1-1: Stylised representation of the FHRI Fund



Source: Deloitte Access Economics. Note: Greyed areas are not the primary focus of this study

<sup>1</sup> Hon Roger Cook MLA, WA Government Media Statement, 3 July 2017

<sup>2</sup> WA Labor, “Future Health Research and Innovation” policy paper, February 2017

<sup>3</sup> WA Treasury, 2016-17 Annual Report on State Finances

<sup>4</sup> WA Treasury, 2017-18 Government Mid-Year Financial Projections Statement

<sup>5</sup> WA Treasury, 2018-19 State Budget Economic and Fiscal Outlook

## 1.2 Purpose of this study

Deloitte Access Economics was engaged by the Department of Health of Western Australia to undertake a baseline review to inform the establishment of the FHRI Fund. This study consists of two major components:

- A **current state assessment** of existing sources of HMR and HMIC funding available in Western Australia, the State's strengths and weaknesses in HMR and HMIC, and an overview of the national HMIC environment in Australia
- Recommendations for the **future state**, based on the findings of the current state assessment, a review of Australian and international best practice funds and funding bodies, and stakeholder consultation. Recommendations cover:
  - The governance model and structure of the Fund
  - Mechanisms and policies for identifying and setting priorities that could be adopted for the Fund
  - Potential priority areas of investment for the Fund
  - Approach to ownership and management of intellectual property.

This **final report** presents the findings of the current state assessment, recommendations for the future state, and supporting evidence from the review of best practice and stakeholder consultations.

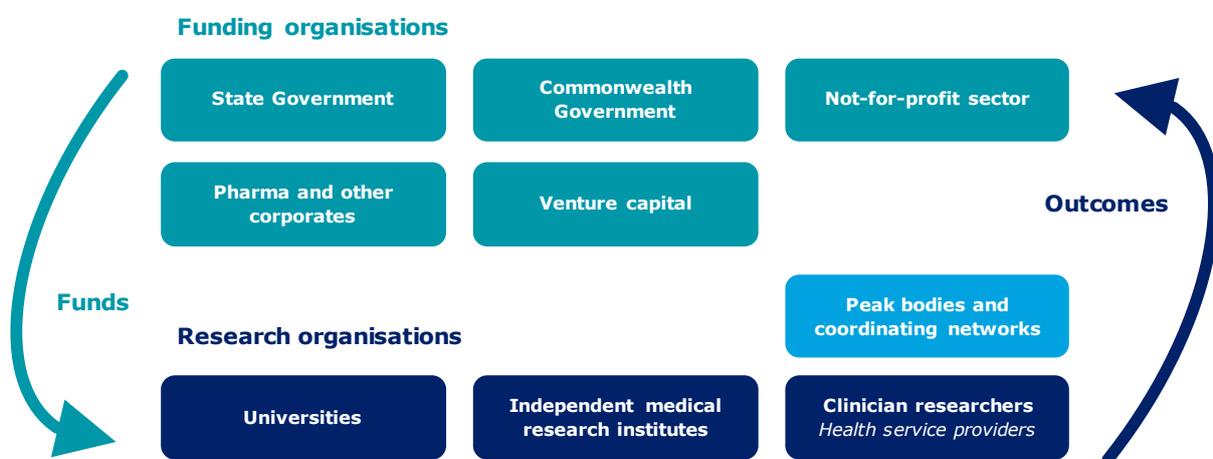
# 2 Current state assessment

The purpose of this chapter is to define the current state of funding available to Western Australian health and medical research and innovation practitioners.

## 2.1 Introduction

Western Australia’s health and medical research, innovation and commercialisation landscape is vast and highly complex. The State has a long history of achieving national and global excellence in research, and boasts a series of historic world-first and world-class achievements that have significantly improved the health and livelihoods of millions of people around the world.

Figure 2-1: Overview of the WA HMR/HMIC landscape



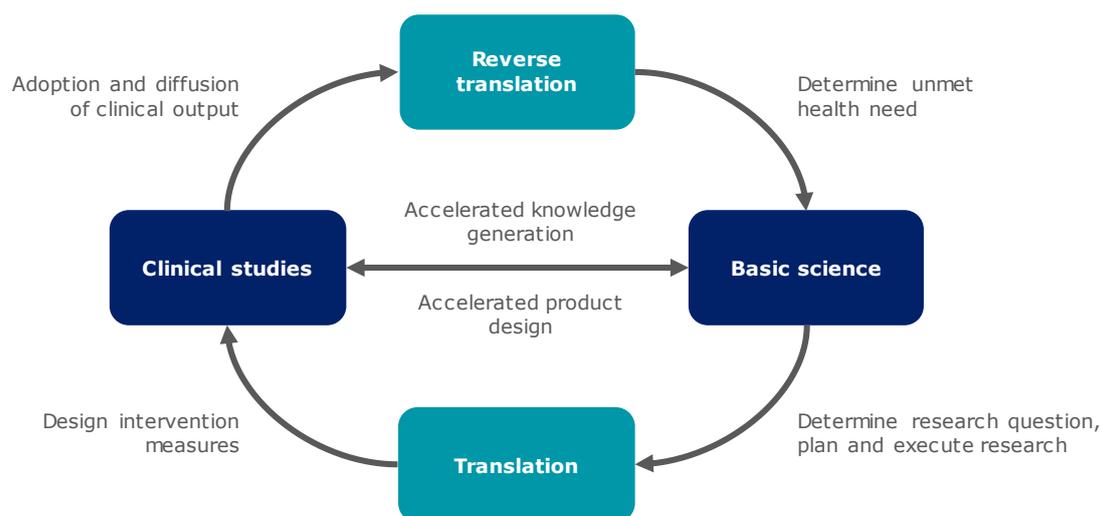
Source: Deloitte Access Economics

For the State to continue to achieve excellence, funding for HMR and HMIC must be stable, consistent, and sufficient to support WA’s potential research output. The decline in WA’s share of funding from the National Health and Medical Research Council (NHMRC), the single largest source of HMR funding in Australia, is a sign that the State’s research community is not attracting the funding it could. There is potentially a need to support researchers getting access to this national funding in addition to ensuring gaps in HMR funding in WA are closed.

Designing a best practice HMR and HMIC funding body requires an understanding that research and innovation are not linear processes with a fixed beginning and end, but a dynamic process that requires the generation of knowledge in response to an unmet health need, the actioning of that knowledge to improve clinical outcomes, the reassessment of unmet need thereafter, and so on. Figure 2-2 presents a stylisation of the HMR and HMIC lifecycle.

Many traditional research funding programs available to WA researchers concentrate resources in basic science and clinical research, without sufficient consideration of translating the output of this research into improved practice and outcomes for patients and the community. Funding for innovation that may not conform to a traditional structured and segmented research process is needed to accelerate the translation of knowledge that already exists into better products, services, and policies. Presently, the vast majority of existing funding programs do not provide sufficient support for innovation.

Figure 2-2: Lifecycle of health and medical research and innovation



Source: Deloitte Access Economics

The following funding sources have been reviewed in this assessment:

- WA State Government
  - Department of Health
  - Hospitals and Health Service providers
  - Hospital and health service-linked research foundations
  - Lotterywest
  - Insurance Commission of WA
  - New Industries WA
  - Healthway
- Commonwealth Government
  - National Health and Medical Research Council
  - Medical Research Future Fund
  - Biomedical Translation Fund
  - Australian Research Council
  - Department of Education and Training
- Non-government
  - National Foundation for Medical Research and Innovation
  - Telethon7
  - Other independent medical research foundations and institutes.

A summary of funding provided by these bodies is provided in Table 2-1. It is important to note that there is a considerable level of complexity in HMR and HMIC funding, in that research is often executed across institutions (e.g. by a clinician employed by a health service who also holds an academic position at a university) with funding drawn from multiple sources. It is difficult to quantify the precise amount of HMR and HMIC funding to WA researchers or what precisely the funding is spent on.

The purpose of this current state assessment is to develop a clear depiction of existing sources of funding for HMR and HMIC available to WA researchers and innovators, and an understanding of gaps and opportunities in the State’s research and innovation output that could be supported by the FHRI Fund. This section is structured as follows:

- An overview of State Government funding for HMR and HMIC in WA
- An overview of other sources of HMR and HMIC funding, including from the Commonwealth Government
- An analysis of the current strengths and weaknesses in WA’s HMR and HMIC capability
- An overview of the HMIC environment in Australia.

Table 2-1: Summary of HMR and HMIC funding to WA, 2016-17

Funding source	Funding provided	Recipients	WA funding (2016-17)
Department of Health (WA)	<ul style="list-style-type: none"> <li>• Project grants</li> <li>• Research fellowships</li> <li>• Infrastructure support</li> </ul>	<ul style="list-style-type: none"> <li>• Universities</li> <li>• Medical research institutes</li> <li>• Clinician researchers</li> </ul>	\$14.4m <sup>6</sup>
Department of Health (WA) FutureHealth WA election commitment	<ul style="list-style-type: none"> <li>• Capacity-building</li> <li>• Training and education</li> <li>• People support</li> </ul>	<ul style="list-style-type: none"> <li>• Universities</li> <li>• Medical research institutes</li> <li>• Clinician researchers</li> <li>• Hospitals</li> <li>• Individual researchers</li> </ul>	\$7.4m
Health service providers' Teaching, Training and Research (TTR) funding	<ul style="list-style-type: none"> <li>• Salary support</li> <li>• Equipment and research facility support</li> </ul>	<ul style="list-style-type: none"> <li>• Hospitals, clinics within each health service</li> </ul>	Unknown <sup>7</sup>
Hospital and health service-linked research foundations	<ul style="list-style-type: none"> <li>• Project grants</li> <li>• Fellowships and salary support</li> <li>• Equipment purchase</li> </ul>	<ul style="list-style-type: none"> <li>• Hospitals</li> </ul>	\$3.6m
Lotterywest	<ul style="list-style-type: none"> <li>• Project grants</li> <li>• Infrastructure grants</li> <li>• Other funding on ad-hoc basis</li> </ul>	<ul style="list-style-type: none"> <li>• Medical research institutes</li> <li>• Hospitals and health services</li> </ul>	Unknown <sup>8</sup>
Insurance Commission of WA	<ul style="list-style-type: none"> <li>• Grants for asbestos-related and other industrial disease research</li> <li>• Support for neurotrauma research</li> </ul>	<ul style="list-style-type: none"> <li>• Medical research institutes (specifically, NCARD)</li> </ul>	\$0.7m <sup>9</sup>
Healthway	<ul style="list-style-type: none"> <li>• Grants for public health promotion and prevention</li> </ul>	<ul style="list-style-type: none"> <li>• Community groups</li> <li>• Education sector</li> <li>• Not-for-profit sector</li> </ul>	\$1.7m
National Health and Medical Research Council	<ul style="list-style-type: none"> <li>• Project grants</li> <li>• Research fellowships</li> <li>• Infrastructure support</li> <li>• Collaboration grants</li> <li>• Development (innovation) grants</li> </ul>	<ul style="list-style-type: none"> <li>• Universities</li> </ul>	\$43.1m <sup>10</sup>
Medical Research Future Fund	<ul style="list-style-type: none"> <li>• Research fellowships</li> <li>• Research translation grants</li> <li>• Clinical trials grants</li> </ul>	<ul style="list-style-type: none"> <li>• Medical research institutes</li> <li>• Universities</li> </ul>	\$4.6m <sup>11</sup>

<sup>6</sup> Some funds provided by the Department of Health are co-sourced by other parties, e.g. the Raine Foundation supports funding for the Clinician Research Fellowships scheme.

<sup>7</sup> Health service providers collectively spend more than \$250m per annum on teaching, training and research; however, it is not possible to determine what proportion of this expenditure is directed towards research.

<sup>8</sup> Lotterywest disbursed \$120.9m in 2016-17 to health related recipients, but it is not possible to determine what proportion of this funding was directed towards research.

<sup>9</sup> Approximation only; represents approximately one third of ICWA's \$1.9m grant to NCARD for the period 2014-15 to 2016-17.

<sup>10</sup> Figure is for the 2017 calendar year.

<sup>11</sup> Represents funding to WA researchers through MRFF fellowship and clinical trials grants. Some MRFF funds are administered by the NHMRC and are included in the NHMRC total.

Biomedical Translation Fund	<ul style="list-style-type: none"> <li>• Equity investments to support commercialisation of medical innovations</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial entities</li> </ul>	Nil
Australian Research Council	<ul style="list-style-type: none"> <li>• Project grants</li> <li>• Research fellowships</li> </ul>	<ul style="list-style-type: none"> <li>• Universities</li> </ul>	\$2.1m
Department of Education and Training (Cth)	<ul style="list-style-type: none"> <li>• Research block grants</li> </ul>	<ul style="list-style-type: none"> <li>• Universities</li> </ul>	Unknown <sup>12</sup>

Source: Deloitte Access Economics analysis of multiple sources (see Reference list)

## 2.2 Funding provided by the WA State Government

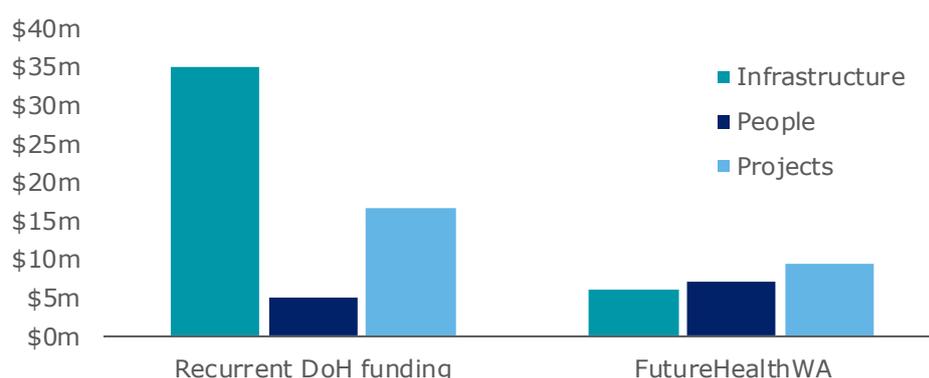
### 2.2.1 Funding provided by the Department of Health

The Research Development Unit (RDU) within the Department of Health is the vehicle through which the State Government provides discretionary, untied and targeted funds for health and medical research in WA, and which is separate from the TTR funding provided to the HSPs. Funding is provided across three main streams, supporting infrastructure, people, and projects. Existing structured funding programs are primarily focused on research, rather than innovation.

RDU funding programs amount to some \$14 million per annum on average, with additional funding made available by the State Government from time to time. For example, between 2013-14 and 2016-17, additional funds were allocated by the State Government through the FutureHealth WA initiative.

Figure 2-3 shows total HMR funding provided by the Department of Health over the period 2013-14 to 2016-17. This consists of \$56.3 million disbursed through annual funding by the Research Development Unit, of which \$34.9 million (62%) was directed to infrastructure, \$4.8 million (9%) to people support and fellowships, and \$16.6 million (29%) to individual research projects. A further \$22.2 million was disbursed as part of the FutureHealth WA initiative, with \$6.0 million (27%) going to infrastructure, \$6.9 million (31%) to people support, and \$9.4 million (42%) to research projects.

Figure 2-3: Department of Health funding for HMR, 2013-14 to 2016-17



Source: Department of Health

<sup>12</sup> The Department of Education and Training will allocate \$170.7 million in research block grants to WA universities in 2018, however this funding is disbursed discretianarily by university administrators and it is not possible to quantify how much is allocated to health and medical research.

## **Infrastructure support**

In many jurisdictions, grants allocated to research projects will cover direct costs associated with undertaking the research, such as staff salaries and expenses. Indirect costs – such as the purchase of research equipment, ancillary staff support, office services and materials, and utilities – are often not adequately covered by project grants. Therefore, the host institution is required to cover these indirect costs.

To fill this funding gap, the Department of Health provides infrastructure support grants (to the value of \$8.5 million in 2016-17) through two major programs: the Medical and Health Research Infrastructure Fund (MHRIF), and the Research Institute Support (RIS) scheme. The purpose of these funding schemes is to contribute to meeting the indirect and infrastructure costs faced by researchers.

The MHRIF scheme has been in place since 1997, awarding more than \$90 million to health and medical researchers in that time. In addition to supporting indirect costs faced by researchers in public hospitals and university departments, where some overheads will be covered institutionally, the MHRIF also supports researchers working in independent medical research institutes who may, for example, be required to rent space and equipment from the institute.

Applications for MHRIF funding are subject to an excellence test based on past income received from peer-reviewed, competitive grant programs. In the latest (2017-18) MHRIF application round, researchers were required to have received at least \$500,000 in such funding over a period of three years. Funding received through other Department of Health programs, or funding granted specifically for arms-length work (such as quality assurance, literature review, travel or training), cannot be counted toward the \$500,000 threshold.

MHRIF funding is disbursed according to two tiers. Tier 1 recipients are researchers working in designated independent medical research institutes, and are able to receive up to 20% of their average eligible research grant income over three years. Tier 2 recipients are researchers working in hospital or university settings, and are eligible to receive up to 10% of their average eligible research grant income over three years. The 2015-16 disbursement of MHRIF funds is detailed in

Table 2-2: MHRIF distribution, 2015-16

Institution	Tier	Number of recipients	MHRIF paid (\$)	MHRIF paid (% of total)
University of Western Australia	2	71	1,826,226	29.8%
Telethon Kids Institute	1	20	1,584,229	25.9%
Harry Perkins Institute	1	13	912,604	14.9%
Curtin University	2	14	597,142	9.7%
Lions Eye Institute	1	3	374,902	6.1%
Women and Infants Research Foundation	1	6	298,886	4.9%
Edith Cowan University	2	4	261,641	4.3%
Perron Institute	1	1	96,180	1.6%
Murdoch University	2	4	78,520	1.3%
Institute for Respiratory Health	1	1	50,614	0.8%
West Australian Sleep Disorders Research Institute	1	1	44,055	0.7%
<b>Total</b>		<b>138</b>	<b>6,124,999</b>	

Source: Department of Health

In addition to supporting indirect costs facing researchers in WA, the MHRIF scheme also supports travel to enable training opportunities, attendance at seminars and conferences, and collaboration with other researchers based outside of the State. This is especially significant in a WA context, given the isolation and distance from eastern-states hubs.

In 2014-15, the Department of Health commenced the Research Institute Support (RIS) scheme, which provides additional infrastructure funding to eligible institutes on top of any disbursement received through the MHRIF scheme. There is no application process for the RIS, with candidates instead assessed through the same process as the MHRIF scheme and funding granted on the basis of the same excellence test as for the MHRIF. The Department has deemed six institutes eligible for the RIS, with 2016-17 funding detailed in Table 2-3 below.

Table 2-3: RIS distribution, 2016-17

Institution	RIS paid (\$)	RIS paid (% of total)
Telethon Kids Institute	1,021,544	42.6%
Harry Perkins Institute	773,532	32.2%
Lions Eye Institute	272,449	11.4%
Women and Infants Research Foundation	222,991	9.3%
Perron Institute	64,409	2.7%
Institute for Respiratory Health	44,868	1.9%
<b>Total</b>	<b>2,399,793</b>	

MHRIF funds are awarded on a basis of demonstrated excellence in receiving competitive grants, and the RIS scheme is designed to bolster funding for research infrastructure to established institutes.

The Department of Health also administers the New Independent Researcher Infrastructure Support (NIRIS) awards that specifically cater to new and emergent independent researchers. These have been disbursed to 126 researchers since their establishment in 2001.

In the latest round, NIRIS awards were up to \$15,000 each in value, made available to researchers with less than eight years' post-doctoral experience who have sufficient research tenure to expend the funds in WA over the subsequent 12 months. Since the scheme's inception, the Department of Health has granted NIRIS awards to the value of \$1,415,000.

### **People support**

The Department provides funding to clinicians within the health system to encourage stronger engagement with research activity while continuing their role in clinical service delivery. This funding is disbursed through two schemes: the Clinician Research Fellowships (CRF), delivered in partnership with the Raine Medical Research Foundation; and Registrar Research Fellowships (RRF).

The CRF scheme was established in 2012 and has since resulted in 21 fellowships. The scheme arose from the findings of the 2010 Report to the Department of Health Western Australia on Medical Research Funding, led by Emeritus Professor Richard Larkins AO ('the Larkins Report'), which noted the need for clinicians employed by WA Health to become more involved in health and medical research.

CRFs are available to clinicians (including medical practitioners, nurses, midwives, allied health and health science professionals) who are early- to mid-career researchers with little or no other paid research time, and provide salary support up to 0.5 FTE and up to \$10,000 in additional funding to cover direct research costs. CRFs are awarded for three-year periods and clinicians must retain at least 0.3 FTE employment with a health service provider to remain eligible.

The RRF scheme was established in 2017 to incentivise early-career doctors to undertake research activity. Improving the research capability of registrars also increases the extent to which they can support the research output of senior clinician researchers within their field of specialisation. Eligibility is similar to the CRF, with some additional requirements suitable for fellowships aimed at early-career researchers; notably, the fellowship period is 12 months and renewal is not possible, while the additional funds claimable for research costs are capped at \$3,000. Seven fellowships were awarded in the scheme's inaugural year.

### **Project support**

The Department of Health established the Research Translation Projects (RTP) program in 2007 to support the translation of research outcomes into improved patient care, more cost-effective health service delivery, and other benefits to the WA Health system and HMR sector more broadly. Preference is given to projects that address contemporary challenges relevant to WA Health, or align with WA Health priorities. RTP funds can also form the basis for further grant applications, such as through the NHMRC.

The RTP program includes economic benefits as part of its assessment criteria, encouraging clinician researchers not only to improve the quality and efficiency of patient care but to consider the financial sustainability of the WA Health system as a key outcome of research.

Since its inception, the RTP program has funded 132 projects with a total disbursement of \$21 million, with up to \$270,000 awarded per project. Projects of up to 24 months' duration are eligible for the program, and applications are encouraged for projects in the areas of clinical research, health services research, and public health research, with emphasis on multidisciplinary and cross-institutional collaboration.

Analysis undertaken by the Department of Health suggests that of the 96 projects funded in the first seven years of the RTP program's existence, 59 (62%) have resulted in research translation outcomes. This includes translation to outcomes in both clinical practice and guidelines and policy.

Research into areas of specific interest and significance to WA Health were previously funded by the Targeted Research Fund (TRF), which was established in 2010 and disbursed \$5.2 million over three years, terminating in 2013. In addition to funding competitive projects initiated by researchers within the HMR community, the TRF was also used to fund research commissioned by WA Health.

The Department of Health has partnered with the Channel 7 Telethon Trust to establish the Telethon-Perth Children's Hospital Research Fund (TPCHRF) to provide funding for research activities focused on child and adolescent health in WA, with the first round commencing in 2012. The TPCHRF also places emphasis on the translation of research findings to improved child and adolescent health policy and service delivery.

The TPCHRF funds projects in two streams: short-term projects of up to two years' duration to a maximum of \$250,000 per project; and strategic projects of up to three years' duration to a maximum of \$500,000 per project. After the fifth (2016) selection round of the TPCHRF, it's the program's total distribution was \$17.5 million across 77 projects.

### **Other support**

In its role as health system manager, the Department of Health through the Research Development Unit provides policy direction, support and governance for research undertaken within the WA Health system. This includes supporting the Research Policy Framework, which sets out the high-level principles and mandatory requirements that apply to all health and medical research activities within WA Health.

The RDU established the Research Governance Service (RGS) centralised information technology system in 2016, a collaborative system for researchers and sponsors to complete, submit, and manage their ethics and governance documentation throughout their research project. The RGS also allows ethics, research governance and hospital administrators, including the Human Research Ethics Committees (HRECs), to administer and authorise relevant research projects. The RGS was funded by the FutureHealth WA initiative.

### **FutureHealth WA**

The FutureHealth WA initiative was established by the State Government to allocate an additional \$30 million in HMR funding over the period 2013-14 to 2016-17, of which some \$22.2 million was administered by the RDU. This sum was in addition to the \$56.3 million already allocated over the same period, distributed through the schemes and programs described above.

Some key outcomes of the FutureHealth WA initiative include:

- Supporting the establishment of the WA Health Translation Network (WAHTN) with an initial \$650,000 grant in 2014 and subsequent payments to support its operations. Key achievements of the WAHTN include being accredited as an Advanced Health Research and Translation Centre (AHRTC) by the NHMRC, supporting Murdoch University to secure a \$2.2 million grant from the ARC, and securing \$3.2 million from LotteryWest to establish the WAHTN Consumer and Community Health Network
- Supporting the 'Science on the Swan' Conference – a joint initiative of the major WA universities, research institutes, and WAHTN – with a \$50,000 annual grant
- Supporting the Major Research Grant Scheme (MRGS) to improve the competitiveness of WA-initiated applications for major grants (e.g. NHMRC)
- Supporting the WAHTN Clinical Trials and Data Management Centre with a \$1.3 million grant over three years, intended to make WA a more attractive destination for national and global clinical trials.

Funds from FutureHealth WA were also used to support HMR training, education and mentoring programs, as well as merit awards and collaboration grants for emergent and early-career HMR

researchers to increase competitiveness for securing additional grant funding. FutureHealth WA funds have also been used to support targeted research initiatives, including the Kimberley Healthy Skin Study.

### Other funding programs

In addition to the recurring schemes described above, the Department of Health from time to time enters into one-off funding arrangements for specific projects that align with strategic priorities for the WA Health system. These include:

- \$1 million over five years for the National Centre for Asbestos Related Diseases
- \$3 million over three years (50% funded by CSIRO) for the Australian Telehealth Research and Development Group
- \$400,000 over four years for the Busselton Population Medical Research Institute to support the Busselton Health Study
- Funding support, at times provided by different State Government agencies (see below), for the Neurotrauma Research Program at the Perron Institute.

**Key finding:** The Department of Health is a source of consistent, stable funding for health and medical research in WA, however is only a small piece of the total research pie. As system manager the Department also supports independent institutions and alternate funders in directing funds to areas of priority. As annual disbursements are set as part of the Department's budget, there is limited scope for short-term injections – such as the FutureHealth WA initiative – to have lasting impact over the medium to long term.

### 2.2.2 Hospitals and health services

Outside of central funds disbursed by the Department of Health, each Health Service Provider is allocated funds for teaching, training and research (TTR) with discretion over how these funds are spent. The 2017-18 State Budget allocated \$260 million in TTR funding across the five Health Service Providers, equivalent to approximately 3% of the total WA Health budget. However, it is not possible to disaggregate the total amount of TTR funding to determine how much is allocated specifically to research activity.

### 2.2.3 Hospital and health service-linked research foundations

Some individual hospitals within WA Health maintain their own medical research funding schemes. For example, the Royal Perth Hospital Medical Research Fund (RPHMRF) distributed more than \$478,000 in research funding in 2017 in grants of up to \$20,000 each.

The Spinnaker Health Research Foundation administers funds to support clinical research at Fremantle Hospital, Fiona Stanley Hospital, and other hospitals in the southern metropolitan region. Spinnaker disbursed more than \$562,000 across 11 project grants, four collaboration grants, and two travel awards.

The Perth Children's Hospital (PCH) Foundation (formerly Princess Margaret Hospital (PMH) Foundation) is an independent charity that distributes funds to Perth Children's Hospital<sup>13</sup> for the purchase of equipment, research, and a range of other services to improve patient experiences. The Foundation disbursed approximately \$5.6 million to PMH in 2016-17, some 47% or \$2.6 million of which was directed towards research and capability improvement.

### 2.2.4 Other State Government sources of funding

#### Lotterywest

Lotterywest, as a State Government statutory authority, distributes approximately 25% of its revenue in community grants, equal to some \$265.3 million in 2016-17. While these grants cover a wide variety of sectors, public hospitals and health institutions are a significant focus, attracting

<sup>13</sup> The PCH Foundation distributed funds to PMH during the period between the Foundation changing its name and PCH becoming operational.

\$120.9 million or 46% of the total amount of grant funding. It is not possible to determine precisely what proportion of this \$120.9 million allocation to WA Health is then used to fund to research activity.

However, funding from Lotterywest has enabled WA Health to support a number of major capital works for HMR facilities in recent years, including:

- \$7.0 million for the BioDiscovery Centre at the Perkins Institute (2013-14)
- \$1.0 million for the Lions Eye Institute's capital fit-out at the Perkins Institute (2012)
- \$7.2 million for Sarich Neuroscience Research Institute (2013), consisting of three \$2.4 million grants to the Australian Neuromuscular Research Institute, McCusker Alzheimer's Research Foundation, and Ear Science Institute Australia
- \$1.5 million for the Perth Children's Hospital / Telethon Kids Institute (2017).

### **Insurance Commission of WA**

The Insurance Commission of WA (ICWA) has a legislative requirement to support research into industrial-related diseases. In accordance with this requirement, ICWA has supported the National Centre for Asbestos Related Diseases (NCARD) since 2001, most recently with a \$1.9 million grant for the period 2014-17. ICWA also partners with the Neurotrauma Research Program (NRP) at the Perron Institute to support research into rehabilitation and care challenges faced by people with catastrophic injuries resulting from motor vehicle accidents and workplace accidents.

### **New Industries WA**

In November 2017, the State Government committed \$16.7 million over four years to the New Industries Fund as part of the New Industries WA initiative. The establishment of this Fund resulted from the inaugural Western Australian Innovation Strategy launched in 2016. The Innovation Strategy, which complements the 2015 WA Science Statement, highlights health and medical research as a priority area for the State.

### **Healthway**

Healthway was established by the State Government as a health promotion foundation in 2016. As a component of its charter to promote good health in WA, Healthway funds research activity related to health promotion, changing community attitudes towards healthy lifestyles, and the prevention of illness. In 2016-17, Healthway distributed more than \$1.7 million in research grants, including:

- \$97,000 for research into reducing harm from tobacco
- \$371,000 for research into reducing harm from alcohol and other drugs
- \$952,000 for research into reducing and/or preventing obesity
- \$252,000 for research into promoting mental health.

Healthway and its grant funding programs will merge with Lotterywest as of 30 June 2018.

**Key finding:** Combined with other sources of government funding, there is no uniform strategic allocation of HMR and HMIC funds provided by the State Government. The Department of Health and other agencies and statutory bodies provide funding over different time periods, through different assessment processes, and with differing degrees of evaluation and impact assessment.

## **2.3 Other sources of HMR and HMIC funding**

### **2.3.1 National Health and Medical Research Council**

The National Health and Medical Research Council (NHMRC) is an independent HMR funding body established by legislation and answerable to the Commonwealth Minister for Health. In its 2017 funding round, the NHMRC distributed some \$841.1 million in competitive grants to health and medical research initiatives across Australia. Most of this funding is directed to individual research projects and programs, with the remainder allocated to fellowships, partnership grants, centres of

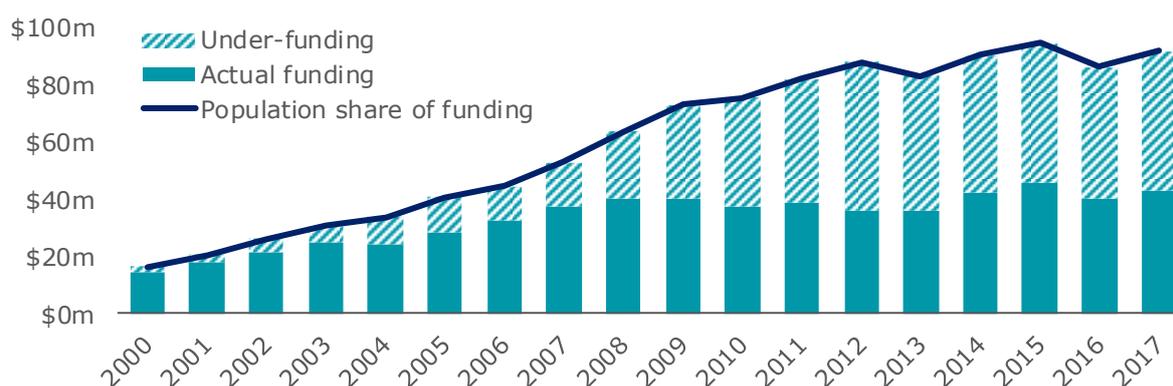
research excellence, and areas of specific priority including dementia research, obesity and metabolic disease. The NHMRC also provides additional non-competitive funding (\$36.5 million in 2017) to support infrastructure and the purchase of research equipment.

In 2017, WA institutions received some \$43.1 million worth of NHMRC grants, or 4.9% of the total disbursement. This is despite WA researchers submitting 6.2% of competitive funding applications and the State representing 10.5% of the Australian population. Indeed, WA's share of NHMRC funding has fallen consistently over the past two decades, from a high of 8.8% in 2000 to a low of 4.3% in 2012, recovering slightly in more recent years<sup>14</sup>.

Were WA to have received its population share of NHMRC funding in 2017, WA institutions and researchers would have received an additional \$49.0 million in grant funding. This 'underfunding' gap has increased 26-fold from \$1.9 million in 2000, as shown in Figure 2-4.

Between 2013 and 2017, WA institutions accounted for an average of 6.2% of NHMRC competitive grant funding applications. Were WA to have received a share of total funding equivalent to its share of applications, the State would have received an additional \$50.1 million over this five-year period. Aside from one \$47,000 infrastructure grant to the Ear Science Institute Australia in 2014, all NHMRC grant funding to Western Australia over the last five years has gone to the five universities. Details of NHMRC disbursements to WA institutions over this period are contained in Table 2-4.

Figure 2-4: NHMRC funding disbursed to WA, actual vs. population share



Source: NHMRC; Deloitte Access Economics analysis

Between 2000 and 2017, the total pool of NHMRC funding increased from \$167.8 million to \$877.7 million, growing at a compound annual growth rate (CAGR) of 10.2% per annum. In contrast, over this same period, Western Australia's share of NHMRC funding has increased from \$14.7 million to \$43.1 million, a CAGR of 6.5% per annum. South Australia experienced the next-lowest rate of growth, at 9.6% per annum, significantly higher than Western Australia's. As Figure 2-5 demonstrates, most states and territories' shares of NHMRC funding have grown at similar or higher rates to the national pool, with WA trailing significantly behind.

A state's share of NHRMC funding is determined by a range of factors, including the record of demonstrated excellence of the applicant and the institution through which that applicant is applying. Western Australia faces a number of challenges in achieving its population share and competing with other states and territories, including a smaller and more isolated population and fewer institutions able to apply for NHMRC funds (because the majority of WA's independent medical research institutes are not accredited to apply for NHMRC funds, because they do so through the universities, and not as independent bodies).

<sup>14</sup> While the application of a population-based analysis of funding is a broad measure and is useful to indicate the relative decline in WA's share of NHMRC funding over time, it should be recognised that there is a need for WA researchers to drive improvements in the quality of NHMRC applications to increase the success rate.

Relative to New South Wales, Victoria and Queensland, it is possible that WA suffers from the lack of a defined State-wide health and medical research strategy. Other jurisdictions utilise such strategies to identify areas of strength and weakness and support researchers in relevant disciplines to improve the quality and competitiveness of their NHMRC applications.

Table 2-4: Total NHMRC grant funding to WA institutions, 2013-2017

Institution	Funding received (\$)	Funding received (% of total)
University of Western Australia	177,323,828	83.9%
Curtin University	20,431,035	9.7%
Edith Cowan University	6,802,581	3.2%
Murdoch University	5,332,770	2.5%
University of Notre Dame	1,372,087	0.6%
Ear Sciences Institute Australia	47,370	0.0%
<b>Total</b>	<b>211,309,672</b>	

Source: NHMRC

A total of 1,305 health and medical research programs were funded by the NHMRC in 2017, chosen from among 5,352 competitive applications, equating to an average success rate of 19.3%. NSW and Victoria, the largest funding recipients, saw success rates of 30.2% and 21.3% respectively, higher than the national average. In contrast, only 16.5% of Western Australian applications were successful. WA's success rate for competitive NHMRC grants has been between 1.8 and 5.4 percentage points below the national average every year since 2013.

While the success rate is a useful indicator of the relative quality of WA's best applications compared to quality applications from other jurisdictions, it is not a useful predictor of the average level of quality of any particular WA application. Many unsuccessful applications are classified by the NHMRC as 'fundable but not funded', indicating a high level of quality but falling short of being funded in a particular year. Examining the proportion of WA applications falling into this category in comparison to other States may be useful in determining the overall quality of applications being submitted from WA.

WA institutions excel in some areas of health and medical research. For example, in 2017, WA researchers attracted 13.2% of total NHMRC funding for medical physiology, 12.3% of funding for paediatrics and reproductive medicine, 11.9% of funding for medicinal and biomolecular chemistry, and 11.3% of funding for genetics. However, in the two largest pools of NHRMC funding – public health and health services (\$145.2 million) and clinical sciences (\$97.8 million) – WA researchers received just 2.0% and 5.6% of total funds disbursed, respectively. In some fields – including psychology, metabolomics, nanotechnology and medical biotechnology – WA researchers did not receive any funding.

Figure 2-5: Annual growth (CAGR) in NHMRC funding, 2000-2017



Source: NHMRC

The NHMRC distributes funding for individual projects, programs, and areas of research priority (around 76% of total funding disbursed in 2017), fellowships and scholarships (16%), partnerships and collaboration (4%), and research infrastructure (4%). The most significant underperformance among WA researchers occurs in the infrastructure space, attracting just 0.8% of the total funding pool in 2017. This is attributable to the fact that WA’s independent medical research institutes submit NHMRC funding applications through or in partnership with one of the five major universities. This limits the extent to which WA researchers can access funds from the NHMRC’s Independent Research Institutes Infrastructure Support Scheme (IRIISS), which universities are not eligible to access. While this is partially offset by State Government infrastructure funding through the MHRIF and RIS schemes, WA is nonetheless missing out on additional research infrastructure funds from the Commonwealth.

WA attracts just 4.3% of NHMRC funding for fellowships and PhD scholarships. This is of particular concern because of the lifecycle of a research fellowship and the self-sustaining nature of accessing research funding; in addition to providing a number of years’ salary support for a researcher, a NHMRC fellowship is likely to position that researcher for greater success in future competitive funding applications beyond the life of the original fellowship. This is especially important for young or early career researchers.

**Key finding:** Western Australia’s share of NHMRC funding is less than half of its per capita share, and the total amount of funding received has grown at a slower rate than every other jurisdiction since 2000. While the NHMRC remains a key source of funds for WA researchers, it has limited scope to be relied upon as a source of sustainable funding over the medium to long term.

### 2.3.2 Medical Research Future Fund

The Medical Research Future Fund (MRFF) was established by the Commonwealth Government in 2015 to provide a sustainable source of long-term funding for medical research and innovation in Australia. The MRFF has a capital target of \$20 billion, funded from savings in the health portfolio, having reached \$7 billion as at 31 December 2017. The Fund is managed by the Board of Guardians of the Future Fund, with an investment mandate for capital preservation and the generation of a stable income stream to fund medical research and innovation. The Government anticipates the MRFF will disburse a total of \$1.4 billion over its first five years of operation, commencing in 2016-17.

Disbursements from the MRFF have thus far occurred through collaboration between the Commonwealth Department of Health and NHMRC, utilising the latter’s existing framework for assessing applications for competitive HMR funding. A total of \$65 million was allocated for MRFF programs in 2018, including \$18.9 million in research grants administered by the NHMRC.

The MRFF has three active headline funding programs: \$78 million over five years for a range of fellowship programs to increase Australian researchers' skills and global competitiveness, \$35 million for its BioMedTech Horizons program to support viable new health and medical technology, and \$50 million for its Brain Cancer Mission initiative with the objective of doubling brain cancer survival rates. In its first year of operation, the MRFF also funded targeted programs into antimicrobial resistance, clinical trials, preventative health, and rapid applied research translation (which included \$10 million to support the NHMRC Advanced Health Research and Translation Centres).

Western Australian researchers received some \$1.2 million, or 7.0%, of the MRFF's first round of career development and practitioner fellowships, commencing in 2018, and no funding from its Translating Research into Practice (TRIP) fellowship program. However, of the \$26.6 million allocated to the MRFF's clinical trials funding initiative, \$3.5 million or 13.3% went to WA researchers.

The targeted nature of the MRFF's many funding schemes could arguably better position Western Australian researchers to access more than the State's population share of funding in its areas of strength and specialisation, however early evidence suggests the State is underperforming in general and non-specific funding schemes, including fellowship programs.

**Key finding:** Though the MRFF is only in its second year of operation, WA researchers are already receiving a significantly lower share of funds disbursed than the State's population share. Of particular concern is that WA received no funding for translational research fellowships.

The annual funding available for disbursement by the MRFF is determined by the Future Fund Board of Guardians, while the high-level allocation of those funds – including selection of priority areas for targeted funding schemes – is the responsibility of the independent Australian Medical Research Advisory Board (AMRAB). The AMRAB was established in 2016 to support the MRFF, including by developing its five-year strategy, foundational funding principles, and reviewing funding priorities on an annual basis.

### 2.3.3 Biomedical Translation Fund

The Biomedical Translation Fund (BTF) was established as part of the Commonwealth Government's National Innovation and Science Agenda (NISA) in 2016, with a \$250 million commitment from the Commonwealth matched dollar for dollar by the private sector. The BTF is managed by three fund managers selected through a competitive process: Brandon Capital, BioScience Managers, and OneVentures. Applications for funding are made directly through one of the three fund managers.

While acknowledging Australia's track record of excellence in health and medical research, the BTF is intended to fill a critical gap by taking viable health and medical innovations to market by supporting their prospects for commercialisation. BTF funds can only be invested in companies with a majority of their employees and assets in Australia, or who commit to spend the entire investment in Australia; and with an average annual turnover of \$25 million or less. That is, the BTF is designed to accelerate the commercialisation of biomedical innovations whose proponents lack the scale and access to capital to do so themselves.

Five investee companies have received funding from the BTF so far:

- ProTA Therapeutics (\$10 million) to advance the development of new treatments of food allergies in adults and children
- Rex Bionics (\$7.5 million) to develop a hands-free robotic device to help people with severe disability to walk, exercise and rehabilitate
- Saluda Medical (\$3.3 million) for neuromodulation technologies for people suffering from chronic back pain and other debilitating conditions
- SummatiX (\$5 million) for data aggregation and commercialisation services for makers of small medical devices

- Global Kinetics Corporation (\$7.75 million) to accelerate the development and commercialisation of a wrist-worn device that measures symptoms and provides clinical reports to assist with planning routine care for Parkinson's patients.

All five investee companies are based in Victoria and New South Wales, with no BTF funds yet to flow into Western Australia.

**Key finding:** Like the MRFF, the BTF is only in its early years of operation and the vast bulk of its \$500 million initial capital is yet to be invested. Though it has the potential to significantly advance Australia's health and medical innovation and commercialisation capability, no funds have yet been allocated to WA innovators.

### 2.3.4 Other Commonwealth Government sources of funding

#### Australian Research Council

The Australian Research Council (ARC) administers the National Competitive Grants Program (NGCP), which comprises two major funding schemes: the Discovery Program and the Linkages Program. ARC Discovery grants fund fellowships, early career researcher awards, and projects. Linkages grants fund ARC Centres of Excellence, industrial transformation research hubs, training centres, and provide additional funds for research infrastructure, equipment, and facilities. In 2016-17 the ARC approved a total of \$906.2 million new NCGP grants involving 3,094 researchers across Australia, some 14% or \$126.9 million was allocated to health and medical research.

The ARC's medical research policy specifically excludes its funding of projects with direct medical and/or human health aims, research involving the use of animal models, interventional research, and the use or development of medical devices and technology directly involved in the diagnosis or treatment of medical conditions. Instead, ARC funding is directed toward fundamental science and basic research. This is a deliberate policy to avoid the overlap of ARC and NHMRC responsibilities.

The ARC allocated a total of \$8.3 million to Western Australian health and medical research project grants (excluding fellowships and other types of funding) between 2013 and 2018; this represents just 5.0% of the \$167.1 million worth of HMR project grants disbursed by the ARC over the same period. This is not dissimilar from WA's recent average share of NHMRC funding, suggesting the existence of similar barriers impeding WA researchers' ability to access Commonwealth funding for health and medical research.

**Key finding:** WA receives roughly the same share of HMR funding disbursed by the ARC as the NHMRC, significantly lower than its population share.

#### Department of Education and Training

Under the terms of the Higher Education Support Act, the Commonwealth Department of Education and Training (DET) provides research block grants to Australian universities in two streams: the Research Training Program to support the training of students undertaking higher degrees by research; and Research Support Grants to support systemic and institutional costs of conducting research. The block grants are allocated to institutions according to their success at attracting research income (including through other Commonwealth competitive grant schemes) and the rate of completion of higher degrees by research.

DET disbursed \$1.9 billion for research block grants commencing in 2018, of which \$170.7 million or 8.9% was allocated to Western Australian universities. Unlike other grant schemes discussed, DET research block grants are distributed to university administrators, with each institution exercising full autonomy over which students, research projects, researchers or infrastructure are funded by the grants. As a result, it is not possible to determine what proportion of the \$170.7 million allocated to WA institutions for 2018 will then be used to support health and medical research.

As of 1 January 2017, the consolidated block grants schemes replaced a number of other DET sources of funding for research, including the former Australian Postgraduate Awards, Research Infrastructure Block Grants, and Sustainable Research Excellence schemes.

### **2.3.5 Non-government sources of funding**

Outside of programs funded by the State and Commonwealth Governments, a number of private, independent, and not-for-profit organisations fund health and medical research and innovation in Western Australia.

#### **National Foundation for Medical Research and Innovation**

The National Foundation for Medical Research and Innovation (NFMRI) is a charitable trust established more than 40 years ago as the Sydney Hospital Foundation for Medical Research. It was re-established as the NFMRI in 2014 to reflect its updated mission to provide grants to researchers across Australia. In 2016, the NFMRI disbursed more than \$700,000 in HMR grants.

Though no longer affiliated with any particular hospital or institution, the NFMRI receives some support from the Queensland and NSW State Governments and from IP Australia, the Commonwealth Government agency responsible for administering intellectual property rights and legislation. As at the end of 2016, the NFMRI had some \$19.6 million in financial capital, the income from which – in addition to donations and public funding support – is used to finance its research grant distributions on an annual basis.

The NFMRI offers four streams of funding support: grants for original innovation and discovery of up to \$200,000 per annum for up to three years; grants for collaborative innovation and advancement of up to \$100,000 over one to two years; grants for innovation uptake and transformation of up to \$150,000 for up to one year; and negotiable support grants for access to research tools, commercialisation and IP support, and industry collaboration.

#### **Telethon**

The Channel 7 Telethon Trust administers funds raised during the annual 26-hour Telethon appeal, supported by the Seven West Media group. Telethon has been operating in WA for 50 years, over that period raising more than \$250 million for a range of health and medical causes but most notably child and adolescent health.

Telethon disbursed \$26.3 million in 2016, a significant majority of which was directed toward Princess Margaret Hospital and the Telethon Clinical Research Centre based at the new Perth Children's Hospital site. The Telethon Kids Institute is also a major recipient. Telethon supports a number of other bodies that in turn support health and medical research, including the Asthma Foundation, Cystic Fibrosis WA, and Joondalup Health Campus (notably through the \$15 million Telethon Children's Ward).

#### **Other sources of non-government funds**

Many of Western Australia's largest private and listed companies are significant supporters of health and medical research in the State through contributions to universities and independent medical research institutes.

Additionally, a number of independent charitable foundations – many of which are related or associated to companies aforementioned – provide regular funding support for HMR in the State, including the McCusker Charitable Foundation, Stan Perron Charitable Trust, Tony Fini Foundation, and Raine Medical Research Foundation.

## **2.4 Strengths and weaknesses of WA HMR and HMIC**

### **2.4.1 Systems and platforms**

The Western Australian health and medical research ecosystem has benefited from long term investments by successive State Governments. With a health system that covers one third of continental Australia, leveraging evidence-based care is critical to delivering high quality services

and improving health outcomes across the State. WA Health has had a pivotal role in establishing key research infrastructure to support health and medical research and innovation in Western Australia such as Linear Clinical Research, WA Data Linkage, and several research institutes (such as the Harry Perkins Institute and Telethon Kids Institute) and continues to provide leadership as health system manager.

WA has a track record of establishing and maintaining unique longitudinal cohort studies, such as the Raine Study (2,868 families, started 1989), Busselton Health Study (30,000 participants, started 1966), Fremantle Diabetes Study (10,500 people, started 1993) and most recently the ORIGINS Project (aiming for 10,000 families over five years). These cohorts have leveraged WA strengths in data linkage, registry management and biobanking with other examples including Australia's first Autism Biological Registry, the Perron Rotary Express Milk Bank, and the Curtin University Health Research and Data Analytics Hub, which includes the NHMRC Centre of Research Excellence in Cardiovascular Outcomes Improvement. A review of Western Australia's data linkage capabilities, chaired by Professor Peter Klinken in 2016, found data linkage projects had attracted more than \$136 million in research and related funding to WA and supported over 400 research projects. The announcement of the \$200 million Digital Health Cooperative Research Centre in April 2018 is further evidence of WA's strength in health data analysis with local partners including the Department of Health, WA Country Health Service (WACHS), WA Primary Health Alliance (WAPHA), St John of God Health Care, and Curtin University.

Western Australia has established itself as an important centre for clinical trials in southeast Asia, with cutting edge trials being conducted across WA hospitals and health services and over 700 trials actively recruiting WA participants at the time of this report.<sup>15</sup> Examples such as Linear Clinical Research, established following a \$9.4 million investment by the State Government, have brought world first medical care to Western Australian patients and contributed to the economic development of the sector. The economic contribution of Linear was recognised in 2017 at the Australian Export Awards where they were awarded the National Business Services Award. A number of local groups are also establishing capability in Bayesian adaptive clinical trial design, further establishing WA as a centre of excellence in southeast Asia.

Clinical trials are an area of strength for Australia generally, attributable to strong commitment from the Commonwealth Government, existing high quality research facilities, strong ethics and regulatory frameworks, and a diverse recruitment pool. Given its unique population characteristics relative to the rest of Australia, WA is well-positioned to continue its track record in clinical trials.

As the technology available to clinicians and researchers for the development and delivery of personalised medicine continues to accelerate, WA is establishing capability with cutting edge platforms such as the Australian National Phenome Centre, an international research node dedicated to developing and delivering metabolic phenotyping services to benefit the global population, at Murdoch University. This capability will enable clinicians and researchers to analyse patient and population-based samples to identify novel biomarkers, diagnostic markers and prognostic markers. Platforms such as the X-RAD SmART system (Australia's first state of the art small animal radiotherapy system) at the Telethon Kids Institute, high throughput next generation sequencing technologies at the Harry Perkins Institute, and the Centre for Microscopy, Characterisation and Analysis at the University of Western Australia provide world class facilities for clinicians and researchers across WA and around the world.

**Key finding:** WA has a long track record of demonstrated excellence in select areas of health and medical research, such as data linkage and clinical trials. However, these areas require ongoing funding to maintain a standard of excellence and international competitiveness.

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<sup>15</sup> The NHMRC and Commonwealth Department of Industry, Innovation and Science have jointly established a national clinical trials registry, see [www.australianclinicaltrials.gov.au](http://www.australianclinicaltrials.gov.au).

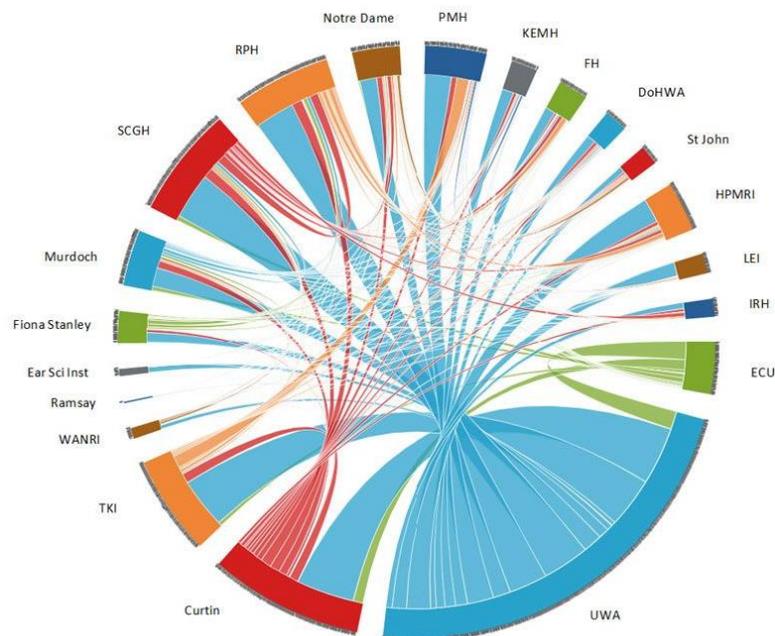
## 2.4.2 Culture and workforce

### Collaboration

Western Australia's isolation relative to other major cities has allowed strong local networks to develop, focused on resource sharing and research collaboration. These networks extend beyond formal structures such as the WAHTN, Accelerating Australia and the WA Health Networks, creating a unique opportunity to translate research outcomes into improved care models and drive innovation across the sector. Collaboration across disciplines, to share capability and extended networks is critical to research and innovation success and a well-documented priority of funding bodies both nationally and internationally.

Figure 2-6 shows instances of collaboration between participants in the WA HMR sector between 2014 and 2016, as measured by the WA Health Translation Network. Each connecting line represents a collaboration, while the size of each participant's sector on the circle represents the relative proportion of measured research undertaken by that participant.

Figure 2-6: Instances of collaboration in the WA HMR sector, 2014-2016



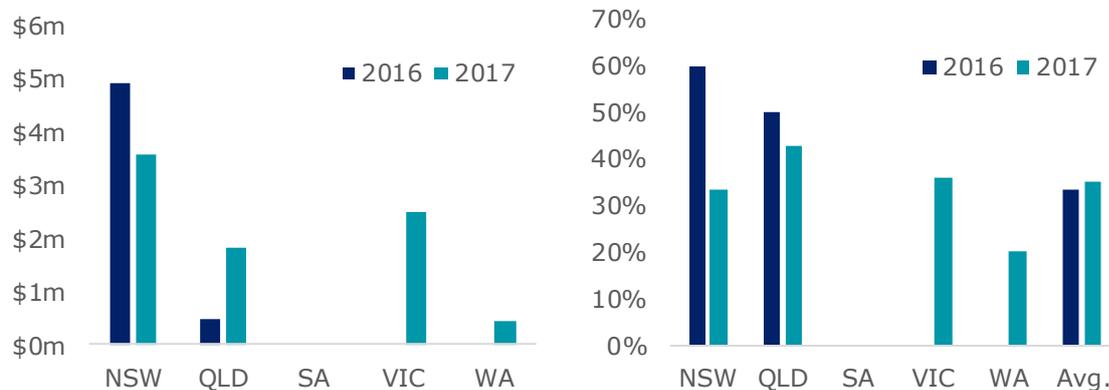
Source: WAHTN

However, while local collaboration is strong, interstate and international collaborations for competitive funding appear to be limited based on recent NHMRC funding outcomes (see Figure 2-7). In 2017, only one of five applications for international collaboration funding was successful, resulting in some \$450,000 worth of funding or 4.5% of the total international collaboration disbursement. Both the total number of applications and rate of successful funding were higher among Victorian, NSW, and Queensland applicants.

Outside of formal NHMRC funded programs for international collaboration, WA researchers develop independent collaborative relationships with overseas partners. This includes participation in sponsored multi-centre clinical trials and WA researchers contributing to applications for major international funding. Such relationships are difficult to quantify but nonetheless demonstrate that WA's top researchers have developed an international collaborative footprint.

**Key finding:** WA's isolation and relatively small research community has enabled strong local collaboration producing world-class research output. However, interstate and international collaboration is limited in part by a lack of funding, and there are insufficient incentives in existing sources of funding to encourage further interstate and international collaboration.

Figure 2-7: NHMRC grant applications for international collaboration, value (left) and funded rate (right)



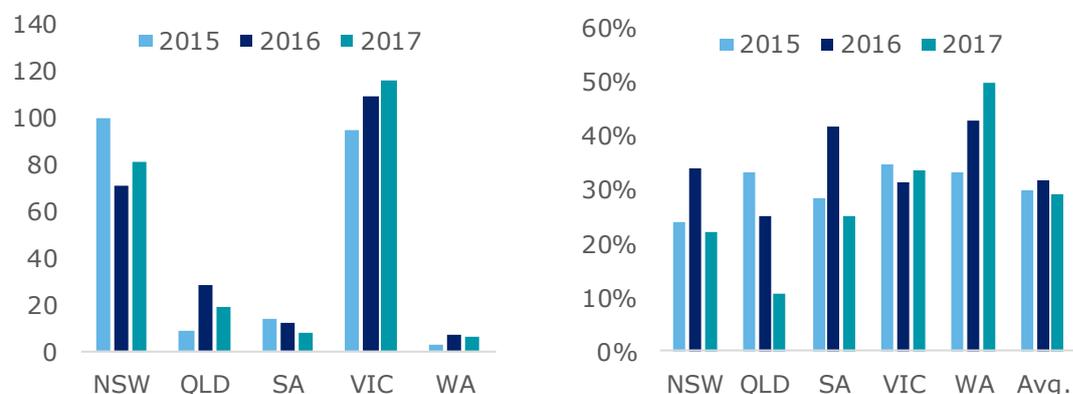
Source: NHMRC

### Workforce

Western Australia's success in attracting funding for NHMRC fellowships, considered the gold standard for individual research excellence, has been limited. Both the number of applications and the funded rate are comparatively lower than other states across the fellowship programs, suggesting WA's research talent pipeline requires further development.

The development of a world class talent pipeline requires investment along the entire length of a researcher's career pathway. The number of Western Australian applications for NHMRC postgraduate scholarships is significantly lower than other states, with just six applications in 2017 compared to 116 in Victoria. Despite similar success rates between states, this volume of applications represents \$4,099,080 in funding for Victorian postgraduates and just \$291,953 to support Western Australian talent. Postgraduate scholarships are awarded to support health and medical graduates to attain a postgraduate degree and develop capability for independent research in Australia.

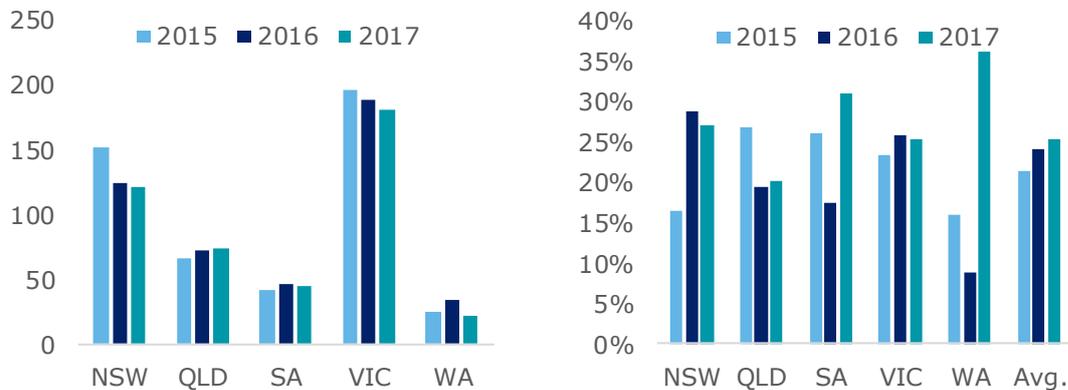
Figure 2-8: NHMRC postgraduate scholarships, applications (left) and funded rate (right)



Source: NHMRC

A similar trend is observed for NHMRC early career fellowships, with WA submitting 22 applications in 2017 compared to 181 from Victoria, 122 from New South Wales, 74 from Queensland, and 45 from South Australia. This lower application rate has historically been coupled with lower than average success rates. Early career fellowships aim to foster career development at the postdoctoral level and provide opportunities for researchers to undertake research in different research environments.

Figure 2-9: NHMRC early career fellowships, applications (left) and funded rate (right)

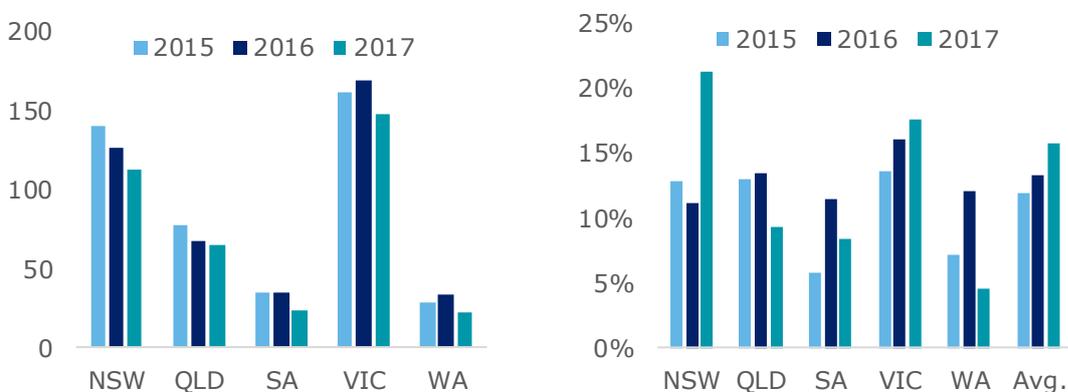


Source: NHMRC

In 2017, WA was awarded seven early career fellowships across public health, basic science, and clinical medicine representing \$2,550,730 in funding support for early career researchers. By way of comparison, SA received \$4,785,852 and QLD received \$4,862,804 in funding. As Figure 2-9 shows, while WA had the highest rate of funding success among the states in 2017, the total number of applications was still disappointingly low.

The NHMRC grants career development fellowships to support the most outstanding early- to mid-career researchers across Australia. This program is highly competitive as it aims to establish recipients as independent, self-directed research leaders. WA's number of career development fellowships decreased from 33 in 2016 to 22 in 2017. While a decrease in total applications at the national level from 452 to 388 was noted, WA's reduction was comparatively large, and accompanied by a drop in success rate from 12.1% to just 4.5%, with one fellowship awarded focused on improving the mental health outcomes of Australian young people.

Figure 2-10: NHMRC career development fellowships, applications (left) and funded rate (right)



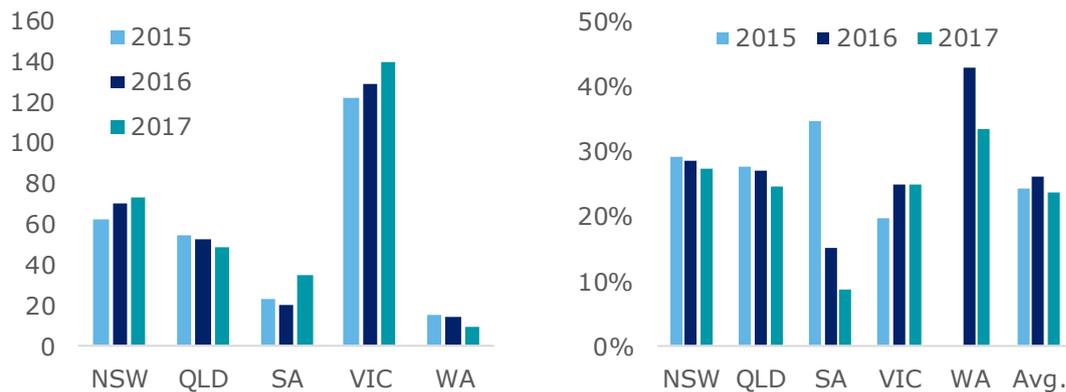
Source: NHMRC

The decrease in success rate at a critical part of the research talent pipeline should be noted with concern. Both the relative lack of applications and the low funding rate suggests WA lacks a

sufficient cohort of competitive mid-career researchers. This represents a challenge in terms of attracting further research funding going forward, developing a critical mass of research leadership and fostering a culture of research excellence for early- and mid-career researchers.

NHMRC research fellowships support world-leading researchers to conduct full-time research and create knowledge to improve health and healthcare in Australia. They are generally won by researchers with a significant history of demonstrated research excellence. The number of research fellowship applications has remained relatively stable over recent years, with Victoria leading all other states in terms of both number of applications and funding received.

Figure 2-11: NHMRC research fellowships, applications (left) and funded rate (right)

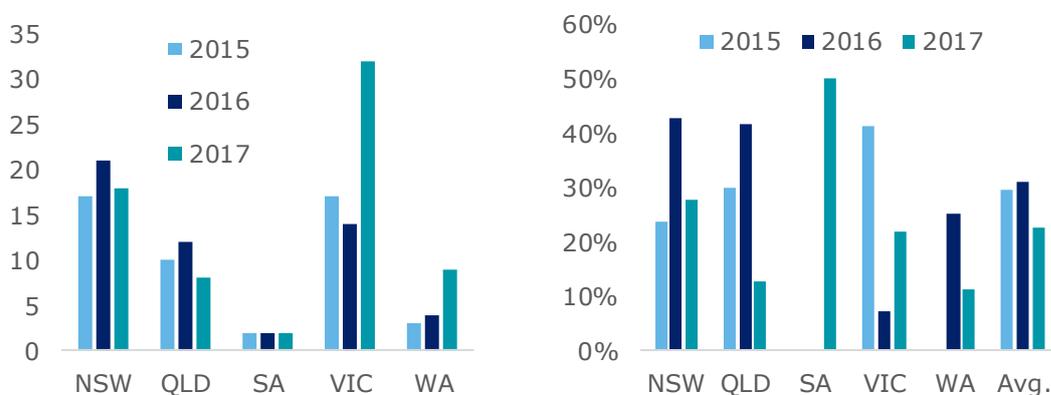


Source: NHMRC

WA submitted nine research fellowship applications in 2017, down on previous years, while Victoria increased its number of applications submitted from 129 to 140. Encouragingly, WA has enjoyed a comparatively high success rate in the last two years after failing to receive any funding in 2015. All fellowships received in 2017 were focused on clinical research, after a very successful 2016 during which six fellowships were awarded equally across public health and basic research.

NHMRC practitioner fellowships are part time, five-year fellowships for clinicians, public health or health service professionals to engage in research to bridge the gap between the acquisition of new knowledge and its implementation into practice and policy to deliver improvements in healthcare to Australians.

Figure 2-12: NHMRC practitioner fellowships, applications (left) and funded rate (right)



Source: NHMRC

WA has been awarded two practitioner fellowships over the last three years and submitted just 16 applications, while Queensland has secured nine fellowships from 30 applications over the same

period. The low number of applications and success rate in WA suggest that the research capability of clinical health professionals in WA may be lacking compared to other states. This may be attributable to a lack of support for clinical professionals to engage in research, relative to other jurisdictions. Clinical professionals require salary coverage and protected time from service delivery in order to conduct research. Insufficient support from health service providers could limit both the number of applications for practitioner fellowships and their quality relative to other jurisdictions, resulting in a lower success rate.

**Key finding:** WA’s lack of success at winning NHMRC fellowship funding is an indicator of the risks to the pipeline of future researchers. Though the State boasts a number of world-leading individuals, many are in the later stages of their career, with a limited pool of early- to mid-career researchers achieving sufficient fellowship funding to replace them.

## Culture

Several reports have provided commentary regarding the research culture within the WA Health system and in particular public hospitals. Commentary is centred around priority being given to clinical service and administration over teaching, training and research. The 2017 Hospital Health Check conducted by the Australian Medical Association (AMA) WA reported that, on average, fewer than 60% of doctors in training across WA hospitals felt supported to pursue research goals, reflecting challenges junior doctors face in developing research capabilities and contributing to excellence in clinical care.

Table 2-5: Doctors in training who feel supported to pursue research goals

Hospital	Response
Fiona Stanley Hospital	54%
Joondalup Health Campus	72%
King Edward Memorial Hospital	85%
Princess Margaret Hospital	43%
Royal Perth Hospital	56%
Sir Charles Gairdner Hospital	45%
<b>State-wide</b>	<b>60%</b>

Source: 2017 AMA WA Hospital Health Check

Likewise, a 2017 review of the morale and engagement of clinical staff at PMH, commissioned by the Child and Adolescent Health Services board, found that:

*"There is a broad held view amongst those interviewed that teaching, training and research is no longer highly valued by the organisation and has been somewhat decimated by a heavy focus on service delivery and compliance, and with staff reductions, a reduction in availability of non-clinical time. Junior medical staff in particular spoke of a real risk to the organisation’s reputation and ability to attract future graduates."*

The apparent lack of a research culture across WA Health may be impacting on the development of WA’s talent pipeline, both in terms of high quality clinicians and researchers. Research is a highly competitive field that requires significant discretionary effort. Leading organisations such as the Mayo Clinic invest heavily in developing a culture that puts patients first and acknowledges the need for medicine to develop as a ‘cooperative science’. To capture the opportunity represented by the FHRI Fund, a significant shift in culture is required by researchers, clinicians, health professionals and health administrators.

Notably, the 2017 Review of Safety and Quality in the WA Health system found that there is a “lack of appropriate tension” and “inability to challenge others”, arising from a health system culture that is reflective of WA as an “isolated microcosm” that “works with a relatively limited resource pool”. This lesson is of particularly critical significance for the Department of Health in its capacity as health system manager.

**Key finding:** There is significant space for improving WA’s research culture, most critically by prioritising research as a meaningful use of time and resources within WA hospitals and among clinical professionals.

### 2.4.3 Financial return and sustainability

#### Research

2017 saw funding received from the NHMRC by WA at its highest in four years, following a period of historically flat outcomes. Studies of the economic and financial returns of investment in health and medical research reveal uniformly positive results, with an estimated economic dividend of \$3.20 for each \$1.00 invested in HMR<sup>16</sup>, arising from workforce productivity improvements and reduced healthcare costs. Over a period of 15 years (2000–2015), it is estimated that the NHMRC’s investment in HMR has yielded a net benefit of \$23.4 billion. Further detail can be found in following reports:

- Deloitte Access Economics 2016, “Australia’s health and medical research workforce: Expert people providing exceptional returns”, Report for The Australian Society for Medical Research
- Access Economics 2003, “Exceptional returns: The value of investing in health R&D in Australia”, Report for the Australian Society for Medical Research
- Access Economics 2008, “Exceptional returns: The value of investing in health R&D in Australia (update), Report for the Australian Society for Medical Research
- Access Economics 2008, “Returns to NHMRC funded Research and Development”, Report for the National Health and Medical Research Council
- Deloitte Access Economics 2011, “Returns on NHMRC funded Research and Development (update)”, Report for Australian Society for Medical Research
- Deloitte Access Economics 2012, “Extrapolated returns on investment in NHMRC medical research”, Report for Australian Society for Medical Research
- Deloitte Access Economics 2014, “Extrapolated returns from investment in the MRFF”, Report for Australian Society for Medical Research
- National Health and Medical Research Council 2011, “Economic benefits of health and medical research”, discussion paper
- Lateral Economics 2010, “The economic value of Australia’s investment in health and medical research: Reinforcing the evidence for exceptional returns”, Report for Research Australia.

Research and clinical excellence (evidenced through NHMRC funding) enables researchers and clinicians to leverage additional funding sources. These sources include philanthropic foundations (Telethon<sup>7</sup>, Minderoo), local research funding (Department of Health, Cancer Council WA), commercial partnerships (venture capital and industry) and further federal funding (such as the ARC).

Funding received by Western Australian institutions from the NHMRC in the last four years has been focused on Aboriginal health, cardiology, paediatrics, respiratory disease and cancer therapies. The top 20 areas funded by NHMRC since 2014 are provided in Table 2-6.

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<sup>16</sup> Deloitte Access Economics 2016, “Australia’s health and medical research workforce: Expert people providing exceptional returns”, Report for The Australian Society for Medical Research

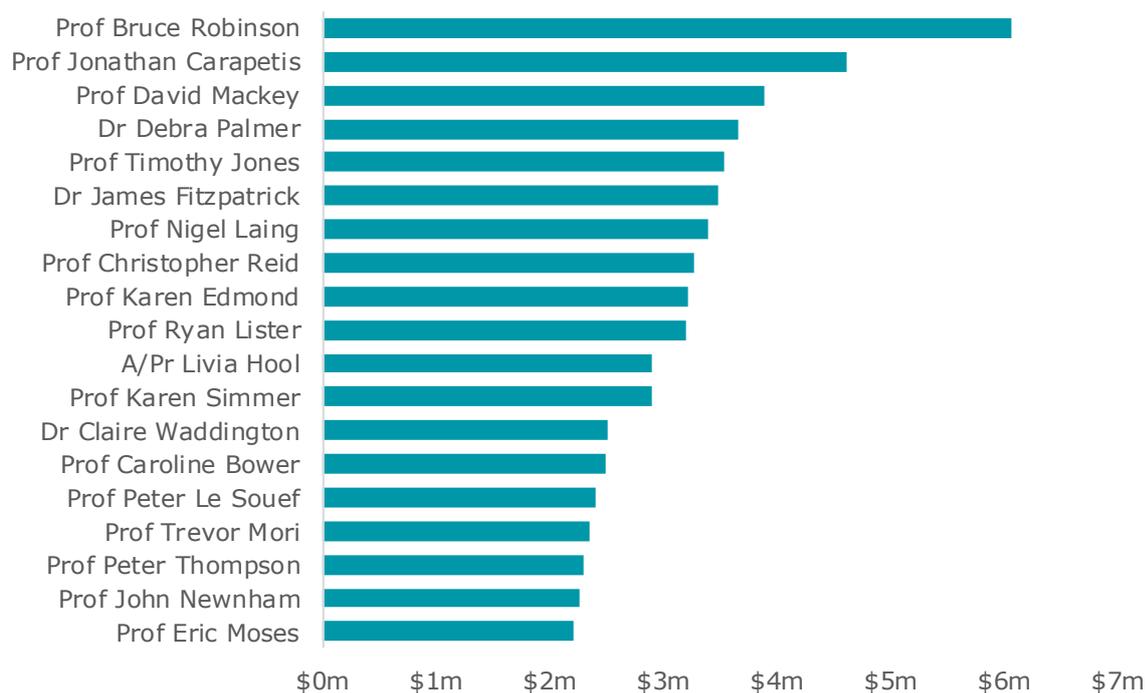
Table 2-6: Top 20 research areas for WA NHMRC funding recipients, 2014-17

Research area	Amount (\$)	Share of total (%)
Aboriginal and Torres Strait Islander Health	16,890,527	16.4
Cardiology (incl. Cardiovascular Diseases)	16,117,657	12.0
Paediatrics	10,528,131	16.6
Respiratory Diseases	9,701,989	18.4
Cancer Therapy (excl. Chemotherapy and Radiation Therapy)	6,896,984	17.0
Allergy	6,603,654	53.7
Epidemiology	6,032,585	6.9
Epigenetics (incl. Genome Methylation and Epigenomics)	4,718,595	27.1
Endocrinology	3,885,324	8.6
Public Health and Health Services	3,786,795	3.5
Neurology and Neuromuscular Diseases	3,690,207	4.9
Ophthalmology	3,399,417	14.0
Solid Tumours	2,969,566	7.8
Medical and Health Sciences	2,890,642	4.2
Psychiatry (incl. Psychotherapy)	2,822,008	5.1
Orthopaedics	2,728,900	25.5
Central Nervous System	2,720,422	1.9
Clinical Sciences	2,581,761	5.1
Obstetrics and Gynaecology	2,272,054	7.3
Immunology	2,231,325	11.7

Source: NHMRC

Leadership in these areas has been provided by a number of individuals who have received significant funding as chief investigators since 2014 (see Figure 2-13). These individuals have established themselves as independent research leaders and if supported, can be expected to remain competitive at the national and international level.

Figure 2-13: Top 20 WA recipients of NHMRC funding, 2014-2017



Source: NHMRC

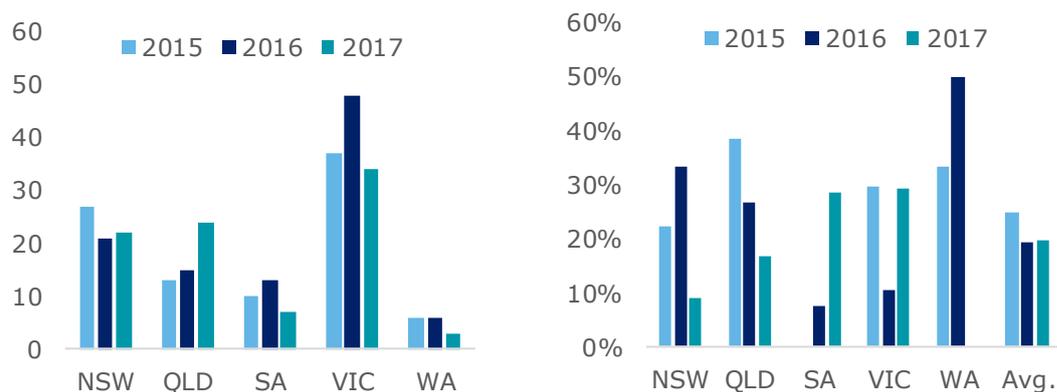
### Innovation

The NHMRC offers development grants to researchers and research teams to support the proof-of-concept stage of the research process, with a specific commercial outcome identified within a foreseeable timeframe. Development grants are not available for basic or discovery science efforts with no foreseeable commercial outcome. In order to be eligible for an NHMRC development grant, the research program in question must have a commercial business plan and detailed feasible commercialisation strategy that accounts for regulatory, intellectual property, and other barriers and potential routes to market.

Western Australia underperforms in the number of development grant applications submitted to the NHMRC, with 15 applications submitted over the previous three years, while South Australia submitted 30 and Queensland submitted 52.

WA received funding for three projects in 2016 with a combined value of \$1.8 million, and two projects in 2015 with a combined value of \$1.4 million. None of the three WA applications submitted in 2017 were successful, with the full \$13.8 million disbursement being allocated to researchers in Victoria, Queensland, South Australia, New South Wales, and the ACT.

Figure 2-14: NHMRC development grants, applications (left) and funded rate (right)



Source: NHMRC

Despite the recent development grant outcomes, Western Australia has a strong track record of commercialisation of life science technologies. The 2017 AusBiotech Snapshot Report found that WA had the fourth highest number of employees in the life sciences sector, with 6,936 people across 119 organisations and approximately 4,000 people directly employed in medical technology and pharmaceutical organisations. Examples of ASX listed companies based in WA include:

- Dimerix: Using GPCR assay technology to develop lead compounds across several disease indications
- iCeutica: A proprietary SoluMatrix™ technology; two nano-pharmaceuticals for pain and inflammation; FDA approved
- Orthocell: Orthopaedic technology-based company developing methods of ankle and elbow tendon repair
- Resonance Health: MRI technology able to assess iron overloads diseases in the liver
- Avita Medical Ltd: A medical device company developing and distributing highly innovative skin regeneration products and treatment solutions derived from the regenerative properties of a patient's own skin
- Phylogica: Develops proprietary peptide candidates, Phylomer peptides for pharmaceutical and biotechnology companies.

A further example is the recently FDA-approved exon-skipping treatment of Duchenne Muscular Dystrophy, the result of work conducted by UWA and Murdoch University researchers. This treatment was licensed to Serapta Therapeutics for a low single-digit royalty on net sales with an option to purchase future royalties up-front, for a \$23.0 million payment to UWA. Additionally, Serapta would still be obligated to make up to \$20.0 million in payments to UWA upon achievement of certain sales milestones.

#### 2.4.4 Social and clinical dividend

Western Australia has an extensive number of individuals widely recognised for their contributions to science and health care, many for translating research outputs into practice, namely:

- Mike Daube – Western Australian of the Year
- Robin Warren, Barry Marshall – Nobel Prize
- Fiona Stanley, Fiona Wood – Australian of the Year
- Fiona Stanley – Australian Legend Award
- Lyn Beazley, Fiona Stanley, Ian Constable, Barry Marshall, Robin Warren – WA Science Hall of Fame
- Graeme Hankey, Hannah Moore, Kevin Pflieger, Graham Hall, Tristan Clemons, Simon Mallal – WA Premier's Awards.

Examples of social and clinical dividends arising from health research and innovation in Western Australia include:

- Developmental Pathways Project, which established the safety of multiple prenatal ultrasounds, a landmark in safe obstetric practice
- Mandatory folate fortification of flour, resulting in a 15% decline in neural tube defects in Australia and 68% in the Aboriginal population
- Creating a diagnostic tool for Foetal Alcohol Spectrum Disorder that has resulted in a greater than 50% reduction in alcohol intake in some Aboriginal communities
- Identification of immunotherapeutic strategies for the prevention of asthma through early exposure to dust mites and other allergens
- Developed imaging techniques to allow the first clinical trials of young children living with cystic fibrosis aimed at preventing rather than reversing lung damage
- Identified that children with neutrophil elastase in their lungs are at higher risk of developing bronchiectasis, leading to a clinical trial of a drug to prevent onset
- Development of antithrombotic treatments for prevention of stroke
- Identifying the effects of diet and alcohol on blood pressure leading to the current Australian dietary guidelines
- Development of non-invasive imaging technology to measure hepatic iron content to quantify hepatic fibrosis and liver fat
- Comprehensive cancer services that include Phase 1 clinical trials and have led to novel liquid biopsies for monitoring melanoma treatments
- Identification of unique molecular marker for leukaemia diagnosis to inform immunotherapy and chemotherapy
- The development of the first cognitive instrument suitable for elderly aboriginal people to detect dementia
- Discoveries in burn injuries and osteoporosis leading to the development of cell therapy treatments and spin out companies (Avita, Orthocell)
- Developed and commercialised a new middle ear prosthesis for malleostapedotomy
- Developed a new tissue engineering approach to treat middle ear disease, ClearDrum
- Developed exon skipping with antisense oligonucleotide therapy to restore expression of dystrophin in boys with Duchenne Muscular Dystrophy
- Examined national mental health services for young people leading to the implementation of new support services for children and families by government
- Numerous programs involving Elders in Aboriginal communities to develop greater awareness and community support in reducing mental illness, drug and alcohol related issues
- Ongoing work of the Rural Health Multidisciplinary Training program, which collaborates with Aboriginal health services across Australia and develops policies to promote health Aboriginal communities
- Telemedicine eye care clinics for screening in rural and remote WA
- Development of the 'no school, no pool' policy to reduce skin and ear infections in Aboriginal children
- The discovery of *Helicobacter pylori* in understanding gastritis and peptic ulcers
- Developing international guidelines for the prevention, diagnosis and management of Group A Streptococcal disease and Rheumatic Heart Disease
- WA being the first state to introduce the mandatory vaccination of the *Haemophilus influenzae* type B infant vaccine resulting in an 80% reduction in infections in Aboriginal and non-Aboriginal populations
- Identification of a panel of 335 genes relevant to the diagnosis of neurodegenerative diseases from which a diagnostic test was developed creating the gold standard for molecular diagnosis of neurogenetic disorders in Australia
- The development of a state-wide genomic diagnostic platform to identify and manage rare diseases
- Identification of genetic causes of blindness
- Research outcomes of the Raine study have been translated into public policy in the areas of adolescent health, development and behavioural trajectories, vision, cardiometabolic, respiratory, and hormonal disorders
- The Busselton health survey established normal ranges for different health tests (haematological indices, blood glucose, cholesterol, lung function, ECG, blood pressure) now used by doctors in Australia and internationally.

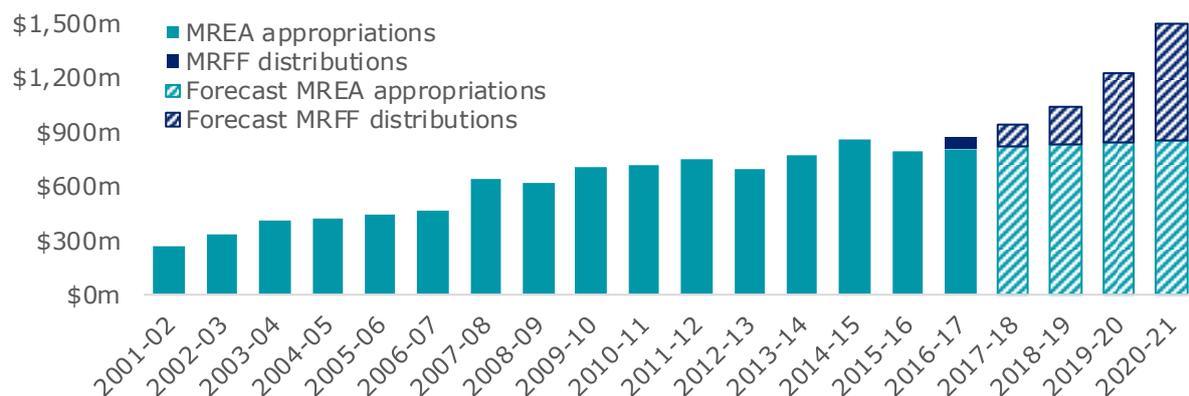
The implementation of the Research Policy Framework by the Department of Health will support continued efforts to increase research and translation across health systems in Western Australia. Annual support for translation projects is provided by the Department, however approximately 60% of projects report achieving their intended outcome, meaning that there continues to exist an opportunity to improve research translation to clinical outcomes.

Western Australia is recognised as a world leader in community engagement methods and practices to involve consumers and the community in research. Programs developed in WA provide advice and training to researchers, consumer organisations and government agencies across Australia, with a 'train the trainer' program being delivered internationally. This program raises awareness of research outcomes in the community.

## 2.5 Overview of the HMIC environment in Australia

Medical research is undergoing a significant shift. Historically, research funding has been awarded to proven 'stars' with a track record of successful research, often managing a large number of grants concurrently. This pattern of allocation, coupled with flat funding available for researchers, has created significant challenges within the national research ecosystem with concerns regarding research workforce development. There is also a widely held view that researchers were more likely to propose less innovative research in the interest of securing funding from reviewers faced with increasing numbers of applications and a fixed pool of resources. In response to these issues and projected flat allocations to the MREA, a structural review of the NHMRC's grant programs was conducted with an announcement made in May 2017 regarding the outcomes of the review.

Figure 2-15: Commonwealth funding support for HMR and HMIC



Source: NHMRC; 2017-18 Commonwealth Budget Papers

In describing the practicalities of the shift in the research funding environment Professor Anne Kelso, Chief Executive of the NHMRC has suggested:

- Teams with shared leadership have replaced the lone scientist
- Research teams need access to a diverse set of skills from basic science to epidemiology to informatics and omics
- Research networks are global
- Digital connection allows data and ideas to be shared and spread fast
- Technologies such as high throughput robotics have replaced traditional lab assistants.

The NHMRC has undertaken reforms of its grant programs aiming to:

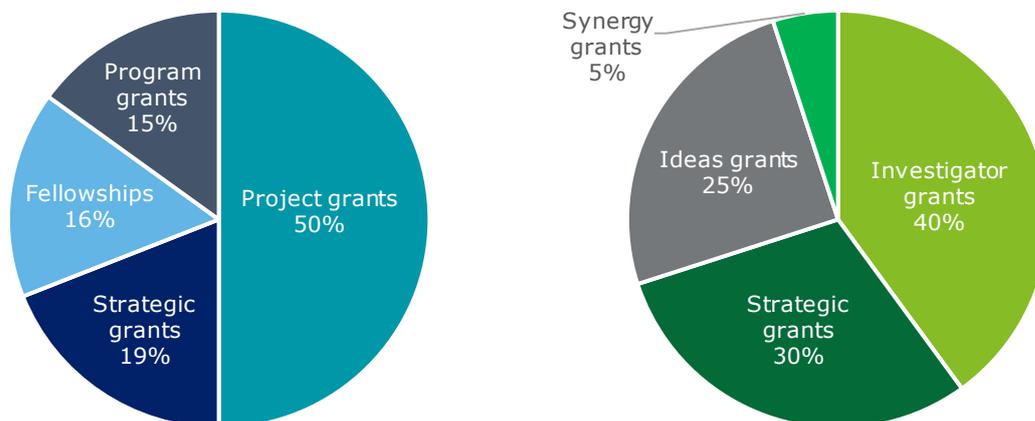
- Encourage greater creativity and innovation in research
- Provide opportunities for talented researchers at all career stages to contribute to the improvement of human health
- Minimise the burden on research of application and peer review so that researcher can spend more time on producing high quality research.

Implementation of the above will be managed under four funding streams:

1. Five-year **investigator grants** that will consolidate the previously separate fellowship and research support into one grant scheme, so as to provide funding both for salary and a research support package for globally competitive researchers. This funding is proposed to be primarily assessed based on research track record
2. **Strategic and leveraging grants** will support identified national needs, similar to existing targeted funding schemes. The program will be enhanced to include additional support for the Targeted Calls for Research scheme and a dedicated funding stream for clinical trials and cohort studies
3. **Ideas grants** that will provide funding for up to five years for researchers at all career stages. The grants will support innovative research projects that address a specific scientific question and will be assessed primarily on scientific merit, innovation and significance. Researchers will be limited to securing a maximum of two ideas grants concurrently, compared to existing project grant schemes that permit researchers to secure up to six grants concurrently
4. Five-year **synergy grants** that will provide up to \$5 million per grant for outstanding multi-disciplinary research teams to work together to answer questions that cannot be answered by a single investigator. This funding is proposed to be primarily assessed on team research track record and fund research costs.

These reforms are currently being implemented with applications under the new grant program opening in late 2018. These reforms will provide an opportunity for early- and mid-career researchers to establish a track record through ideas grants, and for Western Australia generally to bolster its clinical trial and cohort capabilities and the development of research leaders through investigator grants. The allocation of existing funding across NHMRC schemes will also be reconfigured with additional allocations to investigator grants to support individuals and provide greater career certainty for excellent researchers. The reconfiguration provides a fresh opportunity for the WA HMR sector to target its applications for NHMRC funding, however this may require additional funding support at the State level to increase the competitiveness of applications.

Figure 2-16: Configuration of NHMRC funding allocations, current (left) vs. future (right)



Source: NHMRC

In addition to funding reforms, NHMRC has also undertaken a consultation process regarding the peer review process proposed for the new grant configuration.<sup>17</sup>

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<sup>17</sup> For a summary of key themes, see the Peer Review Consultation – Summary Report available at [www.nhmrc.gov.au](http://www.nhmrc.gov.au).

**Key finding:** The proposed reconfiguration of the NHMRC's research funding streams presents a key opportunity for WA researchers to position themselves to win a higher share of funds in the future, especially to address the current gap in funding for early- and mid-career researchers. However, local funding may be required to support WA researchers to become more competitive in the application process.

Beyond the existing NHMRC scheme, additional funding programs have been implemented under the federal National Innovation and Science Agenda. The most significant initiatives related to health research and innovation are the:

- Medical Research Future Fund, which aims to transform health and medical research and innovation to improve lives, build the economy and contribute to health system sustainability through strategic investment
- Biomedical Translation Fund, which aims to support commercialisation of biomedical discoveries through partnerships with three venture capital fund managers, providing \$500 million of capital for deployment, of which \$250 million was attracted from the private sector
- MTPConnect, which aims to accelerate the rate of growth of biomedical technologies to achieve greater commercialisation and establish Australia as an Asia Pacific hub. It fosters collaboration across the sector and jointly funds project that align with its growth priorities.

The \$20 billion MRFF provides an opportunity to strategically fund research and innovation that addresses national priorities in a complementary way. The first round of disbursements focused on preventative health and research translation projects, clinical trials and clinical researchers and breakthrough research, including \$78 million allocated to the Next Generation Clinical Researcher program administered through the existing NHMRC fellowships schemes. Allocations from the MRFF and BTF are discussed in more detail in Section 2.3.

The 2017 round of MTPConnect project funding include \$7 million in funding across a range of initiatives to increase sector competitiveness, with \$1 million provided to WA-based Accelerating Australia which brings together a network of universities, commercialisation entities and industry to facilitate the translation of biomedical research through courses and support services, improve collaboration across sectors, organisations and disciplines and to identify promising biomedical products and assist in bringing them to market.

Opportunities for the FHRI Fund to align with the wider health and medical innovation environment will be discussed further in the best practice review, following stakeholder consultations with key leaders of relevant organisations.

# 3 Future state

This chapter outlines Deloitte Access Economics' recommendations for the future governance structure of the Future Health Research and Innovation Fund, and the framework for prioritisation and disbursement of funds.

A framework to assist in the assessment of a range of governance options for the FHRI Fund is presented. In addition, the framework outlines the basis on which the FHRI Fund should allocate health research and innovation funding.

The framework is guided by a proposed mission to "Provide a secure source of funding to develop WA's research capability to improve the future health and prosperity of all Western Australians." This mission differs from the State Government's original stated purpose for the Fund in two ways:

- The mission is elevated to capture the Fund's core purpose, without reference to specific funded initiatives (such as clinical studies)
- The mission captures the benefits of the Fund to the prosperity of the WA population, beyond direct health benefits.

This framework is illustrated in Figure 3-1, which depicts the relationship between the Fund's mission, governance design principles, and funding objectives.

The FHRI Fund objectives have been developed from a review of best practice funds, and supported by stakeholder consultations. Specifically, other jurisdictions across Australia such as Queensland and New South Wales have developed research and innovation strategies that are largely underpinned by variations of the five broad objectives which have been developed for the FHRI Fund.

The objectives span the key elements of building research culture and capacity, promoting transectoral collaboration, ensuring translation of research into improved health outcomes, achieving global relevance and converting research and innovation expertise leading to related economic benefits. The Medical Research Future Fund has also developed six strategic platforms which align well with the proposed FHRI Fund objectives.

From an international perspective, the Wellcome Trust strategy share strong similarities in their strategic framework through their three complementary approaches across research, science and engagement with society to advance ideas by supporting research that continues to address contemporary health challenges, identifying opportunities when concerted intervention can accelerate progress towards better health, and providing funding support to create connections and build partnership with experts from different research disciplines.

The New Zealand Health Research Council has also outlined four outcomes in their outcome based framework which are consistent with the FHRI Fund objectives. They comprise:

1. new knowledge, solutions and innovations to improve health;
2. the healthcare system is improved through research evidence and innovation;
3. the best clinicians and health researchers are supported and retained in New Zealand, and
4. the impact, responsiveness and uptake of health research is increased.

The National Institute for Health Research in the United Kingdom addresses their vision and mission under the following six broad themes of funding research, translating discoveries, training researchers and leaders, economic growth, research in the NHS and public involvement and participation.

While it is acknowledged that the proposed objectives have been developed for the purposes of the FHRI Fund, and share consistent themes with other best practice funds, it is suggested that these objectives are revisited as part of next steps towards the development of a State-wide research and innovation strategy.

Figure 3-1: FHRI Fund: mission, governance design principles and funding objectives

<b>Mission</b> To provide a secure source of funding to develop WA's research capability to improve the future health and prosperity of all Western Australians				
Design principles	 <b>Clear roles and responsibilities</b>	 <b>Transparency and independence</b>	 <b>Relevance and responsiveness</b>	 <b>Appropriate oversight</b>
Funding objectives	 <b>Prioritise disease prevention, improved clinical outcomes and creation of a sustainable WA healthcare system</b>	 <b>Grow our research talent and strengthen WA's research and innovation culture</b>	 <b>Maximise the global potential of WA's research and innovation ecosystem</b>	 <b>Support research translation to improve the health and wellbeing of people in WA</b>
Funding principles	Address unmet health need Focus on outcomes Complement existing sources of funding Recognise innovation from other sectors Involve and have support of the community	Encourage collaborative behaviour Support the research workforce pipeline	Recognise innovation from other sectors Support research and innovation with potential for commercialisation	Address the whole translational spectrum Recognise the need for good data Address unmet health need Recognise balance of risks and potential benefits
Key funded initiatives	Annual targeted calls based on priorities identified through the development of a State-wide health research and innovation strategy Funding for WA researchers to leverage the full range of national and international sources	Top-ups for existing NHMRC fellows to expand the research capacity of researchers who have a history of demonstrated excellence Strategic recruitment co-funding with universities and MRIs to attract and retain world-class talent to WA Near-miss bridged co-funding for one year NHMRC fellowships deemed 'fundable but not funded' Funding to establish research fellowships targeted at early- and mid-career researchers Funding for research training and education programs	Funding to support research and innovation with potential for commercialisation Funding for WA researchers to access international markets consistent with the WA Innovation Strategy	Funding for specific translation projects to inform major policy and programs where there are evidence gaps Funding to improve the coordination, streamlining and access to clinical trials Funding to improve research infrastructure, including data access and support staff
Suggested metrics	Number of research projects successfully completed on time and on budget Total value of interstate and international funds received by WA researchers Alignment of targeted calls and research activity to priorities identified in the strategy	Percentage of total health and medical workforce engaged in research WA success rate for NHMRC grants Retention rate of world-class researchers in WA Increase in the proportion of early- and mid-career researchers in the workforce WA Health satisfaction survey on research and innovation sentiment	Number of research projects resulting in commercialisation outcome Value of return on investment of commercialised research and innovation Number of funded research and innovation projects achieving global recognition	Number of policy or program changes influenced by funded research activity Adoption of research-influenced changes into clinical practice

Source: Deloitte Access Economics

The sections that follow outline Deloitte Access Economics' specific recommendations for a governance model and funding objectives that best enable the Fund to achieve its mission.

### **3.1 Governance**

#### **3.1.1 Approach**

The FHRI Fund must have an appropriate governance model to achieve its mission of funding and advancing of the medical research and innovation ecosystem in Western Australia. A wide variety of different governance models exist among HMR and HMIC funding bodies across Australia and internationally.

Deloitte Access Economics has undertaken a review of a number of Australian and overseas HMR/HMIC funding bodies to analyse their governance structures and identify best practice elements that can potentially be applied to the WA environment. Funds assessed include:

- National Health and Medical Research Council (Australia)
- Medical Research Future Fund (Australia)
- Biomedical Translation Fund (Australia)
- LaunchVic (Victoria)
- Health Research Council (New Zealand)
- Alberta Innovates (Canada)
- National Health Innovation Centre (Singapore)
- Defence Advanced Research Projects Agency (US)
- Health Innovation, Investment and Research Office (Queensland)
- Biomedical Catalyst (UK)
- Wellcome Trust (UK)
- Life Sciences Industrial Strategy and Industrial Challenge Fund (UK)
- Office for Health and Medical Research (New South Wales)
- Health Industries SA (South Australia)
- National Institute for Health Research (UK).

Differences between alternative governance models are informed by the objectives of the funding body and the existing medical research and innovation landscape by which the fund is bounded. For example, countries such as the United Kingdom (Innovate UK), Finland (TEKES) and Sweden (VINNOVA) operate central agencies that are at arm's length to government and are responsible for the coordination and delivery of research and innovation outcomes. By contrast, under the Federal model that exists in Australia, there is a need to co-ordinate research and innovation policy between the Commonwealth and State and Territory Governments to avoid duplication in programs and in efforts to consolidate global health research and innovation networks. With this in mind, the first step is to identify available governance options that are suitable for application to Western Australia, and apply a systematic approach to assess the options appropriately.

A strong and consistent view put by stakeholders and opinion leaders, and evidenced through examination of other HMR and HMIC funding bodies, is that the FHRI Fund should have a simple structure with clear and transparent governance arrangements, uncomplicated by unnecessary processes.

#### **3.1.2 Governance options**

Six options were initially identified as potential alternatives for the FHRI Fund based on a review of best practice funding bodies and consultation with stakeholders. These are detailed in Table 3-1.

Table 3-1: Governance options for the FHRI Fund

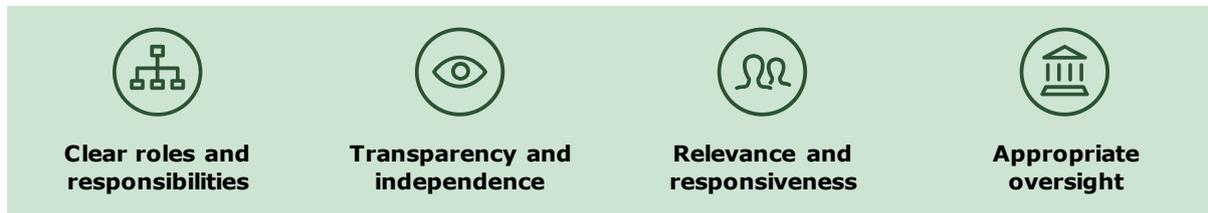
#	Option	Description
<b>A</b>	FHRI funds to be managed by the Department of Health using existing mechanisms	The annual disbursements from the WAFF are managed by the Department of Health’s Research Development Unit using the same processes and mechanisms currently in place for existing research funding streams. Applications for funding, funding decisions, and monitoring of funds are the responsibility of the RDU.
<b>B</b>	FHRI funds to be disbursed by the Department of Health on advice from an independent Strategic Advisory Board	As with Option A, the RDU is the disbursing entity responsible for receiving applications for funding and monitoring funds post-award. However, there exists an independent Strategic Advisory Board that supports the Department of Health in developing a State-wide health and medical research strategy. The Board makes recommendations for funding based on the strategy to the Department. The Department makes final decisions in respect of funding. The Strategic Advisory Board is supported by a number of independent expert committees who assess applications suited to their respective areas of expertise. The RDU provides secretarial support to the Board and committees. Existing funding administered by the RDU is unchanged.
<b>C</b>	Establish a FHRI Office within the Department of Health to disburse all new and existing HMR and HMIC funds	Establish a Future Health Research and Innovation Office within the Department of Health, which takes responsibility for the administration and disbursement of all HMR and HMIC funding streams. This includes both new FHRI funds and existing funding programs administered by the RDU. As with Option B, a Strategic Advisory Board supports the Department of Health in developing and periodically reviewing a State-wide HMR/HMIC strategy and makes funding recommendations, supported by independent expert committees. The Department makes final funding decisions. The FHRI Office takes holistic responsibility for HMR and HMIC policy, development and funding administration.
<b>D</b>	Establish the FHRI Fund as a Schedule 2 statutory authority	The FHRI Fund is established as a statutory authority with the same high-level structure and reporting responsibilities as those authorities listed under Schedule 2 of the <i>Public Sector Management Act 1994</i> (the Act). The Fund has a Board with responsibilities similar to those described in Options B and C, but with additional corporate responsibilities as required under the Act. Reporting streams would be established to be similar to the Health Service Providers, with the Board overseeing a chief executive and staff and reporting to the Director-General of the Department of Health.
<b>E</b>	Establish the FHRI Fund as an independent organisation external to government	The FHRI Fund is established as an independent organisation, for example as a not-for-profit. Annual disbursements from the WAFF are paid to a limited company of which the Fund is sole shareholder; funds are held in trust by the company until disbursed. The establishing legislation provides for oversight of the Fund by the Minister for Health as appropriate but day-to-day operations and funding decisions are otherwise independent of government.
<b>F</b>	Appoint an existing external organisation to disburse FHRI funds	Appoint an external body (such as the WA Health Translation Network) to disburse FHRI funds on behalf of the Department of Health, through a service agreement. Applications for funding, funding decisions, and post-award monitoring of funds would rest with the external body. The service agreement would be drafted to as to provide the Department of Health with the ability to exercise sufficient oversight over the funds.

Source: Deloitte Access Economics

### 3.1.3 Governance design principles

Four design principles have been identified to provide direction for the recommended governance model for the FHRI Fund.

Figure 3-2: Governance design principles



The governance model that is most likely to enable the Fund to achieve its objectives should conform to these principles:

1. **Clear roles and responsibilities** – Clear delineation of the mission of the FHRI Fund, its boards and/or committees, external reporting relationships, executive powers, and roles to advise on the strategic direction of the WA health research and innovation ecosystem, and drive accountability and performance
2. **Transparency and independence** – The process for applying for funds, funding decision-making, and the performance and cost to deliver the funds should be transparent. There should be a high level of independence to avoid conflicts of interest among decision-makers and funding recipients
3. **Relevance and responsiveness** – Relevance and responsiveness to potential health research and innovation recipients, ensuring the right projects are funded to meet the FHRI Fund’s objectives with minimal red tape
4. **Appropriate oversight** – Ensure that oversight is appropriate for the operational effectiveness of the FHRI Fund, such as through providing publicly available reports on its strategy, activities, outcomes and impact.

The following section details the process through which the alternative governance options are assessed against these design principles, and excluded from consideration where appropriate.

### 3.1.4 Assessment of options

Based on the design principles described above, Options D, E and F are excluded from further consideration.

#### Rationale for removing Options D, E and F

Options D, E and F have similar features to some best practice HMR and HMIC funding bodies reviewed for this study. Under Option D, the Fund would operate in the same manner as the area health services in WA. Option E is similar in structure to LaunchVic, in that the Fund would be established as an independent entity external to government. Option F is similar to the approach taken by the South Australian Government with its \$50 million Venture Capital Fund, in that a private fund manager was appointed to hold and manage the funds on behalf of the government.

It is anticipated that the FHRI Fund will receive an annual disbursement from the WAFF in the order of \$35 million. Considering this quantum, it is difficult to justify the costs associated with establishing a statutory body similar to a Health Service Provider or an external organisation.

The significant proportion of the Fund’s disbursement that would be consumed in setup costs and self-administration would reduce the Fund’s capacity to be responsive to unmet health need and to direct funding to research and innovation programs with high likelihoods of improving clinical outcomes.

The Fund's activities must be relevant to current and future unmet health need in WA. This requires the Fund's strategy for directing funds to be aligned to the broader strategy of WA Health, and for ultimate decision-making with respect to disbursing funds to rest with the Department of Health as system manager.

By way of example, Queensland's Health Innovation, Investment and Research Office (HIIRO), was established in August 2016 to support a coordinated approach to innovation, investment and research areas across Queensland Health. It has carriage of significant large-scale programs and funding and has been able to effectively strengthen and coordinate partnerships between hospitals, health services, research institutes and other industry stakeholders during its short time in operation.

Importantly, the HIIRO sits within the Director General's Office and manages the implementation planning process of the State's Advancing Health Research 2026 initiative. Similarly, establishing the FHRI Fund as a statutory authority, independent organisation, or appointing an existing third party to disburse the funds could potentially diminish the alignment of this overarching responsibility. In addition, stakeholders strongly felt that misaligning the Fund's priorities and those of WA Health would reduce the likelihood of funds being directed to highest-impact projects.

Beyond strategy misalignment, having the funds sit outside of WA Health would unnecessarily increase the complexity of decision-making and reporting streams between the Fund and the health system manager. This additional degree of separation would also reduce the likelihood that research supported by the Fund would be translated into improved practice within the health system.

Some limited feedback received during the consultations included suggestions to radically change the delivery of health innovation and commercialisation in WA and that a step-change would foster the independent environment required for success. However from consultations and best practice doing this now without a mature research and innovation ecosystem and no state health research and innovation strategy would present further challenges in addressing the FHRI Fund objectives.

While options D, E and F have not been considered for further assessment for the reasons outlined, it is recognised that they should not be ruled out for consideration in the future. This is critically important, as the WA health research and innovation ecosystem becomes more advanced and may require alternative governance models better suited to address the FHRI Fund priorities for the State.

For example, other jurisdictions have created separate agencies to support HMR and HMIC, including LaunchVic in Victoria and the Agency for Clinical Innovation in New South Wales. However, in each case, these bodies have a broader remit that extends beyond the intended purpose of the FHRI Fund as a body for disbursing HMR and HMIC funding.

The WAFF is Western Australia's sole sovereign wealth vehicle. The establishing legislation recognised its importance by locking away the income streams for 20 years. Releasing that income to fund HMR and HMIC naturally comes with high expectations from the community that the funds will be applied to improve the future health of the WA population.

There are also some other benefits to the Fund being an independent legal entity external to government. For example, this would enable the Fund to acquire deductible gift recipient (DGR) status so that it could receive tax-deductible donations from philanthropic and other non-government sources. Tax deductibility is a significant incentive for non-government donors. While this benefit would not be available to the Fund under Options A, B or C, there are alternative mechanisms to enable contributions from the non-government sector. For example, the FHRI Fund could perform a coordinating role in directing a donation to one of the hospital-linked research foundations that do hold DGR status.

The following sections discuss benefits and challenges of Options A, B and C in further detail.

## Option A

Under Option A, the annual disbursements from the WAFF are managed by the Department of Health’s Research Development Unit using the same processes and mechanisms currently in place for existing research funding streams. Applications for funding, funding decisions, and monitoring of funds are the responsibility of the RDU. Option A most resembles the status quo in current funding for HMR and HMIC by the Department of Health.

Figure 3-3: Structure of governance Option A

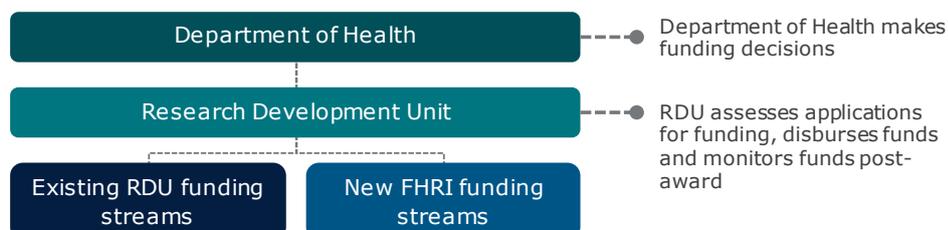


Table 3-2: Benefits and challenges of Option A

Benefits	Challenges
<ul style="list-style-type: none"> <li>Existing internal governance and processes for administering funds, requiring minimal additional resourcing</li> <li>Other functions of the RDU – e.g. supporting the research governance framework – complement HMR activity in WA and would complement the RDU taking on the role of disbursing FHRI funds.</li> </ul>	<ul style="list-style-type: none"> <li>The RDU is not presently a significant funder of health and medical innovation, which may limit its scope to engage with commercial entities in distributing innovation-related FHRI funds</li> <li>The RDU is not a research and innovation system manager and does not presently have a role in setting a State-wide research strategy</li> <li>Lack of independent, external input and feedback risks a misalignment of FHRI decision-making and the wider HMR/HMIC ecosystem.</li> </ul>

## Option B

Option B is proposed with the same operational implementation as Option A, however an additional Strategic Advisory Board would be created to support the development of a State-wide HMR and HMIC strategy, and provide advice on funding decisions. This option would see the RDU seeking advice from a multidisciplinary and trans-sectoral group of people of high standing to support alignment between FHRI funding decisions and the wider HMR/HMIC ecosystem. It is proposed that this board would play a number of roles to support the success of the FHRI Fund, namely:

- Strategic, trans-sectoral advice on long term priorities
- Advocacy and cultural leadership for health and medical research and innovation in WA
- Support contestable and transparent funding processes
- Provide linkages to national and international collaborators
- Removes vested interests and ensures an openness to a variety of opportunities and degrees of risk
- Provides consumer and community input to priority setting.

While the Strategic Advisory Board would provide input into final funding decisions, ultimate decision-making power would continue to rest with the Department of Health. Individual applications for funding would be reviewed by independent committees with relevant expertise sitting below the Strategic Advisory Board.

Figure 3-4: Structure of Option B

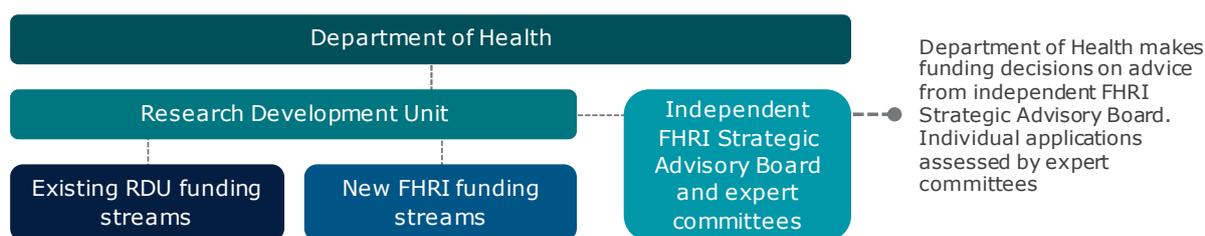


Table 3-3: Benefits and challenges of Option B

Benefits	Challenges
<ul style="list-style-type: none"> <li>• Includes benefits of Option A</li> <li>• Addresses key challenge of Option A by providing independent advice to guide strategy and priority-setting for the RDU</li> <li>• The Strategic Advisory Board would provide additional benefit in connecting the Department of Health with key actors in the HMR/HMIC ecosystem</li> <li>• With a membership including interstate and international representatives, the Strategic Advisory Board would facilitate opportunities for the RDU to learn from and collaborate with similar offices from other jurisdictions</li> <li>• Independent Board input gives confidence to the HMR/HMIC community that funding decisions are informed by expert advice.</li> </ul>	<ul style="list-style-type: none"> <li>• Option B does not address the challenge for the RDU to act as health and innovation system manager, identified for Option A</li> <li>• While providing expert input and elevating confidence in the FHRI Fund, the Strategic Advisory Board would require additional secretarial support from the RDU and likely increase the operating cost of the Fund.</li> </ul>

### Option C

Under Option C, a Future Health Research and Innovation Office is established within the Department of Health to disburse all new and existing HMR and HMIC funds. The FHRI Office would subsume the existing functions of the RDU associated with the disbursement and administration of research funding, and take on the role of health research and innovation system manager. The FHRI Office would support the implementation of a State-wide HMR and HMIC strategy that:

- Addresses systemic clinical challenges and opportunities identified by the Department of Health as system manager and the Strategic Advisory Board
- Addresses systemic gaps in meeting these challenges in WA in terms of platforms and enablers
- Supports the development of research and innovation talent across WA
- Supports the development of potential commercialisation opportunities
- Provides outcomes-focused funding for short-, medium- and long-term priorities
- Provides a clear, funded way forward for HMR and HMIC in WA to support the engagement of industry, academia, service providers and international collaborators
- Supports the promotion of WA as a competitive destination for health and medical research and innovation.

The establishment of the FHRI Office would provide the Department of Health with an opportunity to review its existing funding for HMR and HMIC, and create a cohesive 'one-stop shop' for health research and innovation in WA. As with Option B, the Department of Health maintains ultimate

decision-making power in respect of the development of the State-wide HMR/HMIC strategy and funding decisions.

Figure 3-5: Structure of Option C

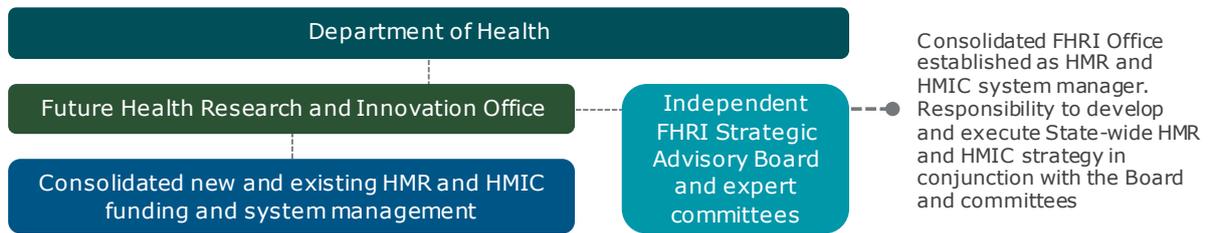


Table 3-4: Benefits and challenges of Option C

Benefits	Challenges
<ul style="list-style-type: none"> <li>Includes benefits of Options A and B</li> <li>Leverages existing resources to fully support the implementation of a State-wide HMR/HMIC strategy</li> <li>Single office established as research and innovation system manager within WA Health, such that funds are directed towards highest-impact opportunities</li> <li>FHRI Office pools capability in research leadership, clinical leadership, commercial and industry leadership, community engagement, and international marketing.</li> </ul>	<ul style="list-style-type: none"> <li>Realignment of existing RDU research funding streams to the new FHRI Office could create potential change management challenges and disruptions to funding</li> <li>Time taken to develop an appropriate State-wide HMR/HMIC strategy could create perception challenges within the research community, albeit these can be mitigated with the prioritisation of some short-term initiatives.</li> </ul>

### 3.1.5 Preferred option – Option C

Table 3-5 compares the degree to which Options A, B and C align with each of the governance design principles. On the basis of this assessment, the preferred governance model for the FHRI Fund is **Option C**.

Table 3-5: Options and governance design principles

Option	Clear roles and responsibilities	Transparency and independence	Relevance and responsiveness	Appropriate oversight
<b>A</b>	◐	◐	◐	◐
<b>B</b>	●	◐	◐	●
<b>C</b>	●	●	●	●

Strongly aligns with design principle
  Somewhat aligns with design principle
  Insufficiently aligns with design principle

The preferred option represents a simple structure that will enable fast decision-making and aims to minimise red tape where possible. The Department of Health makes final funding decisions, which enables the FHRI Fund’s activities to be aligned to government policy. It is expected that the Independent FHRI Strategic Advisory Board (IFSAB) will be made up of ten leading public and private sector figures in health research innovation and include an independent chair and will, amongst its other key functions, drive the development of a long-term health research and innovation strategy for the State. Figure 3-6 outlines the roles and responsibilities associated with the FHRI Fund’s governance.

Figure 3-6: Governance structure – roles and responsibilities



### The Minister for Health and Director-General of the Department of Health

The Minister for Health is accountable to the Parliament and operations of the Department of Health. The Minister endorses the allocation of funding and ensures the strategic objectives of the fund carries the confidence of the community with the appropriate level of scrutiny of funding allocations and transparency in terms of process maintained.

The Director-General of the Department of Health recommends the appointment of the IFSAB to the Minister for Health for approval, with members appointed for an initial term of three years. This provides the Director-General with the opportunity to ensure that board members have the necessary skills, experience and knowledge to enable the board to collectively fulfil its role prior to recommending appointments to the Minister for Health.

As a precaution, the Director-General may also initiate a comprehensive risk governance review, and ensure that an appropriate system of risk oversight and internal controls are in place to enable the effective identification and management of risk. The Director-General is accountable for the

disbursement and allocation of funding including awarding of funding to recipients, and for progress on the FHRI Fund outcomes and strategic key performance indicators.

### **The Independent FHRI Strategic Advisory Board (IFSAB)**

The proposed composition of the IFSAB will consist of two of the ten members being persons of high standing who are or have been engaged in health and medical research (including established and talented emerging researchers), while the remaining eight members bring skills and experience in areas such as digital science and innovation, public health, health service operations management and knowledge of health issues from a consumer perspective.

The membership of the IFSAB should be weighted towards those with strategic acumen, noting that it can draw on additional scientific and technical ability through the expert committees that assess individual applications for funding. This enables the IFSAB to consider funding recommendations in the context of the State-wide HMR/HMIC strategy and the Fund's mission, rather than considering specific areas of research activity.

Having an independent Strategic Advisory Board brings relevant expertise and is more capable of integrating activity within the health and medical research and innovation ecosystem and leveraging potential partnership opportunities within Australia and overseas reducing the risk of policy and/or programs being formed and funded on an ad hoc basis.

This type of advisory board structure is common among HMR and HMIC bodies across Australia and globally. For example, the UK National Institute for Health Research (NIHR) operates at the direction of the UK Health Department, but has advisory and strategic boards that provide expert guidance and supports NIHR in developing its strategic priorities. The NHMRC Council operates in a similar fashion, providing expert advice while ultimate decision-making remains with the CEO and executive.

Similarly, the Wellcome Trust Board of Governors takes advice and recommendations from committees of subject matter experts and peer reviewers to make funding decisions on grant applications and also relies on the assistance of external experts to make funding decisions across the Wellcome Trust's funding remit. The external experts act as members of the Wellcome Trust's advisory committees where the Board of Governors can draw upon the insights from past achievements and utilise their comprehensive network of experts in support of the overall direction and objectives of the Wellcome Trust.

In Australia, the Queensland Department of Health (via the Health Innovation, Investment Research Office) has established an advisory committee comprising representatives of relevant partners to help guide the implementation of the planning process for the Queensland Advancing Health Research 2026 initiative and provide input to assist the Department as required.

In South Australia, the Health Industries SA (HISA) is assisted by an Advisory Board comprising of key business leaders with local, national and international experience. It is essentially tasked to provide high level strategy and policy advice for developing South Australia's life sciences sector and advises the State Government in the formulation of strategies, policies and programs to grow the health and biomedical industries. While HISA is a stand-alone agency of the SA Government which may explain the broader mix of members on its Advisory Board, it is envisaged that the Department of Health would benefit from an IFSAB with a broader base of membership that has relevant experience beyond the health and medical space.

Figure 3-7: Composition of the FHRI Strategic Advisory Board



The IFSAB’s responsibilities include:

- Supporting the Department of Health in the development and regular review of a State-wide HMR/HMIC strategy
- Reviewing funding recommendations made by the expert committees, taking into account the mission and funding objectives of the Fund
- Making funding recommendations to the Department of Health
- Acting as a conduit between the Department of Health and the HMR/HMIC sector.

The IFSAB must maintain a register of interests and ensures IFSAB members are aware of their obligations to declare interests. The IFSAB needs to ensure it is committed to ensuring that all of its activities are conducted in a manner which meets the highest ethical standards.

While many best practice HMR and HMIC funds continue to use conventional peer review as a means of assessing applications for funding, some funding bodies are embracing new and innovative means of distributing funds. To inform the establishment of the FHRI Fund, the IFSAB may adopt some of these approaches with the purpose of streamlining the decision-making processes.

For example, the Health Research Council of New Zealand has introduced the concept of Explorer Grants under the banner of researcher-initiated funding proposals. Applications are assessed by ‘subpanels’ within the Health Research Council’s Explorer Grant Assessing Committee to see if they

meet the criteria of being both transformative and viable. The assessment process for these types of grants is anonymous and all applications that meet the criteria are equally eligible to receive funding. Once all eligible applications are received a random number generator then prioritises these applications. The IFSAB could potentially adopt this approach for 'FHRI Frontier' grants coupled with a similar set of funding criteria and aim to shorten the 'whole of application' process.

Another alternative approach is for the IFSAB to utilise prizes or competitions to award research grants. For example, the University of Tulsa (USA), developed a 'Shark Tank' kick-start program awarding research grants of \$35,000 to assistant professors to create or further research academic projects ranging from concussion prevention to electrochemical purification of solar grade silicon.

Other examples aim to bring multidisciplinary researchers to develop new collaborations and research ideas in a unique competition environment. UC Health (USA) adapted elements of the 'Shark Tank' approach by bringing researchers from across 10 UC Health centres to a location and presenting the challenge "to come up with an idea to wow their peers and win \$100,000 to complete the cancer-based project". After introductory presentations were made from each of the centres, a lottery system to create new teams drawn from three buckets (clinician, College of Medicine researchers and scientists) were formed. After several hours, each team presented its idea during a five minute presentation and the entire group of participants voted. The winning team proposal focussed on the use of radiotherapy and nanoparticles to diagnose and treat breast cancer and shorten therapy. The team then had one month to formalise their proposal and an additional year to complete the project.

While the IFSAB may continue to request expert committees' advice in the assessment and recommendations for FHRI funding, this should not preclude the option of using novel 'Shark Tank' programs for awarding research grants. As demonstrated, compared to the peer review process, the application of prizes and competitions for fund allocation has the propensity to reduce the complexity (and associated cost) of decision-making processes and are relatively straight forward to implement.

**Recommendation:** Establish an Independent Future Health Research and Innovation Strategic Advisory Board (IFSAB) to support the Department of Health in developing and periodically reviewing a State-wide HMR/HMIC strategy and make funding recommendations. The IFSAB comprises ten members, with an independent chair, appointed by the Director-General of the Department of Health. The composition of the Board needs to carry the confidence of the community, and brings together the relevant skills mix and expertise that is capable of integrating and advancing the State's health medical research and innovation ecosystem, and improve the health and wellbeing of Western Australians.

### **Role of expert committees**

Expert opinion and key insights will be provided by expert committees. These expert committees will be created based on the specific needs or requests of the IFSAB. The advice provided to the IFSAB from these expert committees will assist in the assessment and recommendations for funding in line with the WA health research and innovation strategy.

The required expertise of committee members is dependent on the type of funding application they are asked to review. For example, an application to fund discovery science should be assessed for its scientific and technical merit by experts in that field, while reviewers with business and commercial experience may be better suited to review an application to support the commercialisation of a medical device.

This structure is consistent with the way in which other HMR and HMIC funding bodies acquire expert guidance on funding decisions, without creating unnecessary bureaucracy. As previously mentioned, both the NHMRC Council and UK NIHR strategic boards oversee a number expert panels or committees, which are convened to provide specialist advice and assistance in the grant assessment process. The Wellcome Trust Board of Governors takes advice and recommendations from committees of subject-matter experts and peer reviewers to make funding decisions on grant

applications. In some cases, individual members of the Board of Governors may, in various circumstances, sit on committees as members or observers.

**Recommendation:** Convene and utilise expert committees or panels to provide specialist advice and assistance in the grant assessment process. The purpose of the committees is to provide expert support for the IFSAB as required.

### **FHRI Office**

The activities of the IFSAB and expert committees require administrative support, as well as permanent staff to manage the applications process, disburse funds and monitor the progress of funding recipients. These functions are performed by an FHRI Office within the Department of Health.

The FHRI Office is comprised of the existing RDU senior executive team and two workstreams:

- **Funding Operations and Contracts Management** – This workstream will have management responsibility for the funding operations and management of contracts associated with the FHRI, for example:
  - Secretariat support and management of the IFSAB and expert funding committees
  - Management of contestable funding rounds
  - Development of guidelines and application forms
  - Management of peer review processes
  - Monitoring of contractual performance.
- **Research and Innovation Strategy and Implementation** – This workstream will develop and provide policy advice for the IFSAB, for example:
  - Develop and implement a comprehensive State-wide health research and innovation strategy
  - Development of research and innovation policy advice
  - Evaluation of FHRI funded programs and activities
  - Marketing and promotion of the WA health research and innovation.

While the RDU currently performs some of these roles within the Department of Health, additional capability and resources are required for the FHRI Office to properly perform its role as health research and innovation system manager. For example, evaluating the benefits of funded research and innovation programs requires a specific skillset that may not presently sit with the RDU. The FHRI Office should be adequately funded through both existing recurrent funding for the RDU and additional FRHI funds.

In terms of size and scale of the FHRI Office, there are similar entities currently operating as funders of research and/or innovation. LaunchVic received \$2.8 million in operating grants and \$16.1 million in program grants from the Victorian Government to July 2017, and has a staffing complement of 14.

Queensland's Health Innovation, Investment and Research Office (HIIRO) has 25 staff within the Office, and supports a coordinated approach to innovation, investment and research across Queensland Health, including the management of two Advance Queensland programs (the Queensland Genomics Health Alliance - \$25 million over five years and the Integrated Care Innovation Fund - \$35 million investment in partnerships between Hospitals, Health Services and Primary Health Networks). HIIRO also has responsibility for managing research fellowships funds, ethics and governance.

The Health Research Council of New Zealand has operating costs of \$5.0 million and holds research grants of \$91 million. It has 27 FTE, with the following resource profile:

Table 3-6: Health Research Council of New Zealand FTE by Positions

Type of staff	FTE	Share of total (%)
<b>Operational staff</b>		
- Chief Executive	1.0	3.7
- Senior Managers	3.0	11.1
- Managers	2.0	7.4
- Support staff (including research staff)	21.1	77.9
<b>TOTAL</b>	<b>27.1</b>	<b>100.0</b>

Source: Adapted from Health Research Council of New Zealand Annual Report 2016-17

It is possible to derive a high level estimate of the FTE, operating costs and resource profile of the FHRI Office by analysing each of the selected entities and where appropriate, apply assumptions where information is not publicly available. The estimates provided are indicative and should be used to inform further detailed work on the operations of the FHRI Office.

Table 3-7: Estimate of the Operating costs of the FHRI Office

Operational factors	LaunchVic (VIC)	Health Innovation, Investment, Research Office (QLD) <sup>(a)</sup>	Health Research Council (New Zealand)	FHRI Office (WA) <sup>(b)</sup>
Full Time Equivalent (FTE)	14	25	27	<b>20</b>
Operating costs (\$million)	2.8	4.8	5.0	<b>4.1</b>
Operating costs per FTE (\$thousand)	200	193	185	<b>193</b>
Program grants	16.1	60.0	90.8	<b>40.0</b>
Operating costs as a proportion of Program grants	17%	8%	5%	<b>10%</b>

(a) Operating costs per FTE are an average of the LaunchVic and HRCNZ, Programs grants are estimated

(b) Operating costs as a proportion of Program grants is an average of LaunchVic, HRCNZ and HIRO

Based on the comparison assessment, it is estimated that the FHRI Office would have an operating cost of \$4.1 million with an FTE of 20. Using the Health Research Council of New Zealand resource profile as a base, the following allocation of the various staff types has also been considered. Further detailed work on the operations of the FHRI Office will be required to ensure the staff composition and FTE is appropriate for the functions and services proposed to be delivered.

Table 3-8: FHRI Office FTE by Positions

Type of staff	FTE	Share of total (%)
<b>Operational staff</b>		
- Senior Executive	1.0	5.0
- Senior Managers	2.0	10.0
- Managers	2.0	10.0
- Support staff (including research staff)	15.0	75.0
<b>TOTAL</b>	<b>20.0</b>	<b>100.0</b>

**Recommendation:** Establish the Future Health Research and Innovation Office within the Department of Health, consolidating the existing Research Development Unit and associated funding into a new FHRI Office which will be responsible for the administration and distribution of all HMR and HMIC funding streams.

Deloitte Access Economics recommends adopting Option C based on its assessment of the current HMR/HMIC environment in Western Australia. It may be the case that an alternative governance model would better suit the environment in the future– for example, if the pipeline of IP with strong commercial potential is much larger, the FHRI Fund may wish to establish an external entity capable of holding equity in companies.

## 3.2 Funding

The funding objectives of the FHRI Fund should support and guide its funding decisions and enable it to achieve its mission of improving the future health and prosperity of Western Australians. The Fund's four objectives should be to:

- **Promote disease prevention and create a sustainable WA healthcare system** by targeting areas of unmet health need in WA, enabling the Fund to be agile in supporting research relating to local priorities within the WA Health system. This includes involving the community in setting priorities. The Fund should also support WA researchers to increase their competitiveness at winning other grant funding
- **Grow our research talent and strengthen WA's research and innovation culture** by increasing the prominence of research in clinical environments within the WA Health system. The Fund should invest in excellent early- and mid-career researchers. While WA boasts a strong cohort of experienced and senior researchers, there is a risk that this will be diminished in the future if there is not a sufficient pipeline to replace them
- **Maximise the global potential of WA's research and innovation ecosystem** by supporting WA's best and brightest to implement and commercialise their research output into tangible products and services. This includes accelerating opportunities that are 'stuck' at a particular point on the research and innovation lifecycle due to a lack of funds
- **Support research translation to improve the health and wellbeing of people in WA** by funding projects and programs that demonstrate a strong likelihood of delivering tangible health benefits to patients and the WA community. This provides value for money for taxpayers by ensuring that FHRI funds flow into activities that ultimately benefit the future health of Western Australians. The Fund should also support platforms and infrastructure that underpin research activity, including access to data and support staff services such as biostatistics, equipment operation and maintenance, and research assistance.

Having determined the FHRI Fund's funding objectives, there are specific principles that should inform the Fund's decision-making in respect of HMR and HMIC funding. These principles have been developed based on an examination of principles adopted by best practice HMR/HMIC funding bodies, and supported by stakeholder consultation. So as to achieve its objectives, the Fund should apply the following funding principles when determining whether an application for funding should be successful or not:

- **Focus on outcomes** – the Fund and its funded projects should have a positive and lasting impact on the health sector and Western Australian community
- **Complement existing funding schemes** – the Fund should not attempt to substitute other funding sources, including from the private or philanthropic sectors
- **Address the whole research and innovation spectrum** – the Fund should address deficiencies across the whole translational spectrum and be used as leverage, e.g. to match funding from partner organisations
- **Recognise the need for and promote access to digital platforms and data** – the Fund should recognise the centrality of data and digital infrastructure in contemporary health research and science
- **Recognise that innovation may come from within and outside the health sector** – the Fund should support health solutions through the application of ideas even where they fall outside of the conventional domains
- **Involve and have support of the community** – the Fund should carry the confidence of health consumers and the WA population
- **Address unmet health need in WA** – the Fund should reflect current needs and 'big health problems' facing the patient population
- **Recognise and assess the risks and benefits of potential** – the Fund should be balanced in its approach to risk and health service delivery benefits when disbursing funds
- **Encourage collaborative behaviour** – the Fund should incentivise collaboration over competition including interdisciplinary, inter-institutional and inter-jurisdictional partnerships

- **Support the research workforce pipeline** – the Fund should ensure that WA’s research workforce is developing to meet future needs, for example by supporting early- and mid-career researchers
- **Support research and innovation with potential for commercialisation** – the Fund should support competitive research and innovation output with genuine commercial potential getting to market.

The relationship between the funding objectives and principles is depicted in Figure 3-8.

Figure 3-9: Funding objectives and funding principles

Funding objectives	 <b>Prioritise disease prevention, improved clinical outcomes and creation of a sustainable WA healthcare system</b>	 <b>Grow our research talent and strengthen WA’s research and innovation culture</b>	 <b>Maximise the global potential of WA’s research and innovation ecosystem</b>	 <b>Support research translation to improve the health and wellbeing of people in WA</b>
Funding principles	Address unmet health need Focus on outcomes Complement existing sources of funding Recognise innovation from other sectors Involve and have support of the community	Encourage collaborative behaviour Support the research workforce pipeline	Recognise innovation from other sectors Support research and innovation with potential for commercialisation	Address the whole translational spectrum Recognise the need for good data Address unmet health need Recognise balance of risks and potential benefits

Source: Deloitte Access Economics

Across the HMR/HMIC sector, funding bodies commonly develop a set of funding principles to assist with the determination of how the funds should be distributed. They can be strategic in construct and are used as high-level, guiding statements to underpin review processes to be applied to specified funding schemes.

In order to achieve improved transparency of the investment decisions associated with the FHRI Fund, it would be useful for the IFSAB and the Department of Health to review the proposed set of funding principles on a regular basis in close collaboration with health service providers, clinical professionals, universities and medical research institutes, health industry partners and consumers of health. These funding principles would then carry the confidence of the health research and innovation community and clearly present a unified basis for the distribution of the FHRI Fund investments.

**Recommendation:** The IFSAB supports the Department of Health in reviewing and adopting a set of funding principles that are informed by input from relevant stakeholders, as part of the development of a WA health and research innovation strategy. The funding principles should be reviewed at regular intervals in the future, in consultation with stakeholders, to ensure they remain relevant.

### 3.2.1 Identifying and setting priorities

In implementing Option C, it is recommended that the Department of Health takes a systematic approach to developing a comprehensive health and medical research and innovation strategy for WA. To assist in the development of such a strategy, a model demonstrating the virtuous cycle of health and medical research and innovation is shown in Figure 3-10 for consideration.

Figure 3-10: Virtuous cycle of health and medical research and innovation



Source: Deloitte Access Economics

This model of the virtuous cycle has been developed following review of national and international best practice and significant stakeholder feedback. The Department of Health currently plays a role in supporting parts of this cycle, however significant gaps and opportunities exist. The sections that follow discuss these gaps and opportunities in the current WA environment, and provides examples from other jurisdictions as to how these can be addressed.

### Identifying unmet clinical need

Feedback from stakeholders indicated a lack of clear strategy to identify and address unmet clinical need across WA to inform research. Examples of disease-specific need identification were provided by stakeholders and programs such as SPARK were identified as providing training in identification of unmet need. However, there is no overarching strategy to identify unmet need at the population level in WA. As a result, stakeholders were not able to identify priority areas for research support on a State-wide basis, creating uncertainty regarding funding and co-investment.

A number of other jurisdictions identify systemic unmet clinical need as part of formal strategy development in collaboration with health service providers. NSW and Victoria agencies, and the National Institute for Health Research in the UK, identify unmet clinical need on a rolling basis and align investment in both health and medical research and translation to address this need.

## Developing the research question

Research question development is supported by intermittent targeted research funding from the Department of Health, Commonwealth agencies, and philanthropic sources. Additional support is provided by the Department of Health through the research governance framework, however training in translation and implementation science is minimal. Feedback from stakeholders suggests research projects and fellowships are perceived to be driven by investigator interest, rather than being aligned to unmet clinical need or outcomes required by health service providers or the Department of Health as system manager.

While other jurisdictions also provide targeted research funding and support for research governance across health systems, additional support is provided to ensure that research questions being proposed are aligned to patient outcomes and unmet need within the health system. For example, research fellowships provided by the Queensland Government require recipient organisations (e.g. universities) to propose applicants who:

- Have a research proposal that:
  - Addresses one of the Queensland Science and Research Priorities
  - Is aligned with a Queensland Government Industry Roadmap area
  - Involves research that will support entrepreneurship and small to medium enterprise growth in Queensland
- Have one or more partners, including at least one Queensland-based industry or end-user organisation
- Spend at least 50% of the fellowship physically co-located with at least one Queensland-based industry or end-user partner organisation
- Have matched funding from the applicant and/or partner organisations.

In the context of health and medical research, this program results in

- Universities supporting early- and mid-career researchers with 50% of the funding required
- The fellow working closely with a health service
- The fellow collaborating across local industry and end-user organisations
- The fellow addressing an identified area of health priority
- The fellow building a competitive track record to support further funding from NHRMC.

## Undertaking research

While many clinician researchers work across WA Health, a significant gap between research and clinical service was identified by stakeholders. Challenges associated with research culture, funding and time protection, and service level support were identified with a number of stakeholders questioning the effective use of health service providers' Teaching, Training and Research (TTR) funding. Significant opportunities and examples of high quality research and collaboration were also identified, the outcomes of which are discussed in Chapter 2. The Department of Health's investment in research infrastructure was identified as a critical enabler by stakeholders.

Opinion leaders expressed a view that the skills of the future will be different to those needed today. Increasingly there is a need for clinician-scientists (those with deep expertise as both clinicians and researchers), biostatisticians and data analysts, and it is critical for the right individuals to own the right processes. For example, basic research to determine areas of interest for clinical trials should be done by leading academics. Then, clinician-scientists can conduct translational research and design advanced trials, whilst the trial delivery must be left to those with a history of demonstrated operational excellence. Talent management and the ability to attract skilled labour is therefore critical, and WA must use its existing strengths – including attractive location, good facilities and strong research talent – to attract these individuals.

Research excellence cannot be achieved in a jurisdiction that does not have a positive research culture. Considerations for improving research culture in WA include incentivising collaboration and providing incentives for research leaders to train and collaborate with their early- and mid-career colleagues to ensure a strong pipeline of future research excellence.

Many jurisdictions constrain funding to those proposals that have local service collaborators, as well as national and international collaboration as appropriate. Some example of supporting collaborative research effort are:

- Integrated Care Innovation Fund, part of the Advance Queensland initiative, which saw \$35 million in funding allocated to projects that were cross health service and supported the delivery of integrated care
- The NSW State-wide biobank, which brings together health services and researchers to improve patient outcomes alongside the State's data linkage services
- Investment in the Parkville precinct by the Victorian Government to bring together academia, health services and industry.

These initiatives are underpinned by co-investment in enabling infrastructure, which provides benefits for researchers and clinicians. Accessible infrastructure ultimately serves to attract multidisciplinary teams to collaborate on answering significant research questions.

It is important that the Fund supports research activity that genuinely aligns with unmet health need and for which funding is not otherwise available. Stakeholders and opinion leaders expressed a strong view that the Fund should not compete with other funding sources or fund unsuccessful projects which have failed the excellence test in other funding applications.

### **Proof of concept and development**

Feedback from stakeholders suggested little funding or support was available for the development of proof of concept projects or early stage commercialisation. Small amounts of funding are available from universities; however, this funding is typically only available for IP owned by the university. Additionally, stakeholders identified a lack of angel and seed funding available in WA for innovations arising from health and medical research, despite a positive track record of listing technologies on the ASX.

A number of programs to support early stage proof of concept development were identified from other jurisdictions. These include:

- The NSW Medical Devices Fund at \$8 million per annum
- The Victorian Medical Research Acceleration Fund at \$3 million per annum
- The \$40 million Queensland Business Development Fund, which provides matched funding of between \$125,000 and \$2.5 million. The Fund's investment is a direct investment in the business, rather than a co-payment or grant. Both the co-investor and the Fund become shareholders in the same company, holding shares with identical rights. The Fund holds this investment until the Fund's shares are bought out through a merger, acquisition or initial public offering. Drag-along and tag-along provisions allow the Fund to exit an investment when the co-investor exits the investment, or the business is merged, acquired or publicly listed
- Innovation Quick Fire Challenge (in collaboration with Johnson & Johnson) awards up to three new early stage human healthcare inventions with an award of \$100,000 each and access to mentorship and coaching from Johnson & Johnson staff. Both the Victorian and Queensland Governments have partnered with Johnson & Johnson in this initiative.

These programs have supported the development of private investment and venture capital networks that provide leveraged funding as the health and medical technology is developed.

### **Implementing or commercialising the research output**

The Department of Health is a member of the Medical Research Commercialisation Fund (MRCF), managed by Brandon Capital and receives support from Brandon's WA investment manager. Feedback from stakeholders suggests significant investment from venture capital in WA has been limited as the risk profile of technology developed in WA is often too high for venture capital. Implementation of system-wide reforms and innovative technology or clinical models across WA Health has been well-documented, with examples of both significant achievement and suboptimal outcomes widely recognised by stakeholders.

A number of jurisdictions have attracted significant venture capital funding and industry support, most notably Victoria and Queensland. Biocurate and Uniquet are university-led, government supported ventures focused on commercialisation of technologies developed from local universities. Biocurate is a joint venture supported by \$50 million from two Victorian universities and \$10 million from the Victorian Government focused exclusively on preclinical candidates for the biopharmaceutical industry. Further venture capital funding is possible through the implementation of the Biomedical Translation Fund, however the technology risk profile and deal metrics required to create an outcome should be considered when looking to VC funding for WA-based opportunities. Industry partnerships are critical for successful commercialisation as specific skills and facilities are required for health and medical technology development.

There is evidence that public funding support for commercialisation can act as a catalyst for further activity. The Biomedical Catalyst (BMC) in the UK is a joint venture between the Medicines Research Council (a health funding body) and Innovate UK (the government's central innovation agency), the objective of which is to de-risk innovative science and commercialise ideas that emerge from academia and industry. The FHRI Fund could adopt a similar role, aligning health research output with the State's innovation priorities.

Funding to support commercialisation can also extend beyond enabling early stage research and development. For example, the Defence Advanced Research Projects Agency (DARPA) in the United States provides funding for free prototype development, accelerating the translation from research to useable technology.

It is important that the Fund's approach to commercial considerations and intellectual property management incentivise, rather than impede, researchers' ability to draw matched funding from industry and other bodies. Intellectual property considerations are further discussed in Section 3.4.

### **Adoption**

The Department of Health currently provides funding for translational projects, however data provided suggest approximately only 60% of these projects have achieved their intended outcomes. Wider system reform is supported by the Department of Health through a number of offices, while health service providers also undertake activities related to the improvement of services through the adoption and implementation of new technology or models of care.

Industry partnerships and dedicated functional offices for system wide innovation were identified by stakeholders and through review of best practice. An example of this is the NSW Agency for Clinical Innovation, which provides localised support to implement system wide innovation and reforms with a staff of more than 120 FTE through:

- Research brokerage: Using existing evidence and when this evidence is not available, connecting with researchers to establish new information to meet the identified need
- Research translation: Establishing and developing strategies for using research findings and the evidence base in everyday clinical practice
- Implementation social science: undertaking and supporting research to better understand the strategies and factors that enable the take up, spread and sustainability of best practice in patient care
- Large-system transformation: Driving State-wide improvements in population health, patient experiences and health care costs.

There is evidence that targeted support for translational research can act as leverage for other funds, where financiers can see real changes in health outcomes resulting from research output. For example, NIHR's provision of £250m in funding for translational research has resulted in some £150m in additional private funding to more than 300 projects.

### **Change in health outcomes**

As discussed in Chapter 2, WA's data linkage capability has slipped as a national leader in the provision of linked data to support population health evaluation. A review of WA's Data Linkage Branch (DLB) was undertaken in 2016, which cited concerns on the current structure of the DLB.

Specifically, one of the key findings stated that there was an absence of a strong, formal governance arrangement that provided adequate openness, transparency, accountability and consultation surrounding the functions of the DLB.

As part of the stakeholder consultation, it was evident that the current data linkage service continues to struggle with demand across the health sector, culminating in increased costs and longer wait times for users. As a critical enabler it is important that the utility of the DLB data holdings is maintained with the timely access to data for researchers. As such it is suggested that the Department revisit the recommendations from the review and enable the greater use of the data repositories held by the DLB.

**Recommendation:** Revisit and review the Department of Health-related actions from the Data Linkage Review undertaken in 2016.

Similarly, the Sustainable Health Review has identified that the greater use of technology, data and innovation that supports clinical research endeavour is critical to driving change to improve outcomes for patients and the health system.

As such, the development of the State-wide health research and innovation strategy should align with the Sustainable Health Review directions, for example in terms of unmet community needs (prevention and promotion, Aboriginal health and better use of resources).

In reviewing other jurisdictions, it is evident that evaluation of outcomes arising from either strategy implementation (e.g. NSW Office for Health and Medical Research, LaunchVic sectoral review) or innovation implementation (e.g. NSW Agency for Clinical Innovation) plays a critical role in ongoing planning and strategy development. The offices accountable for the implementation of the initiatives discussed above make reports publicly available, while also supporting cyclical planning.

### Key insights

In reviewing national and international best practice, a number of common characteristics are shared across high performing jurisdictions including:

- A clear strategy for health and medical research and innovation across the State, including sub-strategies for areas of key importance
- A dedicated functional office accountable for the implementation and performance of the strategy
- A program of early stage commercialisation funding
- A program of salary support for early- and mid-career researchers
- A program of training for clinical and research staff to support translation
- Prioritised investment in infrastructure and enablers aligned to the strategy

**Recommendation:** The Department of Health should develop a comprehensive State-wide health research and innovation strategy in conjunction with the IFSAB. The purpose of the strategy should be to set priorities for research and innovation based on an assessment of unmet clinical need and WA's strengths in relevant research areas.

In particular, the strategy should address and set outcome measures for priority areas of research and innovation, people and capability required to address these priorities, platforms required to support research efforts, and potential innovation and commercialisation opportunities arising from research.

## Potential priority areas

It is critical that a State-wide health research and innovation strategy is developed as a first step to inform the distribution of FHRI Funds. Distributing funds without a strategy risks the funds being allocated to fragmented, low-impact opportunities.

However, Deloitte Access Economics has identified the following potential areas of priority based on the review of best practice and stakeholder feedback. These areas are illustrated in Figure 3-11 and may form components of the strategy assuming the implementation of Option C.

Implementing the recommended governance model will require time to resource the FHRI Office, establish the IFSAB, and develop the State-wide HMR/HMIC strategy. Additionally, there will need to be early investment in the systems and infrastructure, such as an online applications portal, before the strategy can be fully implemented. However, some of the suggested funded initiatives could be implemented prior to the strategy and new systems being in place, for example:

- Top-ups for existing NHMRC fellows, noting that the fellows have already been through the NHMRC's rigorous application and review processes
- Near-miss bridged co-funding for NHMRC fellowship applications deemed 'fundable but not funded'
- Funding to improve research infrastructure.

Figure 3-11: Potential allocations of FHRI funds

Funding objectives	 Prioritise disease prevention, improved clinical outcomes and creation of a sustainable WA healthcare system	 Grow our research talent and strengthen WA's research and innovation culture	 Maximise the global potential of WA's research and innovation ecosystem	 Support research translation to improve the health and wellbeing of people in WA
Key funded initiatives	Annual targeted calls based on priorities identified through the development of a State-wide health research and innovation strategy  Funding for WA researchers to leverage the full range of national and international sources	Top-ups for existing NHMRC fellows to expand the research capacity of researchers who have a history of demonstrated excellence  Strategic recruitment co-funding with universities and MRIs to attract and retain world-class talent to WA  Near-miss bridged co-funding for one year NHMRC fellowships deemed 'fundable but not funded'  Funding to establish research fellowships targeted at early- and mid-career researchers  Funding for research training and education programs	Funding to support research and innovation with potential for commercialisation  Funding for WA researchers to access international markets consistent with the WA Innovation Strategy	Funding for specific translation projects to inform major policy and programs where there are evidence gaps  Funding to improve the coordination, streamlining and access to clinical trials  Funding to improve research infrastructure, including data access and support staff
<b>FHRI Office operational budget</b>				

Source: Deloitte Access Economics

There are key research areas of strengths within the State which have demonstrated funding success. These have been outlined in Table 2-6. The top five research areas account for more than 50% of NHMRC funding received between 2014 and 2017 and include Aboriginal and Torres Strait Islander health, cardiology, paediatrics, respiratory diseases and cancer therapy. There has also been existing and emerging success in the research areas of allergy, epigenetics, endocrinology, public health and health services and neurology (including neuromuscular diseases).

As outlined previously, WA also has a track record of establishing and maintaining unique longitudinal cohort studies. To take advantage of this opportunity, key stakeholders indicated that getting the right partnerships established can lead to the initiation of ambitious research projects which address major global health challenges. Combined with the rapid advances in 'big data' analytics and computational biology, established population cohort studies can take advantage of new opportunities which will lead to further advances in knowledge and change the way health and medical care is delivered.

However, when considering specific areas of opportunity for major strategic investment, disseminating funds too broadly into areas where WA does not have clear potential to be a world leader may not be the best use of the funds. As such, the development of a State-wide health research and innovation strategy, coupled with the introduction of the FHRI Fund framework and IFSAB will help shape the distribution of FHRI Funds in a structured and informed way.

### **Alternative funded initiatives**

Many best practice HMR and HMIC funds continue to use conventional peer review as a means of assessing applications for funding, similar to the expert committee system outlined above. However, some funding bodies are embracing new and innovative means of distributing funds.

For example, the Health Research Council of New Zealand has introduced the concept of Explorer Grants as one of the four investment streams for funding, under the banner of researcher-initiated funding proposals. The purpose of Explorer Grants is to support transformative research ideas that have a good chance of making a revolutionary change to how New Zealanders manage their health.

These grants provide seed support for transformative research ideas at an early stage, before an application for greater investment through standard funding mechanisms. Explorer Grants are available in any health research discipline and are worth NZ\$150,000 for a term of up to 24 months.

The FHRI Fund should consider alternative means of distributing funds similar to Explorer Grants. Two suggested options are given below:

- FHRI Frontier Grants
- FHRI Fund Grand Prize.

FHRI Frontier Grants would be small in quantum to advance ideas, methodologies, tools or technologies considered to be transformative, innovative, exploratory or unconventional, and have potential for major impact. An impact on knowledge is valid, and the idea doesn't need to be immediately applicable in terms of a health outcome. Applications would be simple and anonymous, with applicants selecting which of the four funding objectives their application is suited to. A random number generator would prioritise applications as a first stage, before proceeding to be pitched to an expert committee.

Using prizes to encourage innovation is emerging as a useful instrument to achieve outcomes associated with health and wellbeing. The introduction of a FHRI Fund Grand Prize has the potential to incentivise innovation, recognising health solutions through the application of ideas even where they fall outside of the conventional domains. This is not in opposition to rewarding excellence in general, but rather provides an additional investment option to prompt action on health issues that matter to the community.

The terms of the Grand Prize would be set by the IFSAB in consultation with the FHRI Office and focus on a current area of unmet health need. In determining whether a Grand Prize is appropriate, the IFSAB should consider whether:

- The goal (or problem to be solved) is achievable, clear and impactful
- The scope of the goal allows for many potential applicants
- The potential applicants accept a degree of risk associated with sunk costs when making the decision to invest.

Figure 3-12: Alternative funded initiatives in summary



### FHRI Fund Grand prize

Establish a \$1 million Grand Prize to prompt action on health issues that matter to the community.

The competition is marketed and open to the public to 'incentivise innovation' to achieve outcomes associated with health and wellbeing.

The Grand Prize should:

1. Set a goal that is achievable, clear and impactful
2. Ensure the scope of the goal allows for many applicants
3. Acknowledge that potential applicants accept a degree of risk associated with sunk costs when making the decision to invest.



### FHRI Fund Frontier grants

Small in quantum ~\$150,000 over two years.

To advance ideas, methodologies, tools or technologies that have the potential for major impact:

***Transformative***

***Innovative***

***Exploratory***

***Unconventional***

Applications would be simple and anonymous.

Applications must be vetted based on basic criteria at first stage, before proceeding to a pitch in front of an expert committee.

A novel example of how a prize has been used to address a health need, is the Heritage Provider Network's \$3 million prize offering (membership health care group entity that operates in the United States of America) where entrants were asked to create an algorithm that predicts how many days a patient will spend in a hospital with the goal of the prize to decrease the number of avoidable hospitalisations and reduce preventable hospitalisation costs. Progress winners were awarded as part of the prize process with the eventual winner comprising of rival teams that formed the leading group POWERDOT which won the final cash prize of \$500,000. Over 39,000 entries were received from over 40 different countries. This type of innovative competition can help accelerate patient centred care by harnessing 'big data' to reduce costs.

Moreover, one of the significant benefits of using prizes is their ability to attract investments from competitors many times greater than the cost of delivering and awarding the prize. For example, the X Prize Foundation actively seek out industry sectors where innovation has stalled thereby presenting the opportunity for a prize offering. The intended purpose of the prize is to inspire potential entrants to invest 10 or more times the amount of the prize purse, to harness the multiplier effect of potentially wicked problems and transforming them into accelerated investment opportunities.

### Funding for research infrastructure

Research infrastructure is a critical enabler to support the delivery of high quality research and innovation outcomes, ultimately improving the health and wealth of WA. Whilst the scope and scale of infrastructure funding varies across all funds reviewed as part of the best practice review, the majority of research ecosystems nationally and internationally allocate funding for systems and platforms. However, only the NIHR, NHMRC, Wellcome Trust and Alberta Innovates explicitly fund expenditure for land and buildings and/or associated ongoing costs. It is not clear if this expenditure is one-off capital or recurrent in nature (utilities etc.).

As a critical enabler for high quality and impactful research, the FHRI Fund should provide funding for infrastructure, however, the FHRI Fund should consider the following prior to the release of funding:

- Exploring other funding sources available to researchers, universities, hospitals and institutes (the FHRI Fund should not substitute existing funding sources)
- The utilisation of existing infrastructure (for example, building occupancy and sharing equipment across institutes and facilities)
- The proportion of funding allocated to recurrent infrastructure costs (for example, utilities and other ongoing maintenance costs).

**Recommendation:** The Department of Health should undertake a review to establish the current utilisation of existing infrastructure in order to determine the appropriate proportion of funding required, and develop procedures to maximise the use external funding sources.

### **3.2.2 Utilisation of funding principles as assessment criteria**

Like other similar funds providing direct investment into health research and innovation, the FHRI Fund will need a set of criteria in which to make a proper assessment of funds it wishes to disburse to potential applicants.

Internationally, there is evidence which indicates that pre-eminent funds, such as the Wellcome Trust and the National Institute for Health Research use a combination of key themes and principles to inform the assessment of 'priority areas' or 'areas of interest' to be funded. Similarly, the New Zealand Health Research Council applies key tenets which align to their strategic intentions to assist in the assessment of funding decisions.

What this means is that there should be strong alignment of the funding principles with the objectives of the FHRI Fund, and the priority areas as outlined in the proposed State-wide health research and innovation strategy when undertaking the assessment of potential applications for funding.

Furthermore, the development of robust funding principles enables the FHRI Fund to maximise the potential impact of the research for patients and the wider community.

It has the ability to do this, for example, by ensuring that the research:

- Answers the right questions
- Is designed, conducted and analysed appropriately
- Delivers the research efficiently
- Is published in full in an accessible and unbiased report.

### **3.2.3 Applications assessment process**

A review of best practice funding bodies indicates that the applications assessment process should be relatively straightforward. In the case of the FHRI Fund, the primary objective of the assessment process should be to provide the Independent FHRI Strategic Advisory Board, expert committees and the FHRI Office with sufficient information to assess alignment of the applicant's proposal with the key objectives and funding principles, and the strength of the scientific and commercial cases for investment.

#### **Applications portal**

While undertaking a review of other funds, it was apparent that the best practice funds had similar online applications portals that were designed with the potential applicant firmly in mind. For example, the Wellcome Trust has developed an easy to use applications portal which outlined clear rules on applicant's eligibility for funding, has an efficient lodgement process, and manages the grant process until assessment is completed.

Online tools were also provided such as a scheme finder for the potential applicant and a grants tracker tool to assist the applicant with transitioning to being a successful grant-holder. This includes the ongoing management of the grant with the online submission of annual progress reports as required.

While there are clear benefits in developing an online applications portal from an applicant/user efficiency perspective, there are also downstream longer term benefits of using the application registration data to commence the collection of key data points. As the dataset grows, this will prove to have high utility for example, when needing to report back to government on key performance metrics as appropriate.

While it is acknowledged that the Department of Health has developed the Research Governance Service (RGS), there does not appear to be a Department of Health designated online applications portal for funding.

During the course of the consultations with key stakeholders, it was stated that while the RGS was designed as a centralised IT system to enable the completion, submission, administration, tracking and reporting of ethics and governance applications through the ethics approval and site authorisation processes; the co-ordination, on-going management and timeliness of these functions continues to be an issue, particularly for research applicants. As such, it is suggested that a targeted review of the Health Research Ethics Committees' current function and approach to managing ethics approval is undertaken to ensure an effective and efficient service for potential users.

**Recommendation:** The Department of Health should explore the development of an 'easy to use' applications portal which outlines clear rules on applicants' eligibility for funding, has an efficient lodgement process, and manages the grant process until assessment is completed. Alternatives, such as purchasing such a system or outsourcing this process to a third party with such a system already in place, should also be considered.

### Applications process map

The application process map shown in Figure 3-13 sets out the key components and commentary associated with the FHRI Fund.

In the first instance, all applications for funding should meet a minimum set of eligibility criteria, which should be determined in detail by the IFSAB:

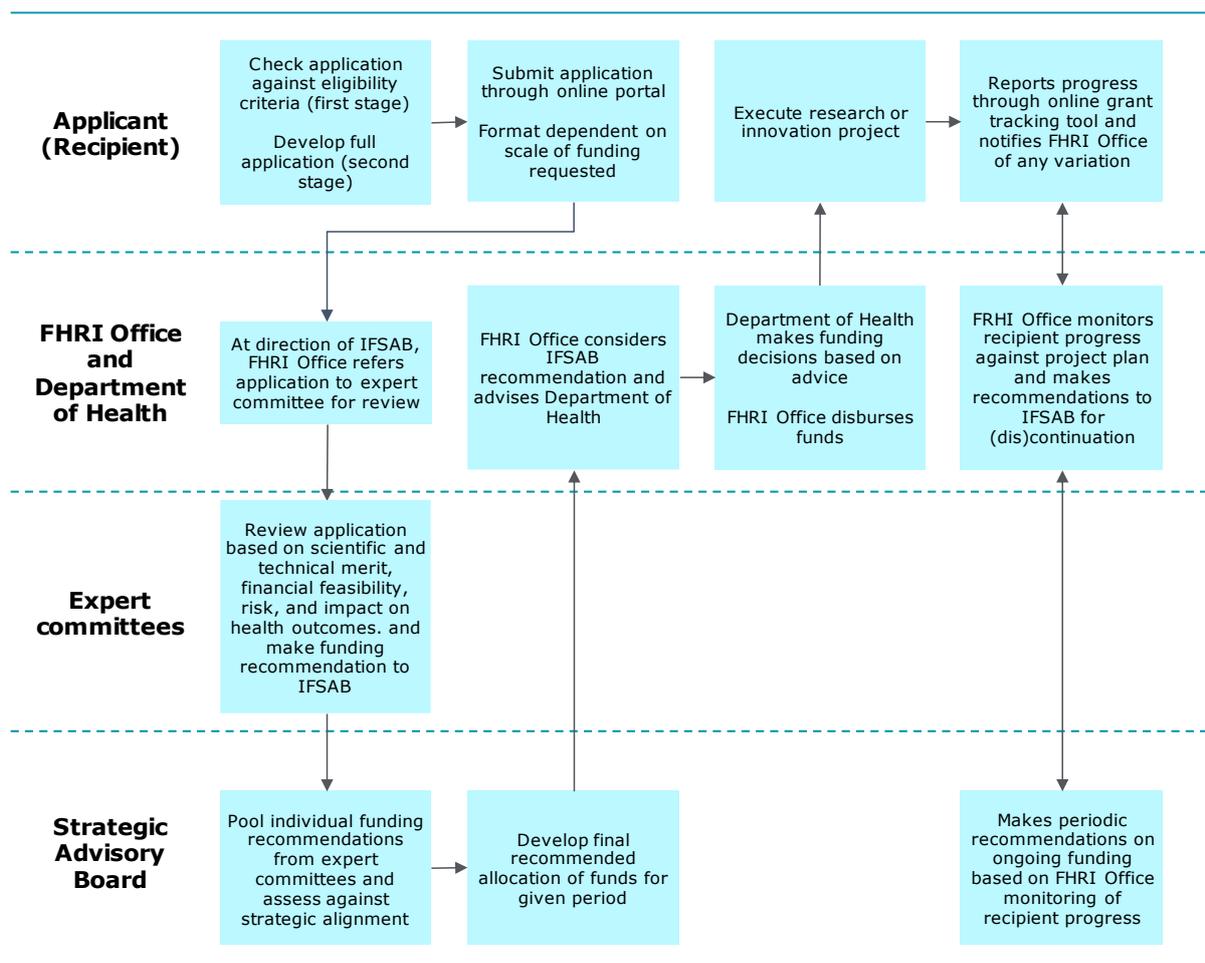
- The applicant should have the suitable level of experience and/or qualification for the type of funding requested
- The application should describe the potential impact of the research output on health outcomes
- The project should align with the future health research and innovation strategy
- The project should align with the funding principles described above.

The form and size of the application should suit the scale of funding requested, as determined by the IFSAB. Applications should be short and sharp and assessed quickly where appropriate, for example for small amounts of funding with clear objectives to be achieved over a relatively short time period.

After lodgement through the online portal described above, the FHRI Office refers applications to the appropriate expert committee or reviewing panel as directed by the IFSAB. Committee members should assess applications through the lenses of:

- Technical and scientific merit, based on committee members' knowledge of contemporary research in the relevant discipline
- Financial feasibility, including whether the requested funds are appropriate for the time and resources required to complete the project
- Potential impact on health outcomes, and whether the project carries risk that matches the magnitude of the impact.

Figure 3-13: Applications process map



Source: Deloitte Access Economics

Expert committees make funding recommendations based on individual applications, which are referred to the IFSAB. The IFSAB assesses recommendations based on the projects' alignment with the health research and innovation strategy, funding principles, and alignment with the FHRI Fund's mission and objectives. The IFSAB provides its recommendations to the FHRI Office, which considers the recommendations and provides briefing advice to the Department of Health executive. The Department of Health makes final funding decisions based on this advice.

Once final funding determinations are made, the FHRI Office notifies applicants of the outcome of their application. The FHRI Office disburses funds to successful applicants on the basis of the project plan agreed between the Office and the recipient.

On a dynamic basis throughout the life of the project, the recipient provides regular updates to the FHRI Office through an online grant tracking tool. At a minimum, full progress updates should occur on an annual basis, with the recipient notifying the FHRI Office of any substantial variations in the project plan as and when necessary.

At agreed milestones or decision stages, the FHRI Office makes recommendations to the IFSAB to release the next stage of funding. In cases where projects are not meeting agreed targets or otherwise failing to comply with the terms of their funding, the FHRI Office may recommend to the IFSAB that funding be frozen pending further review, or discontinued altogether.

It is important to note that different funding streams and different types of projects may suit different processes for submitting and reviewing applications, and different means of monitoring progress. For example, the outcomes of discovery science conducted by a university researcher

will differ greatly from funding requested by a biomedical engineer to commercialise a prototype piece of technology. The IFSAB, expert committees, and FHRI Office should at all times take a dynamic approach to funding applications and monitoring with a view to prioritising outcomes and impact over process.

### **Managing and monitoring performance**

Performance management and monitoring is a key feature of best practice funds both locally and internationally. In most cases, the performance of a fund is predicated on an integrated approach for the delivery and monitoring of funds, which should be straightforward in process and transparent in design.

For example, both Innovate UK and the UK Medical Research Council have standardised monitoring processes with 'monitoring officers' communicating and meeting with successful applicants regularly to keep them on track. This milestone-driven monitoring process includes red, amber, green (RAG) rating performance management functions to resolve issues as they arise. Opinions from expert committee members are sought as and when necessary by the monitoring officers. A similar monitoring scheme is also used by the Department of Health Research Development Unit to keep track of progress in the Research Translation Project and Telethon Perth Children's Hospital Research Fund programs.

It is also clear that while there is an operational imperative to ensure that disbursed funded are monitored and managed effectively and efficiently, key performance indicators (KPIs) are required to measure the progress against the strategic objectives of a fund. In most cases, these 'outcome' oriented metrics may be extended in timeframe and focus on the longer term benefits of the fund by describing the tangible value of the public investment.

They are often referred to as 'impact' highlights for example, Alberta Innovates seeks to enhance health and wellbeing and has a KPI which demonstrates how research impacts improvement in health across the spectrum of quality of care, health status and determinants of health. Alberta Innovates also seeks to grow the economy and has developed success measures by estimating the number of knowledge based workers supported and the follow-on funding leveraged by their fund and partnered projects.

On this basis, it is critical that the FHRI Fund's performance management framework clearly aligns with the proposed State-wide health research and innovation strategy. It also needs to show where the funding goes and ideally the types of organisations it goes to.

It should be noted that the Telethon Kids Institute is developing an Impact Management System that allows research organisations and individual researchers to show the progress of research projects towards real world impacts over time, in a manner which is relevant to stakeholders in industry, government, funding bodies and philanthropy. This initiative is in response to the need to demonstrate the broad impact of their research to society.

The system enables researchers and organisations to bring stakeholders with them on the research journey, telling the story of progress towards real world impacts as they happen and includes:

- Impact Map – the flagship module, which provides an easy and intuitive way to track research as it progresses along a pathway towards an intended impact. The system lets the researcher create a link between a high-level translation pathway, their key engagements, research outputs, outcomes and impacts over time. Rather than merely talking about an impact at the end of research process, for the first time Impact Map shows progress towards impact as it happens
- Impact Collect – this module collects information from researchers for use in conjunction with the Impact Map module. It was designed to prompt researchers for specific information. Impact Collect is already in use institute-wide at the Telethon Kids Institute. Information collected informs reporting to stakeholders
- Impact Connect – to encourage investment in research by government, industry, funding bodies and philanthropy, Impact Map is supported by the Impact Connect module. This

- module informs discussions with stakeholders by visually demonstrating the return on investment and highlighting research areas requiring further funding to achieve their goals
- Two reporting modules, Impact Report and Impact Analyse, easily extract and visualise impact information.

The Telethon Kids Institute has indicated a willingness to partner in the development of the system, representing an opportunity for the FHRI Fund and wider WA Government to co-design a tool that may be applicable to both the Fund and broader WA government initiatives.

Figure 3-14 outlines some suggested interim performance metrics to assist in the development of comprehensive set of key indicators that will support accountability of the Fund.

Figure 3-14: Suggested interim performance metrics for the FHRI Fund

Funding objectives	 <b>Prioritise disease prevention, improved clinical outcomes and creation of a sustainable WA healthcare system</b>	 <b>Grow our research talent and strengthen WA's research and innovation culture</b>	 <b>Maximise the global potential of WA's research and innovation ecosystem</b>	 <b>Support research translation to improve the health and wellbeing of people in WA</b>
Suggested metrics	<ul style="list-style-type: none"> <li>Number of research projects successfully completed on time and on budget</li> <li>Total value of interstate and international funds received by WA researchers</li> <li>Alignment of targeted calls and research activity to priorities identified in the strategy</li> </ul>	<ul style="list-style-type: none"> <li>Percentage of total health and medical workforce engaged in research</li> <li>WA success rate for NHMRC grants</li> <li>Retention rate of world-class researchers in WA</li> <li>Increase in the proportion of early- and mid-career researchers in the workforce</li> <li>WA Health satisfaction survey on research and innovation sentiment</li> </ul>	<ul style="list-style-type: none"> <li>Number of research projects resulting in commercialisation outcome</li> <li>Value of return on investment of commercialised research and innovation</li> <li>Number of funded research and innovation projects achieving global recognition</li> </ul>	<ul style="list-style-type: none"> <li>Number of policy or program changes influenced by funded research activity</li> <li>Adoption of research-influenced changes into clinical practice</li> </ul>

Source: Deloitte Access Economics

**Recommendation:** The FHRI Office should develop a comprehensive set of key performance indicators (with stakeholder input) that align with the objectives of the State-wide health research and innovation strategy. These indicators should be monitored and reported on by the FHRI Office to ensure progress against objectives. The monitoring of the FHRI Fund's key funded initiatives should be straightforward in process and transparent in design. Opportunities to co-develop performance monitoring tools, for example in partnership with the Telethon Kids Institute, should be explored.

### Publication

To ensure transparency, the FHRI Office should make the following publicly available:

- The State-wide health research and innovation strategy
- High-level funding recommendations made by the IFSAB, noting that personal or commercially sensitive information should not be published
- Final funding decisions made by the Department of Health, with any differences between the Department's decisions and the IFSAB's recommendations highlighted
- Outcomes of any funded initiative, including both research findings and performance against key metrics.

Making this information publicly available will help to ensure that the FHRI Fund maintains the confidence of both the HMR/HMIC community and the wider WA population.

### 3.3 Development and ownership of intellectual property

The FHRI Fund should adopt an approach to management and ownership of intellectual property (IP) that is consistent with the State Government's IP policy, but which encourages rather than inhibits innovative behaviour. This section reviews other jurisdictions' approach to IP ownership and recommended IP principles to be adopted by the FHRI Fund.

#### WA State Government

In August 2015, the State Government's Intellectual Property (IP) Policy was updated and released. The purpose of this policy is to guide government agencies in the development, management and use of IP and IP rights.

The current Department of Health IP policy states that, the rights to IP generated by public sector employees in the course of their normal working activities, or logical extensions of these (this can include activities undertaken offsite and/or after hours) are generally vested in their employer. This policy position is, however currently under review given the landmark High Court of Australia decision in 2010 regarding the UWA vs Gray Case. In essence this decision means that an employer has no automatic rights over inventions of an employee, without an express, or implied, term in the contract of employment, ie a duty to undertake research does not carry with it a duty to invent.

Beyond high-level governance arrangements, the FHRI Fund will need to ensure alignment and consistent treatment of IP in accordance with the WA Government IP policy in terms of:

- IP assets including data, created with government resources are identified, captured, suitably protected, responsibly managed, and transparently disposed of according to the key principles outlined in this policy
- Rights to IP created with government resources are allocated to optimise the economic, social or environmental benefits for the State from the use, commercialisation and disposal of the IP
- Employers and employees are encouraged to meet core operational objectives through creativity and innovation which may result in valuable and useful IP being developed and commercialised
- Employees are recognised for their involvement in the development of IP.

It is understood that the Department of Health strongly supports this approach to the management of health sector IP, recognising the great value that innovation and commercialisation can have in both advancing health care delivery and optimising the return on the State Government's investment in health.

#### NHMRC national principles

Since 2001, the NHMRC has applied a 'national principles' approach with an update to the National Principles and related documents in 2013. The National Principles of IP Management for Publicly Funded Research were created to assist researchers, research managers and research institutions develop best practice in identifying protecting and managing IP, thus ensuring appropriate commercial outcomes from publicly funded research.

Put simply, the intention of the National Principles is to improve the commercial outcomes from publicly funded research where a commercial outcome is appropriate. The FHRI Fund should be consistent with NHMRC national guidelines including the principles and policies as stated in the National Principles of Intellectual Property Management for Publicly Funded Research.

**Recommendation:** That the FHRI Strategic Advisory Board ensures that management of intellectual property occurs in a manner that is consistent with the WA Government Intellectual Property Policy and the National Principles of Intellectual Property Management for Publicly Funded Research.

## Queensland Health

Queensland Health provides explicit guidance to inventors to assess IP ownership rights and the most effective way to create public health benefits from the research. The government policy states that Queensland Health “shall manage intellectual property in a way that maximises the performance of the agency through creation of positive public health outcomes whilst minimising legal, reputational and financial risk”.

Queensland Health employees engaged in research often hold dual appointments with universities allowing them to access commercialisation advice and support from agencies such as Uniquest. Queensland Health is explicit in providing guidance regarding IP ownership falling to the department only if the IP was developed in the employee’s course of employment and does not attempt to extend its inferred rights.

## Victorian Government

The Victorian Government has adopted a set of consistent IP management principles across its agencies. The State manages intellectual property in ways that are consistent, transparent and accountable and grants rights to its IP with the fewest possible restrictions. The State may exercise its intellectual property rights restrictively for reasons of privacy, public safety, security and law enforcement, public health, commercialisation and compliance with the law. As with Queensland, the Victorian Government owns intellectual property created by its employees in the course of their employment. The State manages the moral rights of creators as required under the *Copyright Act 1968* (Cth) and responds to breaches of its intellectual property rights where appropriate in order to maintain its reputation or the value of its intellectual property.

The Victorian Government’s IP policy makes it clear that the State is not in the business of commercialising intellectual property and does not create intellectual property in order to generate a financial return. However, agencies may commercialise IP if they have an explicit statutory function to do so, or if it has been explicitly authorised by the Treasurer because of a demonstrated net benefit to the Victorian community.

When providing funding and grants towards IP development, the Victorian Government addresses in an agreement any rights to intellectual property (including pre-existing intellectual property) that may arise as a consequence of the grant or funding. The State does not secure a licence to the intellectual property unless there is a stated purpose for doing so, and then only to the minimum extent necessary to achieve that purpose. If a licence would not be adequate in the circumstances, the State acquires ownership of the resulting intellectual property.

Finally, if the intellectual property is not used by the recipient for the purpose of the grant or funding within a reasonable time, the State ensures that ownership of the intellectual property is able to be assigned to or by the State.

## Commonwealth Government

In December 2016, as part of the establishment of the Defence Innovation Hub, the Australian Government established a contracting and IP framework for the purpose of:

- Developing leading-edge innovation and technological expertise
- Supporting Sovereign Industrial Capabilities (described in the Industry Policy Statement) that are strategically important within the Australian Defence industry.

As a key enabler of this framework, the Australia Defence Force (Defence) developed an IP Strategy to facilitate and support participation in the Innovation Hub by providing a clear public statement of Defence’s approach to the treatment and protection of IP used or created in connection with projects funded by the Innovation Hub, including existing IP contributed by both industry and Defence.

In developing this IP Strategy, Defence recognised the critical role that IP plays in fostering and encouraging innovation and delivering vital capability to the Defence forces. The IP Strategy that was created seeks to achieve an appropriate and reasonable balance between the commercial interests of industry and Defence's objective of maintaining a regionally superior defence force with the highest levels of capability necessary to protect Australia's national interests.

In addressing the various IP arrangements likely to be encountered, Defence made the following general observations (outlined as Principle 1) in relation to ownership of IP:

- Defence will not seek to own Innovation IP (including Innovation IP created jointly by Defence and Participants), unless there are compelling reasons to support Defence ownership
- This principle recognises that IP is generally better managed and exploited where owned by industry through vesting ownership of Innovation IP in the industry partner (or a subcontractor). It also recognises that IP ownership arrangements as between an industry partner and its subcontractors are generally a matter best determined by the industry partner and its subcontractors.

While not an automatic provision in all IP arrangements with Defence, the principle does recognise that Government (including various Government bodies) may not be well-equipped or experienced in the management and commercialisation of IP.

Consistent with contemporary Australian governments' approach to IP management and ownership, the FHRI Fund should adopt an approach to IP ownership that incentivises, rather than impedes, industry partners to contribute funding to and engage with WA's health and medical innovators.

#### **Key insight into funding IP – Singapore's National Health Innovation Centre**

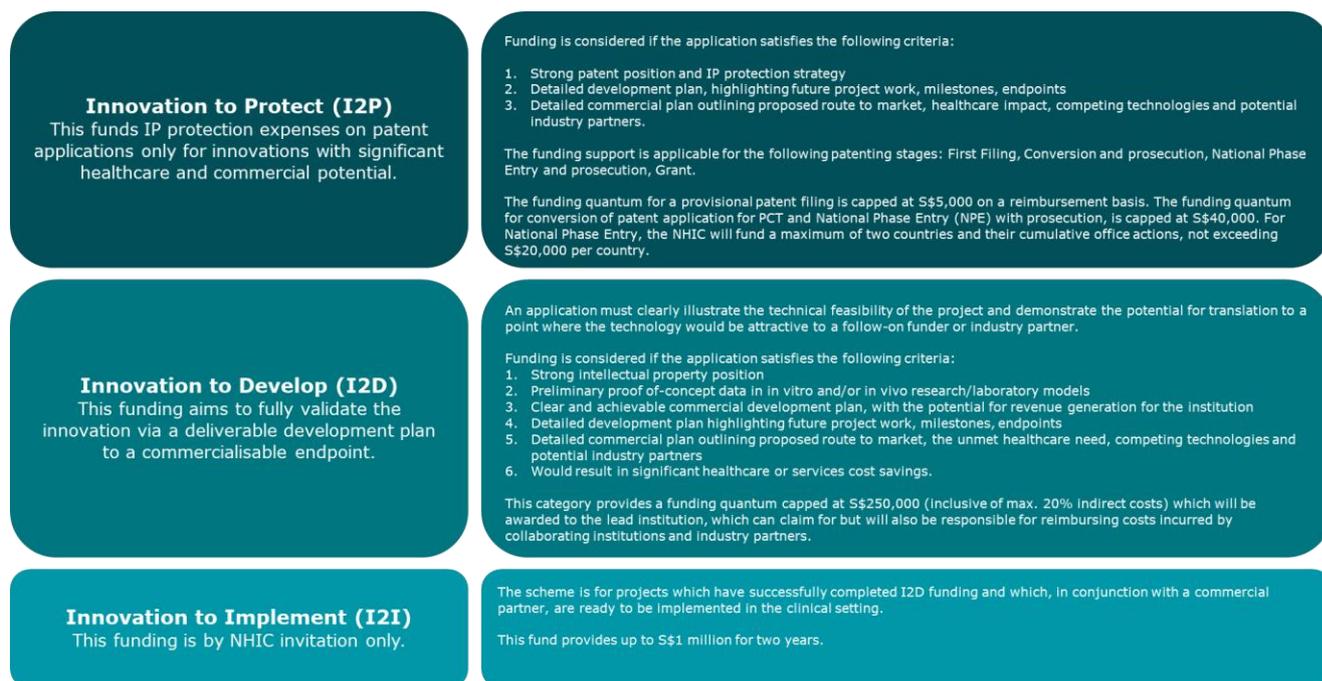
One of the key considerations when progressing innovation relates to IP protection. Singapore's National Medical Research Council has addressed this, as part of a three-stage funding strategy and invested heavily in expediting the translation of innovative technologies/services towards the development of a market-ready product.

The National Health Innovation Centre (NHIC) was established with funding to spear-head efforts to support projects which address unmet healthcare need and have demonstrated 'proof of principle' via experimental data. The three key funding streams target different stages of the innovation development pipeline (except for early stage/ bench research).

The Innovation to Protect (I2P) funding is designed to assist in the protection of relevant protection instruments which have significant healthcare and commercial potential.

Similarly, the FHRI Fund could potentially provide co-funding support for these types of expenses to accelerate medical innovation, through the development of research and technology into commercialised outcomes. This should be balanced against seeking funding from other potential collaborators such as universities which typically fund small amounts but is only available for IP owned by the university.

Figure 3-15: NHIC funding streams which target different stages of the innovation pipeline



Source: Adapted from Singapore National Health Innovation Centre material

# Appendix A: Case studies

Deloitte Access Economics has undertaken a review of a number of Australian and overseas HMR/HMIC funding bodies to analyse their governance structures and identify best practice elements that can potentially be applied to the WA environment. Funds assessed include:

- National Health and Medical Research Council (Australia)
- Medical Research Future Fund (Australia)
- Biomedical Translation Fund (Australia)
- LaunchVic (Victoria)
- Health Research Council (New Zealand)
- Alberta Innovates (Canada)
- National Health Innovation Centre (Singapore)
- Defence Advanced Research Projects Agency (US)
- Health Innovation, Investment and Research Office (Queensland)
- Biomedical Catalyst (UK)
- Wellcome Trust (UK)
- Life Sciences Industrial Strategy and Industrial Challenge Fund (UK)
- Office for Health and Medical Research (New South Wales)
- Health Industries SA (South Australia)
- National Institute for Health Research (UK).

All acknowledgments, material and other sources used to inform the case study reviews are provided in the reference section of the report as appropriate.

## **A.1. National Health and Medical Research Council (NHMRC) - Australia**

### **A.1.1. Fund history and overview**

The National Health and Medical Research Council evolved from the Federal Research Council established in 1927 in response to findings of a Royal Commission into the need to fund health and medical research in Australia. It was a function of the Commonwealth Department of Health until 1 July 2006, at which point it became an independent statutory authority within the Health portfolio. Also at this time, the former National Institute for Clinical Studies (NICS) was incorporated into the NHMRC.

The NHMRC is the primary entity responsible for funding health and medical research in Australia. Its mission is to work to build a healthy Australia, with three strategic directions to:

- Invest in high quality health and medical research and build research capability
- Support the translation of health and medical research into clinical practice
- Maintain a strong integrity framework for research.

### **A.1.2. Governance and structure**

As of 1 July 2006, the NHMRC is constituted under the *National Health and Medical Research Council Act 1992*. The Act establishes a Chief Executive Officer who is directly responsible to the Minister for Health. The role of the CEO is to set major objectives, identify new and emerging health issues, and develop strategies to address these issues.

The Act also establishes the NHMRC Council, which performs the following functions:

- Advises the CEO in relation to his or her functions and performance
- Perform any functions conferred on it by the Minister
- Perform any functions conferred on it by the Act or other legislation.

The Council is comprised of an independent chair, the chief medical officer of the Commonwealth and each State and Territory, a person with expertise in Aboriginal health, a person with expertise in consumer issues, a person with expertise in business, and between six and 11 additional members with expertise in various areas of the health and medical workforce and public health.

The CEO must develop a corporate plan for the NHMRC that contains his or her assessment of current health priorities, the manner in which the CEO intends to address those priorities, and a national strategy for health and medical research. As a statutory authority, the NHMRC must also produce an annual report for the Minister for Health to table in Parliament.

### **A.1.3. Funding operations and arrangements**

A detailed overview of the NHMRC's funding operations is provided in Chapter 2 of this study.

### **A.1.4. Key impacts**

The NHMRC (and its precursor entity) has been the primary funder of health and medical research in Australia for more than 90 years. Many of Australia's contributions to breakthroughs in health and medical research had their roots in grants or fellowships funded by the NHMRC. For example, one of its inaugural grants went to John Carew Eccles, who was a co-recipient of the 1963 Nobel Prize in Medicine.

As part of its strategic plan, the NHRMC develops a number of targets for each of its purpose statements. It then reports on progress in achieving these targets on an annual basis. The metrics with which it measures progress vary and are dependent on the nature of the target.

## **A.2. Medical Research Future Fund (MRFF) - Australia**

### **A.2.1. Fund history and overview**

The Medical Research Future Fund was established in the 2014-15 Commonwealth Budget to boost funding for medical research and innovation. The MRFF receives annual payments from the

Commonwealth Health portfolio until it reaches \$20 billion in capital, which is to be preserved in perpetuity. The net earnings are available for disbursement as funding for medical research, which – once the Fund is fully capitalised – will be in the order of \$1 billion per annum.

The MRFF has three broad missions, supporting:

- The discovery of new techniques and treatments
- Healthier Australians
- New jobs and business growth.

In achieving this mission, the MRFF has developed six strategic platforms:

- Support stronger partnerships between researchers, healthcare professionals, government, and the community
- Make better use of existing data and infrastructure
- Strengthen our health services and systems to make healthcare more efficient and affordable
- Develop the skills of researchers and healthcare professionals and encourage trans-sectoral collaboration
- Support new and existing clinical trial networks
- Support researchers to find a commercial partner or investor.

### **A.2.2. Governance and structure**

The MRFF is an endowment fund managed by the Board of Guardians of the Australian Future Fund. The Board of Guardians is responsible for managing the capital and making the net earnings available for disbursement.

Separately, the Australian Medical Research Advisory Board (AMRAB) was established to advise on how the net earnings should be distributed. The AMRAB is responsible for developing the Australian Medical Research and Innovation Strategy, the first iteration of which has been released for the period 2016 to 2021. The Strategy is reviewed every five years, while the AMRAB develops and reviews specific sets of priorities for funding every two years.

The AMRAB is appointed by government and consists of an independent chair and seven other members, one of whom is the CEO of the NHMRC. This is a deliberate mechanism to ensure that the work of the MRFF complements but does not compete with the work of the NHMRC.

The establishing legislation does not permit net earnings from the Fund to be used for the day-to-day operations and management of the funding streams. Therefore, in practice, MRFF funds are disbursed through the Commonwealth Department of Health or the NHMRC. The AMRAB is advisory in nature, meaning that ultimate decision-making power with respect to funding decisions rests with government.

### **A.2.3. Funding operations and arrangements**

A detailed overview of the MRFF's funding operations is provided in Chapter 2 of this study.

### **A.2.4. Key impacts**

The first round of MRFF funds were disbursed in 2016. Its strategic plan and priorities are yet to be reviewed, and a formal set of funding principles were only endorsed by government in December 2017. Therefore, it is difficult to comment on the impact of the MRFF to date. However, given that the long-term annual quantum of funding is likely to exceed that of the NHMRC, it is clear that the MRFF represents a significant shift in Australia's HMR funding environment.

## **A.3. Biomedical Translation Fund (BTF) - Australia**

### **A.3.1. Fund history and overview**

The \$500 million Biomedical Translation Fund was established as a co-investment venture capital program as part of the Commonwealth Government's National Innovation and Science Agenda

(NISA) in 2016. The Commonwealth contributed \$250 million, with the other 50% contributed by the private sector.

The purpose of the BTF is to:

- Support commercialisation of biomedical discoveries in Australia
- Help translate biomedical discoveries into high growth potential companies to deliver long-term health benefits and national economic outcomes.

Unlike most other sources of Commonwealth funding for health and medical research and innovation, the BTF does not disburse grants or fellowship payments. Rather, it invests in equity of companies undertaking biomedical research and innovation.

### **A.3.2. Governance and structure**

Responsibility for the government's investment in the BTF rests jointly with the Commonwealth Ministers for Industry, Innovation, and Science; and Health and Aged Care. Jointly, the Ministers were responsible for assessing applications from, and selecting, the Fund's three private sector partners.

The government appointed Brandon Capital, OneVentures Management, and BioScience Managers as fund managers for the BTF. The three partners were given responsibility to manage \$230 million, \$170 million, and \$100 million of the BTF capital, respectively. The fund managers are required to establish licensed funds for each of these capital amounts, which are governed by guidelines developed by government.

Applications for funding are made to one of the three fund managers and assessed on the basis of their commercial merit. Government participates in the day-to-day function of the BTF through Innovation and Science Australia (ISA), which assesses applications on the basis of their technical merit. Ultimate decisions on funding are made by a delegate of the relevant Minister, presently the Secretary of the Department of Industry, Innovation and Science.

### **A.3.3. Funding operations and arrangements**

A detailed overview of the BTF's funding operations is provided in Chapter 2 of this study.

### **A.3.4. Key impacts**

The BTF has been in operation since December 2016, and has to date invested only a small proportion of the total capital in investee biomedical companies. Therefore, it is difficult to assess its impact on health and medical research and innovation.

The BTF guidelines permit the Department of Industry, Innovation and Science to evaluate the performance of the three funds and their managers. However, the guidelines do not specify the means of evaluation, nor do they state whether this evaluation will be exclusively on a commercial basis (e.g. the rate of net earnings returned to each fund over a certain period of time) or take into account, for example, the broader health and medical impacts of the investee companies' discoveries, products and services.

## **A.4. LaunchVic - Australia**

### **A.4.1. Fund history and overview**

LaunchVic was established by the Victorian Government as an independent agency in March 2016, responsible for developing Victoria's start up ecosystem. It is a Company incorporated under the Corporations Law and is a company limited by guarantee. Its share capital is owned by the Treasurer of the State of Victoria, on behalf of the State of Victoria. To July 2017 they had received \$2,834,000 in operating grants and \$16,059,334 Program grants from the Victorian government. The HRC mission is to lead the development of a globally-connected start-up ecosystem by supporting start-ups and investors to sustainably grow and deliver economic and cultural benefits for both Victoria and Australia.

LaunchVic is responsible for leading the development of the Victorian start-up ecosystem by focusing on the following activities:

- Develop and deliver programs to foster an entrepreneurial culture, build entrepreneurial talent and capabilities and support firms to grow
- Engage in activities that will expand the capacity of accelerators and other start-up infrastructure and address the specific needs of start-up ventures and small to medium size enterprises with high growth potential
- Coordinate, commission and deliver events, competitions and challenges
- Develop and deliver marketing and communications activities to promote Victoria's start-up ecosystem
- Negotiate, enter into and manage grant, sponsorship and partnering agreements;
- Advocate with the public and private sectors on issues that affect the development of the ecosystem and start-ups
- Monitor Victoria's start-up ecosystem
- Strengthen connections between Victorian and other leading start-up economies;
- Undertake or commission research on policy ideas and reform opportunities to support start-ups
- Support state agencies in respect of start-up and related activities.

### **A.4.2. Governance and structure**

#### **Board**

The directors of LaunchVic are appointed by the Minister for Small Business, Innovation and Trade via a recruitment process. The board currently comprises five members from industry who act in unpaid positions. The board has developed a Corporate Governance framework and oversees the implementing of governance policies and a strategy that was developed through consultation with over 125 stakeholders and announced on 1 June 2017.

#### **Management team**

LaunchVic is led by a Chief Executive officer and supported by a staff of 14 across four focus areas.

1. Capability and Excellence to establish Victoria as an internationally recognised start-up ecosystem through ensuring effective operation of parts of the ecosystem including founder and investor capabilities. Activities in this stream will focus on ensuring a stronger investment community, a ready supply of talent willing to work at start-ups, better connecting start-ups to supply chains and ensuring founders have the skills to support the scaling of their businesses. This stream is general in its sector focus and will support start-ups across areas of growing start-up activity including fintech, food & fibre, education, creative industries, cybersecurity and beyond
2. Leveraging key strengths to establish the State as an internationally recognized start-up ecosystem by leveraging Victoria's existing strengths. This stream focuses on Victoria's health and wellbeing strengths that can be leveraged in positioning the local start-up ecosystem as a global leader
3. Diversity and Inclusion to increase community engagement in the start-up ecosystem. This stream focuses on attracting more founders to start their own businesses and supporting

- new founders through quality education. The stream meets the Government's expectation that LaunchVic will continue to drive interest in entrepreneurship across the community
4. Channel Development aimed at leveraging the work of LaunchVic, as well as communicating the strengths of the ecosystem, locally and internationally. Programs of work will help increase awareness of the Victorian start-up community, facilitate engagement within the start-up ecosystem, support the generation of educational content and promote the Victorian start-up ecosystem internationally.

## Objectives

The Victorian Government established LaunchVic to be the State's lead entrepreneur and start-up support agency, with a focus on:

- Fostering a thriving entrepreneurial culture and entrepreneurial economy
- Strengthening Victoria's entrepreneurial culture and capabilities
- Supporting innovative entrepreneurial firms to grow and contribute to the growth in the economy and employment in Victoria.

LaunchVic focuses on the following activities:

- Develop and deliver programs to foster an entrepreneurial culture, build entrepreneurial talent and capabilities and support firms to grow
- Engage in activities that will expand the capacity of accelerators and other start-up infrastructure and address the specific needs of start-up ventures and small to medium size enterprises with high growth potential
- Coordinate, commission and deliver events, competitions and challenges
- Develop and deliver marketing and communications activities to promote Victoria's start-up ecosystem
- Negotiate, enter into and manage grant, sponsorship and partnering agreements
- Advocate with the public and private sectors on issues that affect the development of the ecosystem and start-ups
- Monitor Victoria's start-up ecosystem
- Strengthen connections between Victorian and other leading start-up economies
- Undertake or commission research on policy ideas and reform opportunities to support start-ups
- Support state agencies in respect of start-up and related activities.

### A.4.3. Funding operations and arrangements

LaunchVic provides funding through a number of focused funding rounds.

The current round is focused on the Health Start-up sector and will fund organisations to deliver accelerator and education programs that will further drive Victoria's strengths and help position the State as a leading health start-up hub in the Asia-Pacific region.

Specifically, LaunchVic is seeking to invest:

- Up to \$1 million per application for Accelerator programs that run up to three years and are focused specifically on the Health Start-up Sector (including medtech, biotech, pharma, health & ageing services and disability services). LaunchVic will accept applications for up to \$3 million only if they are exceptional. LaunchVic would particularly welcome accelerators that are led by or partner with Victorian Hospitals as these provide more opportunities for innovation "pull" and validation of health start-up problems. All applications must demonstrate strong start-up, and preferably accelerator, experience
- Up to \$250,000 per application for founder and investor education services dedicated to the Health Start-up Sector including (but not limited to): founder education programs on: commercial strategy; reimbursements; domestic, international regulatory environments and other programs; and investor education for angels focused on the Health Start-up Sector.

Applicants are required to address Key Assessment Criteria that are used by an assessment panel comprising at least two LaunchVic staff and one representative from the Victorian Department of Economic Development, Jobs, Transport and Resources and a sub-committee of the LaunchVic Board, the "Grants and Funding Committee" (comprising at least two Board Members). Shortlisted applicants are then invited to pitch the two committees. Further due diligence is completed including financial risk assessment, conducted by the Department of Economic Development before a recommendation for funding is made to the full LaunchVic Board. Successful applicants are required to enter into a contract with LaunchVic and provide project reporting to receive payments under agreed milestones.

#### **A.4.4. Key impacts**

Despite its short history, LaunchVic had invested \$11.4 million in the start-up ecosystem, including investing in 28 projects across three funding rounds as at July 2017. This investment has aligned with complementary government strategies focused on the Medical Technologies and Pharmaceutical sector and the Healthier lives, stronger economy: Victoria's Health and Medical Research Strategy 2016-20 initiative. LaunchVic's support for events and promotion of the sector has enabled it to secure the majority of national biotech conferences, while also supporting the promotion of Victoria and Victorian companies and technologies at large international conferences.

The current round of funding focused on Health Tech, has been informed by a State of HealthTech sector report commissioned by LaunchVic which identified recommendations on the types of interventions needed to maximise the comparatively strong health and medical sector.

## **A.5. Health Research Council (HRC) – New Zealand**

### **A.5.1. Fund history and overview**

The Health Research Council of New Zealand (HRC) was established under the Health Research Council Act 1990 and is responsible to the Minister of Health. Their major funding agreement is through the Minister of Science and Innovation. The HRC vision is to improve the health and quality of life of all New Zealanders.

The HRC is responsible for managing the Government's investment in health research. In addition, it supports the development of research careers, so that New Zealand can have a well trained workforce in the future. The HRC also contributes to maintaining an ethical and safe health research environment. The HRC's committees provide advice on gene technology, approve health and disability ethics committees and institutional ethics committees, monitor the data and safety of large clinical trials and review applications to use new medicines in trials.

### **A.5.2. Governance structure**

#### **Council**

The HRC members are appointed by the Minister of Health and are appointed initially for a term of three years. Half of the ten members are or have been engaged in health research, while the remaining members bring skills and experience in areas such as community affairs, health administration, law, management and knowledge of health issues from a consumer perspective.

The criteria for membership of the Council are outlined in Sections 8 to 11 of the Health Research Council Act 1990 and as amended by the Health Research Council Amendment Act 1991. Sections 6, 31 and 34 of the Act sets out the statutory responsibilities of the HRC, which relate to the functions of the Council, consideration of applications, and liaisons with other organisations.

The Council's governance responsibilities include:

1. Communicating with the Minister and other stakeholders to ensure their views are reflected in the HRC's planning;
2. Delegating responsibility for achievement of specific objectives to the chief executive;
3. Monitoring organisational performance towards achieving objectives;
4. Accounting to the Minister on plans and progress against them; and
5. Maintaining effective systems of control.

The Council maintains an interests' register and ensures Council members are aware of their obligations to declare interests. The Council is committed to ensuring that all of its activities are conducted in a manner which meets the highest ethical standards.

#### **Management team**

The HRC is made up of the Office of the Chief Executive and three directorates:

1. **Business Operations and Finance directorate** - Managing and co-ordinating the provision of financial accounting services to the HRC by, for example:
  - providing accurate and timely accounting and financial reports including information on the availability of financial resources and the financial implications of funding decisions
  - ensuring financial and accounting policies, procedures and practices are developed implemented and maintained
  - providing financial policy advice as required
  - advising on and managing the investments of the HRC in accordance with the provisions of the First Schedule, Health Research Council Act (1990)
  - assisting with the negotiation of the output agreement with government ministries and funding agreements with other entities
  - administering any financial matters relating to any contracts entered into by the HRC
  - maintaining a fixed assets register

- preparing the annual financial statements in accordance with Part V of the Public Finance Act (1989) and ensuring that the HRC meets all statutory and legal requirements relating to financial and accounting functions.
2. **Research Investment and Contracts directorate** – Management of the funding operations for the HRC, for example:
    - Management of the annual contestable funding round
    - Management of Career Development Awards
    - Preparation of the Investment Strategy
    - Development of guidelines and application forms
    - Management of peer review processes
    - Support for the HRC's Committees
    - Monitoring of contractual research performance
  3. **Strategy and Policy directorate** – Develop and advice for the HRC, for example:
    - Development of research policy advice
    - Preparation of HRC reports
    - Evaluation of HRC programmes and activities
    - Support for Long Range Strategic Advice Committee

### Statement of intent

The HRC Statement of Intent has been developed to meet the requirements of the Crown Entities Act 2004, and the Crown Entities Amendment Act 2013. It sets out the strategic intentions of the Health Research Council of New Zealand (HRC) over four years (2014-2018), the Government's expectations relating to HRC's performance and its operating environment. It also outlines the outcome framework and the measures that will be used to determine whether the HRC has been successful in achieving their strategic intentions.

The HRC strategic intentions are outlined under the four Outcomes set out in their outcome framework. They are:

1. new knowledge, solutions and innovations improve health;
2. the healthcare system is improved through research evidence and innovation;
3. the best clinicians and health researchers are supported and retained in New Zealand, and
4. the impact, responsiveness and uptake of health research is increased.

The HRC has applied key tenets of each outcome that are a particular focus for the HRC Board over the four years. They include:

1. investing in high-quality research that makes a difference;
2. creating economic gain through supporting innovation, pursuing opportunities that are unique and distinctive, and encouraging risk taking by research teams;
3. contributing to the health sector by improving the quality and efficiency of healthcare, and in particular, delivering value for money;
4. supporting emerging researchers and providing sustainable career paths for our top health research talent, and
5. improving the value and uptake of health research through partnership and collaboration, and better knowledge transfer.

### A.5.3. Funding operations and arrangements

The HRC allocates funding through an annual funding round for researcher initiated projects, Requests for Proposals, and a range of career development awards. The HRC currently supports health research and innovation funding through four arrangements. They are as follows:

1. **Researcher Initiated Proposals** - The majority of HRC funding is awarded through the annual contestable funding round to research ideas that are researcher initiated. A competitive process ensures that high quality and relevant research is supported across four Research Investment Streams, which include biomedical, clinical, public health, health services, Māori health and Pacific health research sectors.

The HRC uses a funding framework for the annual funding round and the HRC Gateway is the HRC's portal for funding applications, current research contracts' reporting, and peer reviews from invited experts. The funding framework has, as previously mentioned, four Research Investment Streams. These are described as follows:

- **Health and Wellbeing in New Zealand** - Keeping populations healthy and independent throughout life
- **Improving Outcomes for Acute and Chronic Conditions in New Zealand** - Improving outcomes for people with illness or injury
- **Rangahau Hauora Māori** - Supporting Māori health research that upholds rangatiratanga and uses and advances Māori health knowledge, resources and people
- **New Zealand Health Delivery** - Improving health and disability service delivery outcomes over the short-to-medium term.

The HRC does not fund research that is not relevant to health outcomes or which is primarily operational or management focused. The HRC has developed a common template for CVs, and other related applications material such as MOU, Peer Review Manuals and Contracts. The processes to manage the research effort/decision making processes are well defined and documented.

2. **Request for Proposals** - Requests for Proposals (RFPs) are calls for research in areas of strategic importance. They include, but are not limited to research that will contribute to an evidence-base for policy and planning. RFPs are released by the HRC as funding opportunities occur throughout the year. Examples are described below:
  - Breast Cancer Register 2018 Partnership
  - 2018 PHARMAC and HRC research partnership
  - Breast Cancer Research in New Zealand 2018 Partnership
  - The HRC-GACD mental health call
  - e-Asia Joint Research Programme
  - 2018 Primary Care models of care evaluation research
  - 2018 MSD-HRC research partnership
  - 2018 Precision Driven Health-HRC Postdoctoral Fellowship Partnership
  - 2018 NZ-China non-communicable diseases collaborative research.
3. **Career Development** – Career development awards help to foster the health research workforce in New Zealand. A range of awards is available to support the career development of emerging health researchers, including Māori and Pacific health researchers undertaking postgraduate qualifications. Examples are described below:
  - The Sir Charles Hercus Health Research Fellowship
  - Foxley Fellowship
  - Girdlers' New Zealand HRC Fellowship
  - Clinical Research Training Fellowship
  - Clinical Practitioner Research Fellowship
  - Māori Health Research Career Development Awards
  - Pacific Health Research Career Development Awards.
4. **Māori Health Research** - Māori health research is research that values Māori world views and builds Māori research capacity and leadership. Examples are described below:
  - Māori Health Research Summer Studentships
  - Rangahau Hauora Award
  - Māori Health Research Preventing and Minimising Gambling Harm Scholarships
  - Māori Health Research Masters Scholarships
  - Māori Health Research PhD Scholarships
  - Māori Health Research Postdoctoral Fellowships
  - Māori Health Research Emerging Leader Fellowship
  - Ngā Kanohi Kitea
  - Māori Health Research Development Grant
  - Māori Health Research Knowledge Translation Grant.
5. **Pacific Health Research** - The primary role of Pacific health research is to generate knowledge and understanding of Pacific peoples that will improve their health outcomes. Examples are described below:
  - Pacific Projects
  - Pacific Emerging Researcher First Grants

- Sir Thomas Davis Te Patu Kite Rangi Ariki Health Research Fellowship
- Pacific Health Research Preventing and Minimising Gambling Harm Scholarships
- Pacific Health Research Postdoctoral Fellowship
- Pacific Clinical Research Training Fellowship
- Pacific Health Research PhD Scholarships
- Pacific Health Research Masters Scholarship
- Pacific Health Research Summer Studentships
- Pacific Health Research Knowledge Translation Grant.

#### A.5.4. Key impacts

The majority of the HRC investment is mapped to four Research Investment Streams that have been designed to cover all areas of human health and development. A summary of the four RIS and the health and economic benefits that arise from the research supported is provided in Table A.1.

Table A.1: Health Research Council investment streams

Research Investment Stream (investment share)	Improved health outcomes	Economic benefits
<b>Health &amp; Wellbeing in New Zealand (30-35%)</b>	<ul style="list-style-type: none"> <li>• Keeping New Zealanders healthy, productive and independent</li> <li>• Prevention, risk reduction, and early intervention</li> </ul>	<ul style="list-style-type: none"> <li>• Decreasing demand and dependence on high-cost health services</li> <li>• Intervening early to reduce significant on-going healthcare costs</li> <li>• Improvements in health lead to increased productivity</li> </ul>
<b>Improving Outcomes for Acute and Chronic Conditions in New Zealand (35-40%)</b>	<ul style="list-style-type: none"> <li>• Better understanding, diagnosis and treatment of acute and chronic conditions</li> <li>• Rehabilitation, end-of-life care and patient self-management</li> <li>• Health technologies and therapies</li> </ul>	<ul style="list-style-type: none"> <li>• Reducing lives lost prematurely</li> <li>• Innovations that improve the quality and cost-effectiveness of healthcare</li> <li>• New products and processes with commercial value</li> </ul>
<b>Research for New Zealand Health Delivery (20%)</b>	<ul style="list-style-type: none"> <li>• Innovative, effective and cost-effective solutions for the health sector in the short- to medium-term</li> </ul>	<ul style="list-style-type: none"> <li>• Improving the quality, efficiency, cost-effectiveness and sustainability of healthcare delivery</li> </ul>
<b>Rangahau Hauora Māori (10%)</b>	<ul style="list-style-type: none"> <li>• Improving Māori health outcomes</li> <li>• Building capacity and capability of the workforce to address Māori health needs</li> </ul>	<ul style="list-style-type: none"> <li>• Improving health, independence and productivity</li> <li>• Increasing efficiency and effectiveness of healthcare delivery for Māori</li> <li>• Producing innovative solutions with commercial value</li> </ul>

Source: Health Research Council

## **A.6. Alberta Innovates - Canada**

### **A.6.1. Fund history and overview**

The Alberta Innovates (AI) system has been built on the research and innovation capabilities across the industry landscape. In relation to the medical research and innovation, the Alberta Heritage Foundation for Medical Research is included, and considered one of the legacy entities that formed the basis of the AI system.

The AI system was first created in January 2010, as part of an overall innovation framework developed within the Alberta Research and Innovation Act. At that time, four corporations were established. The four corporations were:

1. Bio Solutions
2. Energy and Environment Solutions
3. Health Solutions
4. Technology Futures.

From the 1 November 2016, the four corporations were consolidated into one AI and led to the development of a new corporate vision, mandate and values. The new 'Health Innovation' business line was introduced and designed to leverage Alberta's excellence in health research, a growing health technology sector, and unique, unified health delivery system strengths. These qualities would provide an opportunity for leadership in the scale and spread of health innovation, driving to better patient outcomes for Albertans and growth in the health technology economic sector.

There are three desired outcomes of AI – Health Innovation. They are as follows:

1. Increasing the development and adoption (within and beyond the Province) of novel service configurations and technologies to improve outcomes and efficiency of health care
2. Catalysing the strengths of Alberta's research and innovation system, entrepreneurs and unified Provincial health system to accelerate the growth of the life sciences and other health-related technology industry sectors in Alberta
3. Mobilising health data to improve patient care and enable outcomes listed above.

### **A.6.2. Governance and structure**

AI is a research and innovation corporation established by section 6.1(3) of the Alberta Research and Innovation Act. The object of AI is to support research and innovation activities aligned with Government of Alberta priorities including, without limitation, activities directed at discovery, commercialisation and application of knowledge.

The structure is typical of a corporation with a Board Chair representing the Board and its interests, as well as the interests of AI reporting to the Minister who as the representative of the Government of Alberta is responsible for the legislative, regulatory and policy frameworks in which the Corporation operates.

The Minister recommends to the Government of Alberta the appointment of the AI's Board of Directors, Chair and Vice Chair based on her/his assessment that the appointees have the appropriate knowledge, skills, competencies, experience, attributes and values to assist the AI in achieving its outcomes and performing its functions.

Reporting to the Board, the CEO leads the management of AI within the mandate, policies, standards and budget approved by the Board and in alignment with Government of Alberta policy or direction. This involves leading AI while making a significant impact on the Alberta research and innovation system.

The CEO and the AI Senior Management team work on a local, national and international level in developing innovative solutions towards achieving a socially acceptable, diversified, and prosperous economy for Alberta.

## Mandate

The mandate of AI is:

**Outcomes Oriented:** AI accelerates progress in research and innovation with a focus on commercialization, which is particularly aligned with Alberta's world-class strengths, contributing to tangible outcomes that offer value to Albertans, such as a more diversified economy, enhanced environmental performance and a healthier population.

**User-Driven and Responsive:** AI takes a responsive, market/user driven approach that enables Alberta's innovators across current and emerging sectors by providing a single-entry point to meet a range of needs such as:

1. Network/partners across the research and innovation continuum;
2. Funders;
3. Business/technical expertise and applied research services to de-risk and accelerate research and innovation to the next level for impactful application; and
4. Building capacity of Alberta's next generation of innovators.

**Collaborative:** AI catalyses coordinated approaches to drive outcomes through partnerships across all orders of government, the private sector (particularly entrepreneurs), academia and other research and innovation stakeholders.

**Strategic:** AI advises the Government of Alberta on its policy development, bringing innovation leadership, foresight and expertise to the Government of Alberta's overarching system strategy for research and innovation and programs, and leverages the Corporation's strategic partnerships across stakeholders and multiple Government of Alberta ministries.

**Transparent and Accountable:** AI will demonstrate and communicate the tangible value of public investment in innovation to Albertans, via success stories and performance measures.

### A.6.3. Funding operations and arrangements

AI currently supports health innovation funding through seven initiatives and partnerships. They are as follows:

1. **The Alberta SPOR SUPPORT Unit** - jointly funded by AI and the Canadian Institutes of Health Research and aims to support researchers conducting patient-centred research by providing access to health experts and knowledge in core areas of expertise
2. **A pProject Ethics Community Consensus Initiative (ARECCI)** - ARECCI helps practitioners, agencies and organizations identify and mitigate ethical risks in program evaluations, quality improvement projects, needs assessments, health innovations and knowledge translation. People assume that research studies pose ethical risks, but may not make the same assumption about quality improvement, program evaluation, needs assessment, and knowledge translation projects. However, the risks in these projects can be the same as those in research. The ARECCI framework helps project leads and teams address and mitigate these risks. ARECCI has created tools and resources as part of the initiative
3. **Alberta Clinical Research Consortium (ACRC)** – The ACRC aims to improve the efficiency of clinical health research in the province. It provides Albertans with access to the best and most innovative health care possible and attracts both researchers and investment to the province for the ultimate benefit of all Albertans. The ACRC is a collaborative effort which works with a number of partner organisations. It has a set of guiding principles (Collaboration, Best Practice, Simplification, Coordination and Accountability) and three strategic priorities:
  - i. **Making clinical health research in Alberta clear, simple transparent and efficient:** Improve the efficiency of clinical health research administrative processes across the province
  - ii. **Partnerships and participation in clinical health research:** Engage industry, funders, senior leaders, the public and community physicians to increase opportunities for Alberta clinical health researchers and patients

- iii. **Sustainable, integrated clinical health research:** Identify the enabling actions, assets, resources and infrastructure for sustainable, integrated clinical health research.
- 4. **Secondary Use Data Project (SDUP)** - The SDUP is a provincially led, multi-partner project to facilitate the enhanced and advanced use of secondary use health and social data for the health and socioeconomic benefit of Albertans. Five demonstration projects aim to examine Alberta’s capabilities and challenges related to secondary data access and use; findings from the projects will be used to determine the tools and expertise required to further improve Alberta’s use of secondary data
- 5. **Strategic Clinical Networks**
- 6. **Health Research Ethics** - AI is an important part of health research ethics in Alberta and helps to streamline health research ethics review by managing the Health Research Ethics Harmonisation initiative, plays a central role in developing and maintaining ARECCI and managing one of Alberta’s three Health Information Act-designated Research Ethics Boards
- 7. **Alberta Cancer Prevention (Legacy Fund).**

**A.6.4. Key impacts**

AI publishes impact highlights on an annual basis. An example is given in the figure below.

Figure A.1: Alberta Innovates impact highlights



Source: Alberta Innovates

## A.7. National Health Innovation Centre (NHIC) – Singapore

### A.7.1. Fund history and overview

The National Health Innovation Centre (NHIC), an initiative of Singapore’s National Medical Research Council (NMRC), provides the publicly-funded clinical research sector of Singapore with translational funding and strategic guidance to stimulate and support healthcare innovation.

Established in 2014, the fund aims to impact the clinical landscape by accelerating the development of innovative technologies and services to improve healthcare delivery and patient care. By promoting the collaboration of researchers, clinicians and industry, NHIC aims to better position Singapore to tackle the healthcare challenges of tomorrow.

NHIC funding is specifically aimed to expedite the translation of an innovation (by validating, de-risking or developing it) towards a market-ready product. Our three funding schemes are for projects which address an unmet healthcare need and have demonstrated ‘proof-of-principle’ supported by experimental data.

### A.7.2. Governance structure

#### Board

The NMRC Board advises the Council on the formulation of strategies and priorities to promote excellence in translational and clinical research in Singapore, with the objective of improving human health. By overseeing the implementation of the research programmes approved by MOH and the HBMS Executive Committee, the Board ensures that the Council is being effectively managed to meet its mission and key performance targets. The Board also ensures that governance frameworks are in place, such that NMRC’s budget is appropriately managed and optimally utilised. In FY16, the NMRC board consisted of 18 members.

Figure A- 1: NMRC Board structure



#### Mandate

In 2006, the Ministry of Health established a new mandate to support translational and clinical research in areas where Singapore has great potential. With this in mind, NMRC’s role is ever more important in the leading, promotion, co-ordinating and funding of medical research in Singapore.

NMRC-funded research has led to inter-disciplinary partnerships and international collaborations. It also evaluates the outcomes of the research projects and facilitates the commercialization of research findings.

Since its inception, it has built upon the medical research capabilities in Singapore through the funding of more than 1100 individual research projects and 13 national research programmes.

## **Objectives**

The NHIC's objective is to provide Singapore's clinical research sector with translational funding and strategic guidance to stimulate healthcare innovation and commercialisation.

### **A.7.3. Funding operations and arrangements**

NHIC has three funding streams which target different stages of the innovation development pipeline (early stage/ basic research is not eligible for funding). All proposals for funding must address intellectual property management, the commercialisation strategy and public health impact of the innovation. Collaborations with industry are encouraged if they strengthen the proposal. The three funding streams are as follows:

- Innovation to Protect (I2P)
- Innovation to Develop (I2D)
- Innovation to Implement (I2I)

#### **Innovation to Protect (I2P)**

This scheme funds IP protection expenses on patent applications only for innovations with significant healthcare and commercial potential.

Funding is considered if the application satisfies the following criteria:

- Strong patent position and IP protection strategy
- Detailed development plan, highlighting future project work, milestones, endpoints
- Detailed commercial plan outlining proposed route to market, healthcare impact, competing technologies and potential industry partners.

The funding support is applicable for the following patenting stages: First Filing, Conversion and prosecution, National Phase Entry and prosecution, Grant.

The funding quantum for a provisional patent filing is capped at S\$5,000 on a reimbursement basis. The funding quantum for conversion of patent application for PCT and National Phase Entry (NPE) with prosecution, is capped at S\$40,000. For National Phase Entry, the NHIC will fund a maximum of two countries and their cumulative office actions, not exceeding S\$20,000 per country.

#### **Innovation to Develop (I2D)**

This funding aims to fully validate the innovation via a deliverable development plan to a commercialisable endpoint. An application must clearly illustrate the technical feasibility of the project and demonstrate the potential for translation to a point where the technology would be attractive to a follow-on funder or industry partner.

Funding is considered if the application satisfies the following criteria:

- Strong intellectual property position
- Preliminary proof of-concept data in in vitro and/or in vivo research/laboratory models
- Clear and achievable commercial development plan, with the potential for revenue generation for the institution
- Detailed development plan highlighting future project work, milestones, endpoints
- Detailed commercial plan outlining proposed route to market, the unmet healthcare need, competing technologies and potential industry partners
- Would result in significant healthcare or services cost savings.

This category provides a funding quantum capped at S\$250,000 (inclusive of max. 20% indirect costs) which will be awarded to the lead institution, which can claim for but will also be responsible for reimbursing costs incurred by collaborating institutions and industry partners.

## Innovation to Implement (I2I)

Application to this fund is by NHIC invitation only. The scheme is for projects which have successfully completed I2D funding and which, in conjunction with a commercial partner, are ready to be implemented in the clinical setting. This fund provides up to S\$1 million for two years.

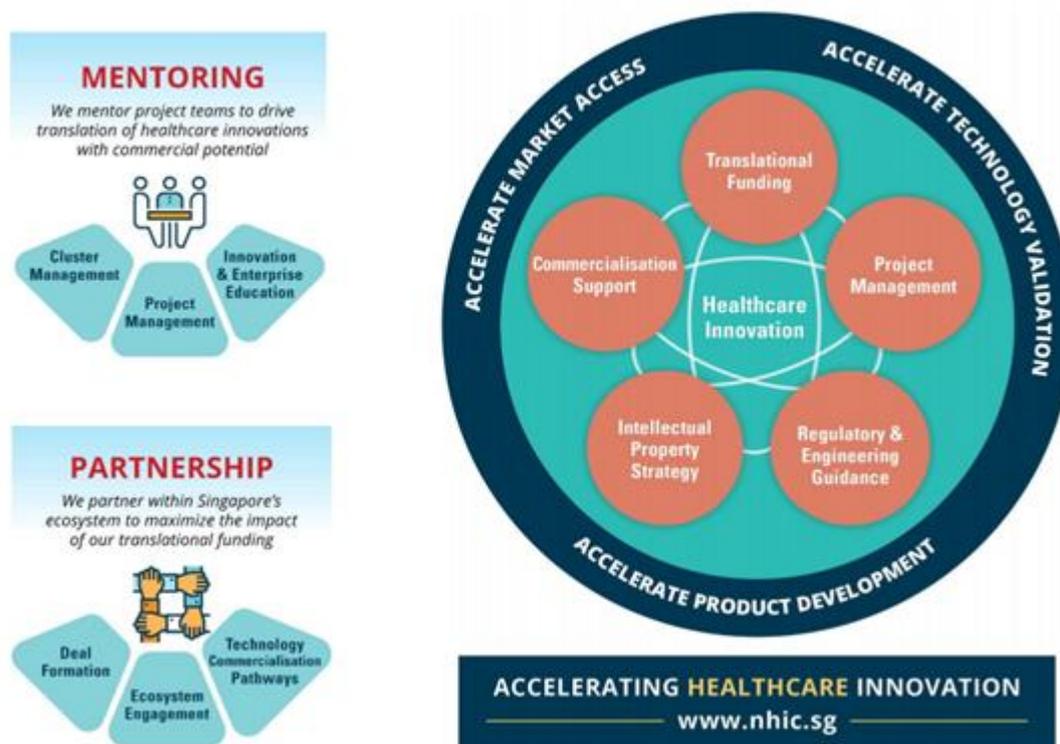
### A.7.4. Key impacts

The NHIC's key impacts are focused on supporting medical innovation, through the development of research and concepts into commercialised outcomes. Feasibility studies and pilot projects from Healthcare clusters are developed and accelerated through the NHIC's strategic pathway, generating the following three pathways:

- Startup Pathway
- Licensing Pathway
- Drug Discovery Pathway

The innovation journey is fostered via mentoring and partnership, driving the translation of healthcare innovations with commercial potential and maximising the impact of translational funding. The key overarching impact of the NHIC and its funding is accelerated healthcare innovation.

Figure A- 2: NHIC's support for the innovation lifecycle



Source: NHIC

## **A.8. Defence Advanced Research Projects Agency (DARPA) – United States of America**

### **A.8.1. Fund history and overview**

DARPA was established in 1958 with the objective of making pivotal investments in breakthrough technologies for national security. DARPA has an annual budget of over \$3.17 billion and is charged with the discovery of new phenomena and the exploration of the potential of such phenomena for defence applications. It supports the scientific study and experimentation that is the basis for more advanced knowledge and understanding in information, electronic, mathematical, computer, and materials sciences.

### **A.8.2. Governance structure**

#### **Relationship with Defence Department**

DARPA is an agency of the United States Department of Defence responsible for the development of emerging technologies for use by the military. Its research portfolio is managed into six technical offices charged with developing breakthrough technologies and a special projects section that is responsible for the transition of DARPA-funded technologies into Department of Defence capabilities.

All offices report to the DARPA Director, with leads heading up each of the offices. At the Agency level, the DARPA Director and Deputy Director approve each new program and review ongoing programs, while setting Agency-wide priorities and ensuring a balanced investment portfolio.

#### **Organisational structure**

DARPA comprises approximately 220 government employees across the six technical offices, including nearly 100 program managers, who together oversee about 250 research and development programs:

- **Biological Technologies Office** - DARPA's Biological Technologies Office develops capabilities that embrace the unique properties of biology—adaptation, replication, complexity—and use these features to revolutionize how the United States prepares and protects its citizens, Soldiers, Sailors, Airmen, and Marines from threats at home and abroad. Example new Department of Defence capabilities include the ability to counter novel bioterrorism, deploy innovative biological countermeasures to protect its forces, and accelerate war fighter readiness/overmatch for adversary threats
- **Defence Sciences Office** - DARPA's Defence Sciences Office (DSO) identifies and pursues high-risk, high-payoff research initiatives across a broad spectrum of science and engineering disciplines and transforms them into important, new game-changing technologies for U.S. national security. Current DSO themes include frontiers in math, computation and design, limits of sensing and sensors, complex social systems, and anticipating surprise. DSO relies on the greater scientific research community to help identify and explore ideas that could potentially revolutionize the state-of-the-art
- **Information Innovation Office** - I2O explores game-changing technologies in the fields of information science and software to anticipate and create rapid shifts in the complex national security landscape. Conflict can occur in traditional domains such as land, sea, air, and space, and in emerging domains such as cyber and other types of irregular warfare. I2O's research portfolio is focused on anticipating new modes of warfare in these emerging areas and developing the concepts and tools necessary to provide decisive advantage for the U.S. and its allies
- **Microsystems Technology Office** - Since its inception in 1991, DARPA's Microsystems Technology Office (MTO) has been working to create and prevent strategic surprise through investments in compact microelectronic components such as microprocessors, microelectromechanical systems (MEMS), and photonic devices. MTO-derived innovations and advanced capabilities in areas such as wide-band gap materials, phased-array radars, high-energy lasers, and infrared imaging have helped the United States establish and maintain technological superiority for more than two decades

- **Strategic Technology Office** - DARPA's Strategic Technology Office (STO) is focused on technologies that enable fighting as a network to increase military effectiveness, cost leverage, and adaptability
- **Tactical Technology Office** - The mission of DARPA/TTO is to provide or prevent strategic and tactical surprise with very high-payoff, high-risk development and demonstration of revolutionary new platforms in Ground Systems, Maritime (Surface and Undersea) Systems, Air Systems, and Space Systems.

DARPA goes to great lengths to identify, recruit and support excellent program managers—extraordinary individuals who are at the top of their fields and are hungry for the opportunity to push the limits of their disciplines.

These leaders come from academia, industry and government agencies for limited stints, generally three to five years. That deadline fuels the signature DARPA urgency to achieve success in less time than might be considered reasonable in a conventional setting.

Program managers address challenges broadly, spanning the spectrum from deep science to systems to capabilities, but ultimately they are driven by the desire to make a difference. They define their programs, set milestones, meet with their performers and assiduously track progress. But they are also constantly probing for the next big thing in their fields, communicating with leaders in the scientific and engineering community to identify new challenges and potential solutions.

Program managers report to DARPA's office directors and their deputies, who are responsible for charting their offices' technical directions, hiring program managers and overseeing program execution. The technical staff is also supported by experts in security, legal and contracting issues, finance, human resources and communications. These are the people who make it possible for program managers to achieve big things during their relatively short tenures.

DARPA benefits greatly from special statutory hiring authorities and alternative contracting vehicles that allow the Agency to take quick advantage of opportunities to advance its mission. These legislated capabilities have helped DARPA continue to execute its mission effectively.

### **A.8.3. Funding operations and arrangements**

DARPA's purpose is to support the development of emerging technologies for use by the military. It utilises a modest budget of US\$3 billion and generally undertakes short projects (three to five years). Many of its specific funding activities are confidential.

### **A.8.4. Key impacts**

- Trans-sector innovation:
  - Funding is allocated to a mix of university-based researchers, start-up firms, established firms and industry consortia as a means to advance ideas towards useable technology
  - Dedicated to knowledge sharing to drive innovation, and by utilising its funding networks, DARPA has increased the flow of knowledge between competing research groups, sharing 'dead ends' as well as business brokering.
- Fostering and developing talent:
  - The infinite nature of projects and their variety attracts top talent and creates an intense, sharp focused environment that inspires collaboration and innovation.

## **A.9. Health Innovation, Investment and Research Office (HIIRO) - Australia**

### **A.9.1. Fund history and overview**

Queensland Health created the Health Innovation, Investment and Research Office (HIIRO) in August 2016. It sits within the Director-General's office to support a coordinated approach to innovation, investment and research across Queensland Health.

HIIRO provides a strategic framework for research, investment and innovation activities to ensure Queensland Health is positioned to meet the State's current and future healthcare needs, create and maintain jobs, boost the State's economy and improve patient outcomes. HIIRO focuses on three priority areas to strengthen Queensland's approach to health and medical research and innovation by:

- **Trade and investment**
  - Harnessing and developing capabilities in Queensland's health sector, attracting investment and promoting health services and product exports, in partnership with Queensland's Department of State Development, Manufacturing, Infrastructure and Planning, Department of Environment and Science, and Trade and Investment Queensland
  - Initiating international engagement programs for Queensland's health sector which enable export and investment activities.
- **Research**
  - Managing research grants and fellowships that leverage co-investment and build individual and institutional capacity to address priority health issues for Queenslanders
  - Promoting the translation of research into improved practice and technologies at scale, including through clinical trials and commercialisation.
- **Clinical trials, research ethics and governance**
  - Providing a central point of contact for researchers, research managers and study sponsors seeking advice and direction on ethical and governance issues associated with research and clinical trials
  - Managing a robust research ethics and governance framework that ensures patient safety, while streamlining administrative and regulatory burdens.

### **A.9.2. Governance structure**

As previously outlined, HIIRO sits within the Office of the Director-General of Queensland Health. It is not clear if a permanent and independent board is responsible for the governance of the HIIRO. However, it is understood that from time to time, the HIIRO convenes advisory committees to assist with their functional responsibilities.

For example, in relation to the Queensland Advancing Health Research 2026 initiative, the Department of Health (via HIIRO) will lead the implementation planning process for the strategy. An advisory committee comprising representatives of relevant partners will be established to help guide this process and provide input to assist the Department.

### **A.9.3. Funding operations and arrangements**

Queensland Health (via HIIRO) manages two Advance Queensland programs:

- The Queensland Genomics Health Alliance - \$25 million over five years
- Integrated Care Innovation Fund - \$35 million investment in partnerships between Hospitals, Health Services and Primary Health Networks.

HIIRO also manages funding for:

- **Junior Doctor Research Fellowships** - Funding of up to \$250,000 available for junior doctors to advance their research skills and develop their research potential under the mentorship and supervision of experienced researchers

- **Nursing & Midwifery Research Fellowships** - The Nursing and Midwifery Research Fellowships enables nurses and midwives to improve health outcomes for Queenslanders through research that enhances the value of the professions through discipline specific research
- **Physiotherapy Research Fellowships** - The Physiotherapy Research Fellowships aim to improve and enhance the practice of the physiotherapy profession in Queensland in the interests of the health and safety of consumers
- **Health Practitioner Research Scheme** - The Health Practitioner Research Scheme is open to all professionals covered by the Health Practitioners' (Queensland Health) Certified Agreement (No. 2) 2011. It is a peer reviewed, merit based scheme, annually awarding funds to build research capacity within the health practitioner professions.

The HIIRO also supports a single ethics review process across all QLD Health Sites including coordination of HREC applications and supporting HREC committees, IP management and manages the Database of Research Activity.

#### **A.9.4. Key impacts**

HIIRO manages the funding of research fellowships which are aligned to the Queensland Government's research priorities. This has built the research talent pipeline for the State.

To support the integration of translational research into the Queensland health system the Advancing Health Research 2026 initiative was developed. This plan was designed to guide Queensland Health's research investment decisions and actions to achieve the vision of healthier Queenslanders through research-informed healthcare.

## **A.10. Biomedical Catalyst (BMC) – United Kingdom**

### **A.10.1. Fund history and overview**

Established in 2012 as part of a wider package of measures to support the life sciences sector, the Biomedical Catalyst involves funding for target three related objectives:

- Deliver growth to the UK life sciences sector
- Deliver innovative life sciences products and services more quickly and more effectively into healthcare
- Provide support to both academically and commercially led research and development in a seamless, effective and efficient manner.

Delivered in partnership between the Medical Research Council and Innovate UK the scheme offers funding to life sciences projects at varying stages of technical and commercial development: Confidence-In-Concept (CiC) awards for portfolios of small projects at the earliest stages of technical development by academic institutions, Feasibility awards (comparable in focus to the CiC awards, but awarded on a firm-by-firm basis by Innovate UK), and more substantial funding for pre-clinical and clinical work through the early and late-stage awards (funding is available up to a Phase II clinical trial or equivalent).

The BMC aims to de-risk innovative science and commercialise ideas arising out of academia and industry helping UK SMEs to develop into competitive and sustainable organisations. This accelerates the progress of novel products to market, facilitates onward investment and bridges “the valley of death”.

Since BMC launched in April 2012, the scheme has awarded more than £250m funding, matched by ~£150m of private finance, to over 300 projects seeking to develop a wide range of therapies, diagnostics and devices.

### **A.10.2. Governance structure**

#### **Delivery process**

As previously mentioned, the BMC programme is delivered jointly by the Medical Research Council and Innovate UK. The former administers grants for translation projects led by academic institutions, while the latter administers grants for R&D projects originating from SMEs.

Funding for the programmes originates from two separate Directorates of the Department for Business, Innovation and Skills (the Science and Innovation directorates respectively) and is not pooled for the purposes of the delivery of the programme (i.e. the Medical Research Council and Innovate UK are accountable for separate budgets).

#### **Organisational structure**

Both Innovate UK and the Medical Research Council maintain a programme secretariat responsible for the design and co-ordination of funding competitions, of which two to three have been delivered each year. Funding for each round is based on projections for the necessary spend required as dictated by the (annual) budget allocation and take into account any over or underspend from earlier rounds (in each round, funds will be committed to individual projects over a number of years, though individual projects may spend those funds more or less rapidly than originally anticipated). As the Major Awards Committee is a shared process across Innovate UK and the Medical Research Council, and panel sessions can last up to three days, dates for these sessions are agreed between the two organisations well in advance.

#### **Objectives**

As previously outlined, the BMC targets three related objectives for funding:

- Deliver growth to the UK life sciences sector
- Deliver innovative life sciences products and services more quickly and more effectively into healthcare

- Provide support to both academically and commercially led research and development in a seamless, effective and efficient manner.

### **A.10.3. Funding operations and arrangements**

In broad terms, the programme is delivered as a funding competition (which will have involved eight rounds by the end of 2014/15) in which academics and SMEs submit applications for grant funding to the Medical Research Council or Innovate UK respectively. Processes to allocate resources are broadly similar across the two organisations. Applications are appraised by external experts, with Early and Late Stage applications given detailed consideration by project selection panels. Only one process is formally shared across the two organisations which makes recommendations for funding decisions with respect to the Early and Late Stage strands of the Innovate UK programme and scores applications for Late Stage awards to the Medical Research Council.

Both Innovate UK and the Medical Research Council undertake a range of marketing activity both as part of the specific funding round and on an on-going basis, to promote the Biomedical Catalyst programme. The primary objective of these processes is to secure a pool of high-quality applications from which to make funding decisions. However, as highlighted in the preceding section, there is a secondary goal to produce effects on the funding landscape (through raising awareness and confidence amongst the investment community).

### **A.10.4. Key impacts**

The Biomedical Catalyst programme was evaluated in terms of process and impact in January 2016.<sup>18</sup>

The following process evaluation findings were categorised into the five areas of marketing and communication, application, assessment, project selection and due diligence and monitoring.

- **Marketing and communication** - The evaluation showed that the programme has been well communicated and largely effective in raising awareness across the communities of interest. The Medical Research Council built on an existing programme and established communication channels. Innovate UK communicated with subsets of relevant sectors through a number of industry associations. There is an opportunity however to better develop the Biomedical Catalyst brand and highlight the two distinct routes for industry and academic-led projects, as well as to target some specific groups (med -tech companies and universities without medical schools)
- **Application** - Applicants found the process of applying and submitting the application forms relatively straightforward. It may help to improve the quality of the assessments from firms if the Innovate UK application form highlights the opportunity for applicants to include a scientific annex offering further detail
- **Assessment** - The assessment processes are well set up by Innovate UK and the Medical Research Council but the limited pool of assessors of Innovate UK results in a perceived variability in the quality of the judgements made on applications. Feedback to applicants is seen as an important part of the process and both the Medical Research Council and Innovate UK make strong efforts to give constructive feedback to applicants in both stages of the two stage process
- **Project selection** - Is performed by panels made up of highly regarded and experienced individuals from the fields of science, business, and venture capital, who are well placed to judge the scientific and commercial potential of the projects. Panels scrutinise details behind the science and proposed method and the study team is confident in their technical ability to select the applications with highest potential for the pull through of academic research. Supporting the growth of the sector by responding to market failures is considered to some extent, but this appears to be a less prominent factor in the decision making process. Concern was also expressed by a number of stakeholders that the panels'

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<sup>18</sup> Biomedical Catalyst Evaluation: Process Evaluation and Baseline Impact Evaluation  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/600023/Biomedical\\_Catalyst\\_Baseline\\_Evaluation\\_Report.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/600023/Biomedical_Catalyst_Baseline_Evaluation_Report.pdf)

expectations around applicants' ability to have tested the science behind their ideas may have made the panel selection processes more risk averse than necessary. There may also be scope for Innovate UK to better help industry applicants to prepare for the panel

- **Due diligence and monitoring** - Both organisations, the Medical Research Council and Innovate UK, use standard contracting, due diligence and monitoring processes. The focus of Innovate UK on project management and monitoring relates to the applicant's self-written project plan. The Medical Research Council operates a milestone driven monitoring process in which the milestones are often set by the panel and have scientific outputs that form gateways to progress to the next project phase (such as substance particular test score for an assay). Each of the approaches has pros and cons. Aggregated performance management in the Medical Research Council is organised by regular meetings revisiting live projects on a red, amber green (RAG) rating of each specific milestone. Innovate UK's approach is more pragmatic, also following quarterly monitoring meetings, but focusing on escalating any issues to the Lead Technologist as and when they arise. The differences between Medical Research Council and Innovate UK processes partly reflect differences in the organisations' focus and their key audiences. There may be scope nevertheless to incorporate additional scrutiny of scientific progress into Innovate UK processes.

The following impact evaluation findings were categorised into the eight focus areas of progress, research and development relating to the project, broader research and development, funding, collaboration, research output, turnover and employment.

- **Progress** - The projects funded through the Biomedical Catalyst have shown progress since notification of the award, with the proportion at the clinical trials stage doubling from 14 to 28 per cent and similar progression observed from exploratory stages to in-vitro and in-vivo experiments (or equivalents). The progress made was also more rapid than that observed amongst unsuccessful applicants.
- **Research and development activity relating to the project** - Successful applicants saw R&D expenditure relating to the project rise faster in absolute terms than unsuccessful applicants. However, R&D expenditure relating to the project rose faster in percentage terms amongst unsuccessful applicants. This is partly explained by the lower base from which unsuccessful applicants were starting.
- **Broader research and development** - Similar patterns were observed for total annual R&D expenditure, which rose at a slower rate than expenditure on the project forming the focus of the Biomedical Catalyst application. This suggests that both successful and unsuccessful applicants have undergone a process of diverting resources away from other areas to focus on these projects.
- **Funding** - Successful applicants had attracted higher levels of funding from private or public sources than unsuccessful applicants at the time of their application, and appear to have had greater success in securing additional funds following the award (though not necessarily in connection with the project).
- **Collaboration** - The survey did not provide substantial evidence to suggest that the Biomedical Catalyst has had a large effect on collaboration to date. Successful applicants to the fund were less likely than unsuccessful applicants to report that they engaged in collaborative relationships to deliver projects. Approximately half of both successful and unsuccessful applicants suggested that they had formed novel collaborative relationships (suggesting that funding may not have caused the formation of new relationships, though it is possible that this was an effect of the process of developing applications). There was, however, a suggestion that the new collaborative relationships formed by successful applicants were potentially more productive than those formed by their unsuccessful counterparts.
- **Research output** - Successful applicants were less likely to have produced research outputs (in the form of conference papers, presentations of results at conferences or events, or journal articles) to disseminate their research than unsuccessful applicants. This could be indicative of commercial secrecy an unwillingness to publish until patents have been registered, or could reflect that the delivery of the Biomedical Catalyst award is diverting attention away from these activities.

- **Turnover** - The turnover of successful firms rose more rapidly than that of unsuccessful applicants, though for the majority, annual sales were zero at both the time of the application and the survey. It is difficult to link this result to Biomedical Catalyst funding, as so few had brought a product to market, though there were indications that some applicants had been able to secure licensing agreements which may be contributing to the changes observed.
- **Employment** - Total employment rose more rapidly amongst successful applicants than unsuccessful applicants, though at a similar order of magnitude as R&D employment. This suggests that any jobs created to date are likely to be associated with the implementation of R&D projects rather than production, and it is not anticipated that the Biomedical Catalyst will have had any wider effects on output beyond the wages received by R&D staff, or productivity at this early stage (which aligns with prior expectations).

## **A.11. Wellcome Trust – United Kingdom**

### **A.11.1. Fund history and overview**

The Wellcome Trust is an independent global charitable foundation dedicated to improving health in London, United Kingdom. It was established in 1936 with legacies from the pharmaceutical magnate Sir Henry Wellcome to fund research to improve human and animal health.

It has an endowment of £23.2 billion (2017) making it the second wealthiest charitable foundation in the world, after the Bill & Melinda Gates Foundation.

The objectives of the Wellcome Trust (as detailed in the foundation's constitution), are:

- To protect, preserve and advance all or any aspects of the health and welfare of humankind and to advance and promote knowledge and education by engaging in, encouraging and supporting:
  - Research into any of the biosciences
  - The discovery, invention, improvement, development and application of treatments, cures, diagnostics, and other medicinal agents, methods and processes that may in any way relieve illness, disease, disability or disorders of whatever nature in human beings or animal or plant life.
- To advance and promote knowledge and education by engaging in, encouraging and supporting:
  - Research into the history of any of the biosciences
  - The study and understanding of any of the biosciences or the history of any of the biosciences.

### **A.11.2. Governance structure**

#### **Organisational structure**

As previously mentioned, The Wellcome Trust is an independent global charitable trust. It was created in 1936 by the will of Sir Henry Wellcome and is now governed by its Constitution, which was established in February 2001 by a scheme of the Charity Commission and has been subsequently amended.

The Wellcome Trust is a charity registered in England and Wales (registration number 210183) under the Charities Act 2011. The Wellcome Trust Group comprises the Trust and its subsidiary undertakings.

#### **The Trust and Board of Governors**

The Wellcome Trust is governed by its memorandum and articles of association. The Trust's directors (known as Governors), the Company Secretary, the Executive Leadership Team and other administrative units comprise the organisational and governance structure of the entity.

The Board of Governors sets strategy, decides priorities, maintains a framework for accountability, allocates budgets, makes strategic funding decisions and monitors progress.

Members of the Board of Governors are distinguished in the fields of medicine, science, business and policy. The Board considers each of the Governors to be independent in character and judgement and manages any relationships or circumstances that are likely to affect, or could appear to affect, the Governors' judgement. Governors are appointed for terms of four years, with an extension of three years on mutual agreement, and a further three-year term in exceptional circumstances. The Wellcome Trust undertakes a comprehensive induction programme for all new Governors and training is also available as required.

#### **Executive Leadership Team (ELT)**

The ELT, chaired by the Wellcome Trust's Director (the equivalent of a CEO), reports directly to the Board of Governors. It is responsible for the day-to-day management of the Wellcome Trust's operations and provides advice to the Governors and the Director with regard to strategy,

planning, operational or policy matters, the delivery of objectives and issues arising from the specific functional areas for which its members are responsible.

It provides leadership across the organisation in support of the overall direction given by the Director and ensures that the vision and strategic objectives of Wellcome, which have been agreed with the Governors, are disseminated and all necessary actions taken to uphold the vision and deliver the objectives.

An Operational Sub-Group of the ELT was created in 2017. Other than for certain key governance areas and matters having a material impact, this group has the full delegated authority of ELT in relation to all operational matters affecting the Wellcome Trust, and implementing policy agreed by the Board of Governors or ELT in relation to them.

### **Strategic framework**

The Wellcome Trust has set out their strategy to benefit people by improving health through three complementary approaches across science, research and engagement with society. This framework allows the Wellcome Trust to adapt as new ideas and challenges arise, drawing on insights from past achievements and utilising their comprehensive network of experts.

The three strategic areas related for funding are:

- **Advancing ideas** – Support research that continues to address fundamental contemporary health challenges, across discovery science, medical innovation, and the humanities and social sciences. Provide grants to people and teams, and for places and resources, as well as providing seed funding, through a set of funding schemes. Includes supporting researchers at the start of a career and at every stage that follows, as well as creative people, teachers and others who have ideas and experience in health and science matters. Develop leaders and advocate policy change and adapt funding support quickly and flexibly, to meet fresh needs at times of unexpected opportunity or challenge
- **Seizing opportunities** – Identify times when concerted intervention can accelerate progress towards better health. We do this by providing focused, intensive support that creates a step change over five to ten years. Recognise the potential in connecting people that the Wellcome Trust supports, and stimulate a new field of endeavour, or invest in new technology that drives discovery. Create connections with experts from different research disciplines, build partnerships, and lead advocacy, policy development, communications and public engagement. The Wellcome Trust acknowledges that the challenges chosen for funding are often tough and complex and not every effort will succeed. But those that do will transform lives. The Wellcome Trust identified the following priority areas:
  - drug-resistant infections
  - Our Planet, Our Health
  - research ecosystems in Africa and Asia
  - vaccines.
- **Driving reform** – Identify and recognise practices that enable ideas to reach their full potential and address barriers that stand in the way. The Wellcome Trust supports funding for key reforms associated with open access to research results, public engagement, and research careers in order to challenge ways of working, and to propose better alternatives. The Wellcome Trust identified the following priority areas:
  - diversity and inclusion
  - improving science education.

#### **A.11.3. Funding operations and arrangements**

The Wellcome Trust takes advice and recommendations from committees of subject-matter experts and peer reviewers to make funding decisions on grant applications. Individual members of the Board of Governors may, in various circumstances, sit on committees as members or observers.

The Board of Governors relies on the assistance of external experts to make funding decisions across the Wellcome Trust's funding remit. The external experts act as members of the Wellcome Trust's advisory committees and provide written peer reviews as required.

The Wellcome Trust has established its grant making policy to support its status as a public benefit entity. It considers and funds a large number of grants and awards for its core activities through a wide portfolio of funding schemes. The scheme categories are: Biomedical science research, Population health research, Product development and applied research, Humanities and social science, and Public engagement and creative industries.

All applications are reviewed to ensure that they will be supported by adequate and appropriate resources and are used only for grant activities. Grants are generally subject to requirements to submit progress reports during the grant period and an end of grant report within three months of the end of the grant period. In addition to the grants for the core activities, the Wellcome Trust provides funding for 'priority areas'. Areas for this funding are sought to respond to the Wellcome Trust's mission and primarily Wellcome Trust led. Levels of funding are determined through the scoping, development and implementation stages.

Historically, the Wellcome Trust has provided capital funding for large scale project to universities across the UK, with the intent to facilitate internationally competitive, leading edge biomedical research.

#### **A.11.4. Key impacts**

- **Fostering and developing talent** – The Wellcome Trust actively supports new talent through initiatives such as the Investigator awards and Early Research fellowships, as well as ongoing training programs open to all Wellcome Trust funded researchers. The Wellcome Trust recognises the need for researchers to positively engage with the public. To support more successful public engagement, the Wellcome Trust supports their researcher through public engagement funding, advice and training opportunities
- **Independent governance** – The Wellcome Trust utilises milestone payments, which enables them to undertake performance related funding, ensuring the right projects are funded and supported
- **Complementary funding** – The Wellcome Trust funds a number of schemes that include funding for: collaborative research teams, seed funding, centres of excellence and resources. The variety in the funding themes enables the Wellcome Trust to support excellent, innovative research with the right scheme whatever the idea or career stage.

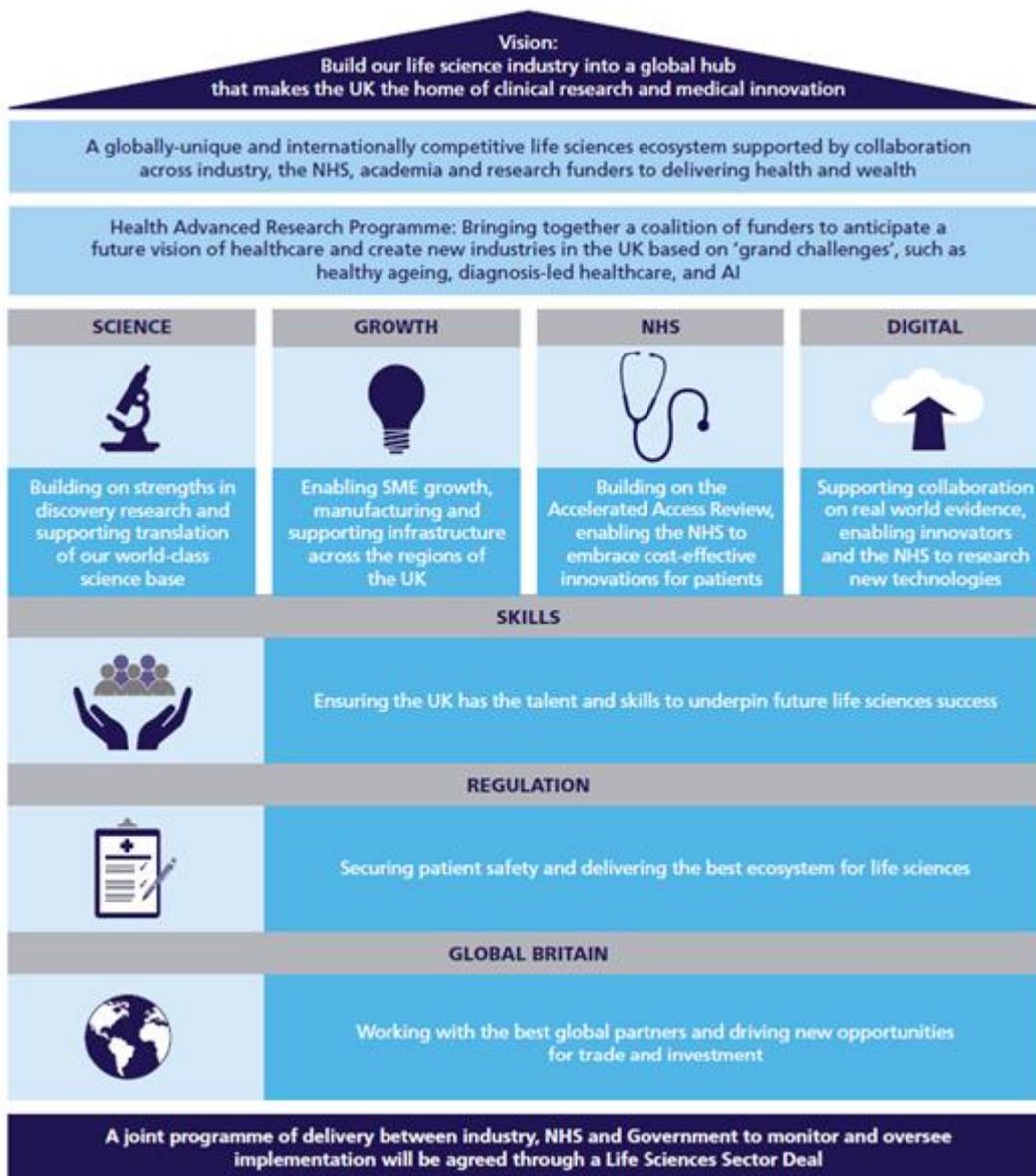
## A.12. Life Sciences Industrial Strategy (LSIS) / Industrial Challenge Fund – United Kingdom

### A.12.1. Fund history and overview

Professor Sir John Bell was commissioned by the UK government to commence work on the LSIS in 2016. A Life Sciences Industrial Strategy Board was established to inform the development of the LSIS which contained relevant company, charity, learned society, trade association, academic and NHS representation

The LSIS was designed to address 21st century health challenges for example, focusing on 'moonshots' to transform healthcare and reinforce the UK's position in the global LS industrial sector. The below infographic outlines the key aspects of the LSIS.

Figure A- 3: Overview of the LSIS



Source: LSIS

### A.12.2. Strategic framework

The LSIS aspires to put the UK in a world-leading position to take advantage of the medical trends of the next 20 years through the establishment of the Health Advanced Research Programme (HARP). Taking inspiration from the DARPA model (the part of the US Department of Defence responsible for the development of emerging technologies for use by the military), four areas are identified as potential areas of focus for HARP:

- Genomics in medicine
- Creating a platform for developing effective diagnostics for early, asymptomatic chronic disease
- Digitisation and artificial intelligence to transform pathology and imaging
- Healthy Ageing, a commercial opportunity.

### A.12.3. Funding operations and arrangements

The LSIS recommended the establishment of the Healthcare Advanced Research Program (HARP), a programme through which industries, charities and the NHS can collaborate on ambitious and long-term UK-based projects to transform healthcare and take advantage of the medical trends of the next 20 years. Alongside the LSIS, the UK government also announced a £146 million funding package as part of the government's Industrial Strategy Challenge Fund. Investments announced were:

- **Medicines Manufacturing Innovation Centre:** A £13 million competition to establish a new centre, in partnership with industry, that will accelerate the adoption of emerging and novel manufacturing technologies
- **Vaccines Development and Manufacturing Centre:** To develop and manufacture vaccines for clinical trials and prepare for emergency epidemic threats, government is investing £66 million in a new centre of excellence
- **Advanced Therapies Treatment Centre:** A £30 million investment in 3 new sites will help establish a network of centres, based in hospitals, that will transform the UK's ability to develop and deliver cell and gene therapies to a large number of patients
- **Expanding the Cell and Gene Therapy Manufacturing Centre:** Enhancing the UK's offer in the fast-moving field of cell and gene therapy by investing £12 million in doubling the capacity of the Cell and Gene Therapy Centre in Stevenage
- **Research and Development to support innovation at the manufacturing centres:** Through a new collaborative scheme, the government is investing £25 million to support SMEs working in this sector and boost innovation. The first £15 million of the £25 million investment cited above will be made available through a new Innovate UK medicines manufacturing funding competition. £14 million of funding was also announced to support 11 medical technology research centres to encourage collaboration between the National Health Service and industry in developing and bringing new technologies to patients through the National Institute for Health Research.

### A.12.4. Key impacts

- **Trans-sector innovation** – The Fund works with a wide ecosystem including charities, universities, industry and government to identify potential funding gaps in areas of unmet patient need. The Fund is structured to achieve ambitious goals, by focusing on 'frontier science' solutions to address long running issues and to leverage breakthroughs across sectors.
- **Independent governance** – To ensure the funding of 'moon-shot' projects in areas of unmet need, the Fund ensures a high degree of autonomy in selecting, initiating, assessing and suspending projects to ensure flexibility and variety in the projects it funds. As part of selection criteria for the Fund a number of attributes are considered fundamental to a successful application, these include; cross discipline backgrounds, high risk appetite, intelligence openness and demonstrating new ways of thinking to address future health challenges.

## **A.13. NSW Office for Health and Medical Research - Australia**

### **A.13.1. Fund history and overview**

The Office for Health and Medical Research (OHMR) was established by the NSW State Government in response to the *NSW Health and Medical Research Strategic Review 2012*. While the State Government already funded health and medical research in the order of \$200 million per annum, the review revealed significant gaps and highlighted the lack of strategic coordination of the State's HMR activities.

The OHMR was set up to support and coordinate the implementation of the '10 Year Health and Medical Research Plan', with an initial budget of \$70 million for new HMR programs for the first four years followed by \$159 million (including \$70 million for capital works) for the subsequent four years.

The OHMR works with and across other State Government agencies to implement the HMR strategy, with four main objectives:

- Improving State-wide capacity to deliver world class health and medical research through the provision of funding for research infrastructure
- Supporting investment in the development and commercialisation of medical devices and related technologies
- Fostering the generation of high quality research and evaluation by funding and administering grants programs and reforming research ethics and governance pre-approvals
- Strengthening the research workforce through training programs for early-mid career researchers.

### **A.13.2. Governance structure**

The OHMR is an office within the Chief Health Officer function in the NSW Ministry of Health. Officials within the OHMR are responsible for the disbursement and monitoring of grant funding, drawing on external reviewers to assess individual applications for funding. Decision-making rests with the Ministry of Health.

The OHMR administers the NSW Medical Devices Fund (MDF), and provides medical devices commercialisation training and support to researchers and innovators in partnership with Cicada Innovations. MDF funding is made on the basis of recommendations from an independent expert group.

### **A.13.3. Funding operations and arrangements**

The OHMR administers a range of funding programs and grant schemes, including:

- Medical Devices Fund, \$8 million per annum
- PhD scholarships, \$500,000 per annum
- Sponsorship for HMR events held in NSW, \$100,000 per annum
- Translational research grants, between \$6 and \$7 million per annum
- Early-mid career fellowships, \$3 million per annum
- Medical Research Support Program (MRSP, similar to WA's MHRIF) varies year to year.

NSW Health has invested in a State-wide biobank service, the first and largest facility of its kind in the southern hemisphere, that uses large-scale robotic technology to store and process millions of bio-specimens for world-class health and medical research. This service, along with the eHealth Strategy for NSW Health, the NSW Health Analytics Framework and the Centre for Health Record Linkage in NSW that links data from NSW and the ACT is positioning NSW as a leader in data linkage and precision medicine. To capitalise on this investment, the OHMR is also implementing an Early Phase Clinical Trials Framework for NSW to benefit patients, industry, the health system and researchers.

Applications for MDF funding are online and occur in three stages, the first of which is a self-assessment that filters applications on matters such as competitiveness and technology-readiness.

#### **A.13.4. Key impacts**

The OHMR's partnership with Cicada Innovations has allowed NSW medical researchers and innovators to access medical device commercialisation training free of charge. Since 2014, this partnership and funding support provided through the NSW Medical Devices Fund has resulted in 50 graduates launching 12 companies and raising approximately \$20 million to commercialise their ideas.

Through the OHMR, NSW Health has invested significantly and strategically in world class enablers, including the State-wide biobank service and advances in ehealth and data linkage capability. The OHMR is a strong example of a State Government developing a dedicated office to develop and implement a State-wide HMR strategy.

## A.14. Health Industries South Australia - Australia

### A.14.1. Fund history and overview

Following an assessment of SA's innovation ecosystem and government support programs in 2016, a number of core issues were identified, namely:

- **Government Administration and Policy** - Government not having a co-ordinated and integrated approach to developing, implementing and managing innovation policies and programs;
- **Entrepreneurial Activity and Capability** - Whilst there is a reasonable amount of entrepreneurial activity in South Australia very little of it is was being conducted at scale or in a collaborative manner; and
- **Investment** – A financing gap existed in South Australia for early stage companies. The financing gap was defined as the gap between the funding requirements of companies that ought to receive investment and the amount of investment available for those companies.

In response to this the SA Government launched a number of initiatives including:

- The \$10m South Australian Early Commercialisation Fund providing grants up to \$500,000.
- The \$50m South Australian Venture Capital Fund focused on post Phase 1 biotech.
- Innovation in SA supporting programs similar to Advance QLD across areas of strength.
- Investment Attraction South Australia which provides financial incentives for innovative projects and business to base themselves in SA.

As part of the SA Government's efforts to grow the development of the health and life sciences sector, the Health Industries South Australia (HISA) was formed in 2014. It acts as a single point of contact for health and life sciences companies investing in Adelaide, and is staffed by business professionals, with experience in areas such as pharmaceuticals, biotech and medical devices.

The HISA provides advice on government regulations, help accessing land and introductions to the local life sciences community, from education and research through to venture capital and industry. The specific purpose of HISA is to facilitate South Australia's economic growth, create jobs, stimulate exports and attract inbound investment in the health and related sectors.

### A.14.2. Governance structure

The HISA is a stand-alone agency of the SA Government. Its structure comprises an Advisory Board with a management team (led by a Chief Executive) in place to deliver on the following core functions:

The five core functions are as follows:

- **Provide a single point of access** for investors and industry partners to the South Australian Health and Biomedical Precinct and broader health sector, to streamline activities across government departments and to facilitate introductions to decision makers and other leaders within South Australia
- **Leverage South Australia's inherent strengths across health and other related sectors** to build and develop globally competitive, innovative teams to address worldwide market opportunities
- **Provide unified marketing and communications strategies** highlighting the strengths of the state's health and related sectors to state based, national and international audiences
- **Create a positive business environment in South Australia** by advocating for regulatory and governance reform
- **Support existing health and related sectors** and key individuals by providing exposure to worldwide innovators and markets to increase opportunities for business growth.

HISA is assisted by an Advisory Board comprising key business leaders with local, national and international experience. It is essentially tasked to provide high level strategy and policy advice for developing South Australia's life sciences sector and advises the State Government in the formulation of strategies, policies and programs to grow the health and biomedical industries.

The management team comprises a Chief Executive (with Executive Support), Business Development Manager, Business Development Officer, Marketing and Communications Manager and Corporate and Government Relations Officer.

#### **A.14.3. Funding operations and arrangements**

Besides the previously outlined SA government funding programs such as the SA Early Commercialisation Fund and the SA Venture Capital Fund, the HISA appears to focus on the benefits of using the R&D Tax Incentive (which is an Australian Government initiative jointly managed by AusIndustry and the Australian Taxation Office) to invest in SA/ Adelaide. The R&D Tax incentive provides a cash reimbursement of up to 43.5% of R&D costs to eligible companies with an aggregated annual turnover of less than \$20 million.

#### **A.14.4. Key impacts**

HISA provides a single point of coordination for industry to work with the SA government and access programs such as the \$10m South Australian Early Commercialisation Fund providing grants up to \$500,000, and the \$50m South Australian Venture Capital Fund focused on post Phase 1 biotech.

As HISA is the South Australian Government agency helping life sciences companies expand in Adelaide, it has a sector focus on Clinical Trials, MedTech, Digital healthcare, Pharma and Biotech, Nutraceuticals and Chinese Medicine.

HISA is staffed by a team of business professionals and provides advice on regulations, government grants, and access to land.

## A.15. National Institute for Health Research – United Kingdom

### A.15.1. Fund history and overview

Prior to the establishment of the National Institute for Health Research (NIHR) in 2006, National Health Service (NHS) patient-based research was conducted and funded through a range of ad-hoc funding programmes and schemes managed by the Department of Health and Social Care. Whilst these programs and schemes significantly advanced health research, a range of reviews and reports on health research carried out in the 1990s and early 2000s indicated critical challenges to the health research environment in the UK.

In response to these reviews and reports and after a national consultation undertaken in 2005, the Government embarked on a health research strategy and subsequently created the NIHR with its vision to 'improve the health and wealth of the nation through research'.

The NIHR funds health research and translates discoveries into practical products, treatments, devices and procedures, involving patients and the public.

### A.15.2. Governance structure

The NIHR is not a corporation or a legal entity, rather the NIHR is a virtual overarching entity which represents publicly funded research in the NHS.

The NIHR is directed by the Department of Health and Social Care. The NIHR's strategic direction and priorities are set by the NIHR Advisory Board and the NIHR Strategy Board, with both board's membership composition including senior NHS government representatives.

The NIHR's vision is to improve the health and wealth of the nation through research. Their mission is to provide a health research system in which the NHS supports outstanding individuals working in world-class facilities, conducting leading-edge research focused on the needs of patients and the public. The NIHR aims to:

- Establish the NHS as an internationally recognised centre of research excellence
- Attract, develop and retain the best research professionals to conduct people-based research
- Commission research focused on improving health and social care
- Strengthen and streamline systems for research management and governance
- Increase the opportunities for patients and the public to participate in, and benefit from, research
- Promote and protect the interests of patients and the public in health research
- Drive faster translation of scientific discoveries into tangible benefits for patients
- Maximise the research potential of the NHS to contribute to the economic growth of the country through the life sciences industry; and
- Act as sound custodians of public money for the public good.

### A.15.3. Funding operations

The NIHR addresses their vision and mission under the following six broad themes:

- **Funding research** - Funding research to improve the health of patients, the public and overall health and care services
- **Translating discoveries** - Translating discoveries into breakthrough, practical products, treatments, devices, procedures and interventions for clinicians and other users of research evidence:
- **Training researchers and leaders** - Training and developing researchers to keep the nation at the forefront of international research
- **Economic growth** - Working with the life sciences industry to help patients gain earlier access to breakthrough treatments and to encourage broader investment in, and economic growth from, health research

- **Research in the NHS** - Ensuring the NHS is able to support all research funders, such as the life sciences industry, charities and public funders, to benefit patients, the public and the health and care system
- **Public involvement and participation** - Involving patients and the public across all of our work and enabling patient participation in research.

### Principles and developing research questions

The NIHR applies the following principles:

- Transparency
- Open competition
- Quality
- Cost effectiveness
- Delivery

All research results are published in accessible and unbiased reports.

The NIHR recognises that to add value in research, questions being research are those that are most important to patients, clinicians and the public. In order to achieve this, the NIHR works with a range of partners to identify research priorities, including patients and the public, researchers, the Government, Health Authorities, Priority Setting Partnerships (PSPs) and charities.

Researchers seeking to answer research questions are subject to a robust application process. Where possible, the NIHR uses an international panel to review and select potential projects to ensure rigorous project assessment prior to selection. Panel members have a variety of backgrounds, including multidisciplinary leaders from academia and medicine.

### Infrastructure support

The NIHR Office for Clinical Research Infrastructure (NOCRI) provides funding across the following categories:

- Research Capability Funding
- Clinical Research Network
- Biomedical Research Centres
- Biomedical Research Units
- Patient Safety Translational Research Centres
- Clinical Research Facilities
- Experimental Cancer Medicine Centres
- Collocations for Leadership in Applied Health Research Care
- Excess Treatment Costs
- Research Design Service
- BioResource
- Translational Research Collaborations
- Healthcare Technology Co-operatives
- Diagnostic Evidence Co-operatives
- MRC/NIHR National Phenome Centre; and
- Other initiatives, including dementia and child prosthetics

Whilst it is clear that the NIHR fund research facilities, the NIHR does not specify if funding is capital (one-off expenditure) or recurrent in nature.

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