

# Medical Research: Queensland's Future Health and Wealth

SOLVING TOMORROW'S HEALTH PROBLEMS TODAY

Prepared by a Working Group of the **Smart State Council**

*November 2007*

Dear Premier

Please find attached the Smart State Council working group report on *Medical Research: Queensland's Future Health and Wealth. SOLVING TOMORROW'S HEALTH PROBLEMS TODAY*

The report is set against a backdrop of adversity – the ongoing crisis in Queensland health services delivery, and opportunity – the emerging strengths of our biotechnology industry.

It proposes the following solutions –

- increasing the quality and quantity of health services delivery and economic outcomes through focused investment in critical mass
- linking our health and medical research organisations through an extension of the ideas developed in the Smart Cities report
- redefining the culture of Queensland health and medical R&D through the creation of a strong quasi governance model

I believe these solutions will enable us to both overcome the adversity facing our health services delivery and seize the opportunity provided by our growing biotechnology industry.

I commend it to you



Professor Peter Andrews  
Queensland Chief Scientist and  
Chair, Standing Committee  
Smart State Council

November 2007

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## SMART STATE COUNCIL

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The Smart State Council was established in June 2005 as a central advisory body to provide high-level advice to the Queensland Government on emerging Smart State issues and trends, and to propose measures to position Queensland to respond to challenges and opportunities.

The Smart State Council is chaired by the Premier of Queensland and comprises Government Ministers, the Queensland Chief Scientist and representatives from Queensland's business and research communities.

This paper was prepared by an independent working group for the Smart State Council. The views expressed in this paper are those of the group and do not represent Queensland Government policy.

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## EXECUTIVE SUMMARY

A working group of the Smart State Council prepared this report to advance Queensland's health and medical research and development (R&D) outcomes. It focused on how Queensland compares nationally and internationally, noting that the quality of Queensland's health and medical research is improving. However, the State's ability to convert local discoveries to health, social and economic outcomes is lagging. It also found a widespread interest in optimising the delivery of high quality healthcare to Queensland.

The report addresses two major objectives:

- delivering better health services to Queenslanders
- contributing to the growth of Queensland's biotechnology, pharmaceutical and health service industries.

The Queensland Government has been addressing the issues<sup>1</sup> identified in the Queensland Health System Review.<sup>2</sup> It has achieved much to alleviate the health system crisis. Nonetheless, health and medical research, combined with teaching, can potentially make substantial additional contributions to the State's health system. Its future success is an essential platform for the State's economic success. Health and medical R&D will attract and retain high quality health workers and deliver high quality health care.

The Smart State investment in health and medical R&D has had considerable impact to date. Further progress would yield even greater social and economic returns for Queenslanders. The aim is to position Queensland as a national leader, translating local discoveries into proof-of-concept, and proven interventions into everyday practice.

## KEY FINDINGS

### 1. Health and medical R&D produces benefits

#### Attracting and retaining high-calibre clinicians

The consultation process with both young and experienced clinicians and clinician-researchers highlighted similar issues to those in the 2005 Queensland Health Systems Review.

*"...in health service delivery settings, health and medical research contributes to a culture of excellence and learning and is important for attracting and retaining good clinicians. In turn, the community in*

<sup>1</sup> Health action: delivering reform. Published by the Queensland Government October 2007 [http://www.health.qld.gov.au/publications/health\\_action\\_reform.pdf](http://www.health.qld.gov.au/publications/health_action_reform.pdf) accessed November 2007

<sup>2</sup> [http://www.health.qld.gov.au/health\\_sys\\_review/final/qhsr\\_final\\_report.pdf](http://www.health.qld.gov.au/health_sys_review/final/qhsr_final_report.pdf)

*Queensland derives a direct benefit from improved quality of care particularly from research with a focus on delivery of health services and quality and safety”.<sup>3</sup>*

The Mayo Clinic<sup>4</sup>, is the first and largest integrated, not-for-profit medical group practice in the world. It is an example of an institution dedicated and committed to medical education and research as well as patient care. The Mayo Clinic’s mission is a good example of what Queensland should strive for: “*to provide the best care to every patient every day through integrated clinical practice, education and research*”.

### **Health services multipliers**

There is powerful evidence that investment in health and medical R&D generates social and economic benefits well beyond the direct health outcomes. Further, it has been estimated that for every \$1 invested in health and medical research, \$5 flows into Australia’s economy.<sup>5</sup> Consumer benefits of the investment in health and medical research since 1960 have been estimated to be worth \$5.4T to Australians.

Further multiplier productivity gains follow through increases in skilled jobs at universities, academic institutions, biotechnology firms and other associated companies. Health gains improve quality of life and workforce participation.

### **Basis for innovation-intensive industries**

Queensland is already capitalising on its outstanding biomedical research base. This research has become the basis of an emerging biotechnology industry that is further extending Queensland’s drug and vaccine development pipeline. The State’s biotechnology industry has grown from a standing start a decade ago into a substantial sector with 23 drugs<sup>6</sup> currently in clinical trial. In 10 years the number of publicly-listed biotechnology firms in Queensland has risen from two to 12. There are approximately 90 companies involved in Queensland’s health and medical biotechnology sector – in diagnostics and generics, therapeutics, vaccines, platform technologies, natural products, processing and regulatory support services.

This growth is predicted to continue, with 3,500 jobs forecast by 2010 and 16,000 by 2025. By 2025 the market value of the industry is expected to be \$20B, with annual revenues of \$4B. Continued growth will require stronger interaction with the R&D sector and public health.

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<sup>3</sup> Queensland Health Systems Review Final Report September 2005. p18

<sup>4</sup> Mission: to provide the best care to every patient every day through integrated clinical practice, education and research.

<sup>5</sup> Exceptional Returns: The Value of Investing in Health R&D in Australia prepared for The Australian Society for Medical Research by Access Economics Canberra September 2003.

<sup>6</sup> Biotechnology – Setting New Horizons: Queensland Biotechnology Strategic Plan 2005-2012. Queensland Government.  
[http://www.dtrdi.qld.gov.au/dsdweb/v3/quis/templates/content/gui\\_cue\\_cntnhtml.cfm?id=20917](http://www.dtrdi.qld.gov.au/dsdweb/v3/quis/templates/content/gui_cue_cntnhtml.cfm?id=20917)

## 2. Queensland needs to improve its health and medical R&D performance

Despite a strong biomedical research base and an emerging biotechnology industry, there remain three substantial areas of concern regarding Queensland's health and medical R&D performance.

### Significant but small

The Health Systems Review highlighted that *"on a per capita basis Queensland invests significantly less on health and medical research than most other states. This is quite concerning in an environment of workforce shortage and global competition for clinicians"*.<sup>7</sup>

It is evident that Queensland's health and medical R&D activity and performance can improve based on national and international benchmarks. It is clear that Victoria leads in health and medical R&D performance within Australia. In 2005-06 Victoria reported \$589M in total research expenditure compared to \$259M in Queensland.

These data suggest a nexus between state investment and the ability to secure Australian Government and other funds for research.

### A fragmented health and medical R&D industry

Those contributing to the health and medical R&D efforts could be better linked.

#### *Linking Smart State and Smart Cities - geography*

A sound platform on which to build a world-class Queensland health and medical R&D cluster exists in Brisbane. Major geographical precincts are forming – 109 Central (Woolloongabba to St Lucia) and the Herston/Kelvin Grove precinct. These two major precincts will be the anchors at either end of the knowledge corridor highlighted in the *Smart Cities: rethinking the city centre* report.<sup>8</sup> There are further opportunities to develop significant regional health and medical R&D precincts on the Gold Coast and in Townsville.

While there are some strong linkages within and between these centres, there is a need to establish closer associations between researchers, companies and supporting infrastructure, with the formation of clusters or networks. Such clusters of people and technologies would have the capacity to nurture discoveries, turn them

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<sup>7</sup> Queensland Health Systems Review Final Report September 2005. p18

<sup>8</sup> Smart State Council (May 2007). *Smart Cities: rethinking the city centre*. [http://www.smartstate.qld.gov.au/partnerships/ss\\_councilreports.shtm](http://www.smartstate.qld.gov.au/partnerships/ss_councilreports.shtm) accessed September 2007  
<http://www.smartstate.qld.gov.au/> accessed November 2007

into marketable products and translate them into safe and effective clinical interventions.

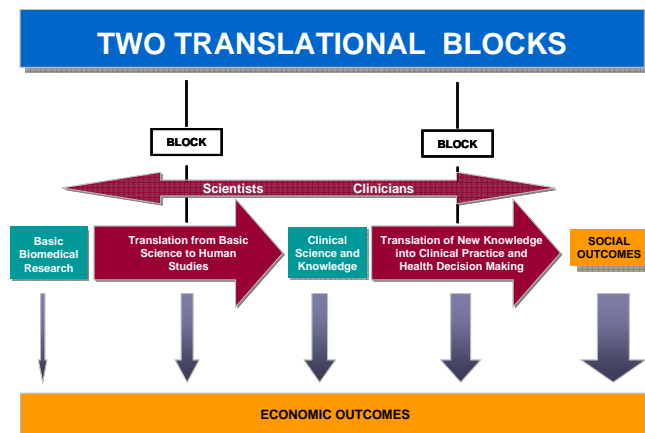
*Clusters that can “unblock the pipeline” by investing in specific strategies to overcome them are likely to dramatically improve their competitive position and amplify local returns on investment.*

### Critical blocks in the R&D pipeline

Numerous national and international reports have identified a serious disconnect between scientific discoveries and the delivery of better health-improving services. Translational and clinical research has not kept pace with the advances in basic scientific discovery.

Two discrete and important obstacles have been identified. These two “blocks” relate to limited Queensland capability to translate:

- research into products i.e. moving basic science discoveries into clinical studies (including pharmaceuticals, vaccines and medical devices)
- proven interventions to clinical implementation i.e. clinical studies into health policy and routine medical practice.



In addition to these internationally-recognised impediments to success, the report identified **additional significant problems** in Queensland’s R&D capability.

Most of these exacerbate the two blocks in the R&D pipeline.

### Research culture and other challenges

Many systemic, cultural and workforce challenges were identified through consultations. Instances of openly negative attitudes towards research and researchers were cited. The environment discourages young clinicians from participating in research.

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Academic medicine is a key component of a health system that aims to nurture the next generation of the workforce, to deliver the highest quality of care and to deliver new cost-effective interventions. But it is under serious threat.

Many areas require action: lack of research leadership; poor coordination; ill-defined mechanisms to facilitate collaborations between universities, institutes, biotechnology companies, hospitals, and the broader community; weak links between fundamental and clinical research; powerful institutional barriers to collaboration; disincentives for clinical scientists (lack of mentorship, career paths, remuneration, clinical demands, infrastructure support); workforce recruitment and retention; and regulatory and administrative burdens.

### 3. Solutions to strengthen health and medical R&D

#### Investing in a winning sector

A major catch-up strategy is vital if Queensland is to perform at a level comparable to Victoria. Currently, Queensland's investment in health and medical R&D support falls well short of the best performing state. Simply investing at the same rate as Victoria will not bridge the gap. Some degree of "extra investment" in the short to medium term will be required. Evidence suggests that investment in health and medical R&D yields disproportionate health, social and financial returns.

In particular, investment in fellowships and translational research projects is required to attract and retain high-calibre clinical researchers in Queensland.

*An expanded investment within Queensland is likely to be low in risk – with the potential for high social and economic returns.*

#### Linking Smart Cities

A sound platform on which to build a world-class Queensland health and medical R&D cluster exists in Brisbane. The major geographical precincts are forming – 109 Central (Woolloongabba to St Lucia) and the Herston/Kelvin Grove precinct. These two precincts should be reinforced as the anchors at either end of the knowledge corridor highlighted in the *Smart Cities: rethinking the city centre* report.<sup>9</sup> The Gold Coast and in Townsville provide opportunities to build significant regional research precincts linked to Brisbane.

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<sup>9</sup> Smart State Council (May 2007). The Smart Cities: rethinking the city centre. [http://www.smartstate.qld.gov.au/partnerships/ss\\_councilreports.shtm](http://www.smartstate.qld.gov.au/partnerships/ss_councilreports.shtm) accessed September 2007; <http://www.smartstate.qld.gov.au/> accessed November 2007



## **Governance arrangements**

Consultations highlighted the need for an integrated “whole of government” approach to health and medical R&D, aimed at ensuring alignment of purpose and strategy among Government departments, particularly Queensland Health. Similarly, the efforts of private industry, independent institutes and universities need to be aligned with overall Government research-related activity.

In particular, consultation feedback supported the establishment of a semi-autonomous superstructure organisation, appointed and supported by Government, to provide a long-term strategic focus for health and medical R&D across all sectors.

**Queensland Health has an important role within this superstructure.** The primary focus of Queensland Health is service delivery. However, research, teaching and training are essential to its survival as a healthy business capable of recruiting and retaining a contributory professional health workforce, and playing a major role in the translational pipeline.

## **4. Outcomes**

The enabling effect of an investment today in translational and clinical health and medical research by the Queensland Government has the potential to leverage substantial future social and economic returns for Queensland.

Specifically, it is estimated that there will be an increase in health and medical R&D expenditure in Queensland from \$260M in 2006 to \$600M by 2015, in 2006 terms. An anticipated \$350M will be leveraged from the Australian Government and \$150M from non-government sources.

### **Improved health services**

An environment enhanced by R&D will attract and retain high-calibre clinicians (medical, nursing and allied health), world-class researchers, business leaders, and skilled research and administrative support staff.

The availability of more high-calibre clinicians will significantly improve access to high quality health services, which maximise outputs for the resources available.

### **Growth in innovation-intensive industry**

The quantity and quality of translational research will increase three-fold with an associated increase in the vibrancy and viability of Queensland’s biotechnology and pharmaceutical industries. An integrated Queensland health and medical R&D pipeline will enhance the transfer of new discoveries to the health service delivery setting - more efficiently and with greater economic returns.

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## CONCLUSION

The report has identified an immediate need for a three-point “G3” strategy to accelerate Queensland’s health and medical R&D. The strategy encompasses strategic investment by Government (G1) building critical mass (workforce) through geographical linkages (G2) and strong governance (G3) arrangements.

An investment today in translational and clinical health and medical research by the Smart State will enable it to leverage substantial future social and economic returns for Queensland.

It will create an environment that is more conducive to the recruitment and retention of high-calibre clinicians, world-class researchers, business leaders and skilled research and administrative support staff. It will lead to improved health and medical R&D outputs and, most significantly, to improved delivery of cost-effective health services.

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## 1. Introduction

This report has been prepared by the Smart State Council to set future directions of health and medical research and development (R&D) in Queensland.

The health of the population is central to Smart State policy. Health and medical research underpins effective healthcare products and service delivery. A strong local research presence provides the knowledge and capability to deliver a first-class health service and create a healthy community.

In the past decade the Queensland Government has nurtured an emerging health and medical research industry through direct investment in research activities and infrastructure and indirectly through the healthcare delivery system. In preparing the way forward, Government will need to reconfirm its support for this effort, to establish a climate for ongoing development.

There are two vital objectives of health and medical R&D:

**Objective 1:** To achieve social outcomes by delivering better health services to Queenslanders.

**Objective 2:** To achieve economic outcomes by building Queensland's biotechnology, pharmaceutical and health service industries.

Health and medical R&D aims to create, apply and disseminate new knowledge for health and well-being. The key contributors - research entities, universities, public and private health systems and private industry - have disparate cultures but many shared goals.

The report recognises Queensland's individual examples of world-renowned health and medical research. The report also acknowledges the Government's Smart State vision and investment towards health and medical R&D. This investment helped establish and grow several high-quality health and medical research institutes, which have attracted world-class researchers to Queensland. It also facilitated the State's growing local biotechnology and pharmaceutical industries.

However, this investment has been largely uncoordinated. There is no roadmap, no clear strategy and no overall coordination of effort.

Comparing the income each state has secured from the National Health and Medical Research Council (NHMRC) suggests there is considerable room to improve Queensland's current performance.

The healthcare delivery system faces challenges related to population changes, management, medical leadership and investment. The Smart State Council Working Group's consultation process identified deficiencies in the clinical research environment as a significant part of the challenge including: funding; workforce issues; increasing State and national regulatory burdens; shortage of skills

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(particularly clinician-researchers<sup>10</sup> and researcher-clinicians<sup>11</sup>); dedicated time for research; research culture; incompatible systems within institutions; and lack of research participants – all of which impact negatively.

Two discrete and important obstacles to optimal success have already been identified at an international level<sup>12</sup>. These “blocks” (refer to Figure 1) relate to limited capability to translate:

- basic science discoveries into clinical studies
- clinical studies into medical practice and health decision-making in health service delivery.

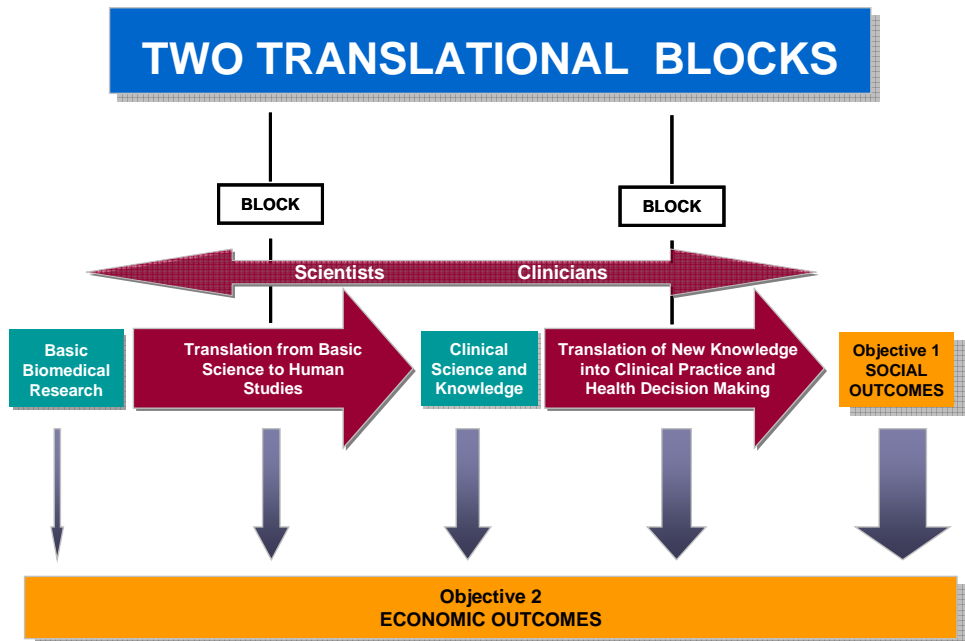


Figure 1: Translational blocks

<sup>10</sup> Clinician-researchers in this report refers to those involved primarily in clinical work with some research

<sup>11</sup> Researcher-clinicians in this report refers to those involved primarily in research with some clinical duties

<sup>12</sup> Strengthening Clinical Research - A report from the Academy of Medical Sciences. October 2003 <http://www.acmedsci.ac.uk/p99puid22.html> accessed July 2007

Tunis S, Korn A, Ommaya A, eds. The Role of Purchasers and Payers in the Clinical Research Enterprise: Workshop Summary. Washington DC: National Academy Press 2002 <http://www.nap.edu/catalog/10400.html>

Aungst J, Haas A, Ommaya A, Green L eds (2003). Exploring Challenges, Progress, and New Models for Engaging the Public in the Clinical Research Enterprise: Clinical Research Roundtable Workshop Summary Based on a Workshop of the Clinical Research Roundtable. <http://www.nap.edu/catalog/10757.html>

Sung N et al (2003). Central Challenges Facing the National Clinical Research Enterprise. JAMA Vol 289, 10, 1278-1285.

Sung N, Franko M eds (2004). The Health Research Alliance: A Consortium of Biomedical and Health Research Organizations. Partnering to Advance Health Research: Philanthropy's Role. <http://www.healthra.org/>

A strategy of geographic clustering using government investment will strengthen and build critical mass in medical R&D in Queensland. Equally, new business models will address the current impediments and gaps and provide another mechanism for Queensland to develop a strong health and medical R&D cluster. It is important to have a well-coordinated and strategically-integrated businesslike approach to research and development.

Locally and internationally, the medical educational community is struggling to maximise its research capability. Enormous challenges face academic medicine, which have been articulated within a global campaign to promote and revitalise medicine.<sup>13</sup> At a time of increasing health burdens, poverty, globalisation and innovation, many have argued that academic medicine is failing to realise not just its potential but also its global social responsibility.<sup>14</sup>

Academic medicine can be defined as:

*“the capacity of the healthcare system to think, study, research, discover, evaluate, teach, learn, and improve. As such, little could be more important—particularly as new discoveries in science offer tremendous opportunities and emergent diseases pose huge threats. Indeed, academic medicine has been responsible for enormous gains in human health and development over the past century.”<sup>15</sup>*

Academic medicine, which includes medical schools, teaching hospitals and many other types of organisations, is an essential part of the solution to Queensland’s current health issues and to maximise other returns from health and medical R&D.

*This report serves to review progress, identify future opportunities and recommend Government strategies to build on current investments to secure a strong future for health and medical R&D and improved healthcare delivery in Queensland.*

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<sup>13</sup> Ioannidis J (2004). Academic medicine: the evidence base. BMJ;329:789–92

Wilkinson D (2004). ICRAM (the International Campaign to Revitalise Academic Medicine): BMJ;329:787–9

Awatsthi S et al. (2005). The Future of Academic Medicine Five Scenarios to 2025. Milbank Memorial Fund <http://www.milbank.org/reports/0507FiveFutures/0507FiveFutures.html>

<sup>14</sup> Awatsthi S et al. (2005). Five futures for academic medicine: the ICRAM scenarios. BMJ ; 331:101-104

<sup>15</sup> Ibid p.101

## 2. Health and medical R&D produces important social and economic benefits

### *Healthy people and productive communities*

It is widely recognised, internationally and within Australia, that investment in science and health and medical R&D generates major social and economic benefits.<sup>16</sup> The benefits are evident in traditional measures of health and well-being, such as morbidity and mortality rates. Broadly, Queenslanders and people around the world live longer and are less likely to succumb to the many diseases of the past. Better diagnostics mean that many illnesses are identified sooner, and this improved diagnosis results in better prognosis for treatment and recovery. The rates of incidence are not dropping in many diseases but the outlook for patients is dramatically improving. Victims of many diseases live fuller, better-quality lives due to improved methods of treatment. Quality of life is extremely important to patients and their families.

Buxton and Hanney<sup>17</sup> showed health services research delivers a range of benefits beyond just knowledge. Political and administrative benefits include an improved information base on which to make political and executive decisions. Health sector benefits include cost reduction in the delivery of existing services. They noted qualitative improvements in the process of service delivery; increased effectiveness of services such as increased health; and equity benefits such as accessibility and improved allocation of resources at an area level. They noted broader economic benefits from commercial exploitation of innovations arising from R&D and from a healthy workforce and reduction in working days lost.

Research conducted in hospitals and universities provide significant benefits. Important laboratory discoveries expand world understanding, cure diseases and improve quality of life. Clinical and translational research develops and tests discoveries to create potential health interventions. Health services research identifies needs and finds ways to implement and access new interventions.

Benefits of health and medical R&D include research that:

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<sup>16</sup> The Virtuous Cycle Working together for health and medical research. Health and Medical Research Strategic Review 1999 (Wills Review)

Sustaining the Virtuous Cycle for a Healthy, Competitive Australia Investment Review of Health and Medical Research Final Report Dec 2004 (Grant Review)

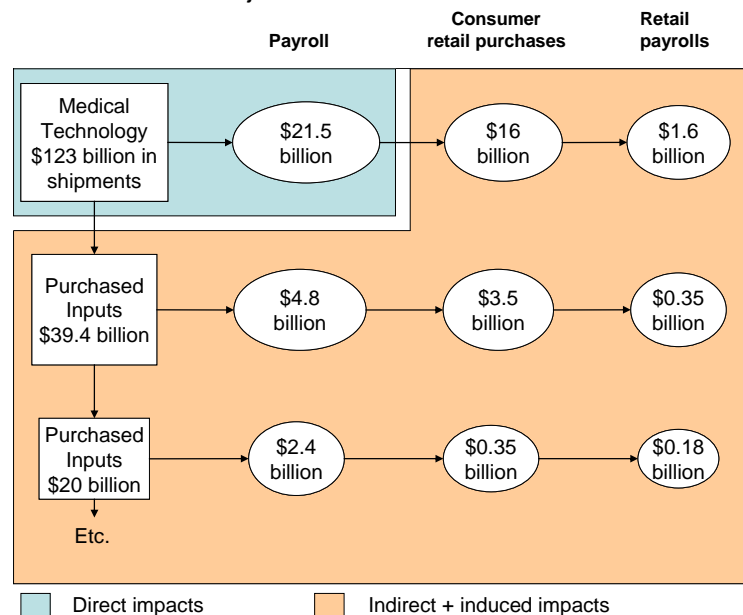
Exceptional Returns: the value of investing in health R&D in Australia. Prepared by Access Economics for the Australian Society for Medical Research September 2003 (accessed 31 July 2007)

The Benefits of medical Research and the Role of the NIH May 17, 2000. Office of the Chairman, Connie Mack [http://hsc.utoledo.edu/research/nih\\_research\\_benefits.pdf](http://hsc.utoledo.edu/research/nih_research_benefits.pdf)

<sup>17</sup> Buxton M, Hanney S (1996). "How can payback from health services be assessed?" J Health Serv Res Policy.1:35–43 (cited recently also in: Kwan P et al (2007) A systematic evaluation of payback of publicly funded health and health services research in Hong Kong.)

- helps in understanding the determinants of health and informs preventative strategies eg correlations between smoking and heart disease and lung cancer; diet and heart disease; sun exposure and skin cancer
- develops new interventions to cure and treat disease eg vaccines; antibiotics
- produces innovative ways of delivering care eg keyhole surgery; angioplasty; liver transplants
- bridges scientific discoveries and clinical practice (translational) eg aspirin in cardiovascular disease.<sup>18</sup>

There is powerful evidence that investing in health and medical R&D generates social and economic benefits well beyond the obvious direct outcomes. Multiplier productivity gains follow through increases in skilled jobs at universities, academic institutions, biotechnology firms and other companies. Health gains improve quality of life and workforce participation. A 2007 report<sup>19</sup> rates the medical technology industry (MTI) as critical to improving the quality of life and health of patients, as well as being a powerful driver of economic growth and a source of high-paying jobs. In 2006 the MTI in the US employed 357,700 workers, paid \$21.5B in salaries and shipped \$123B worth of products (refer to Figure 2). Each medical technology job generated an additional 4.5 jobs across the nation.



**Figure 2: Graphical Exposition of the "Multiplication" of Direct Economic Benefits<sup>20</sup>**

(Source: State Impacts of the Medical Technology Industry)

<sup>18</sup> Gelijns A et al (1998). "Capturing the Unexpected Benefits of Medical Research." New England Journal of Medicine, v. 339, no. 10, pp. 693-7.

<sup>19</sup> State Impacts of the Medical Technology Industry. Prepared by: The Lewin Group, Inc. Advanced Medical Technology Association 2007

<sup>20</sup> Ibid p11



It is critical for policymakers at all levels to understand that health and medical R&D drives advances in individual and public health, at the same time strengthening national, state and local economies. Opening up the health and medical R&D pipeline will enhance the social and economic returns.

National and international reports have demonstrated substantial increases in human life expectancy. Benefits resulting from medical advances last century were achieved through interventions such as inoculations, development of vaccines, pharmacological and surgical developments and psychosocial interventions. However, the effects of demographic ageing and the associated increasing prevalence of chronic conditions such as dementia, arthritis, cardiovascular disease and cancer will place unprecedented demands on the Australian health system.<sup>21</sup> The mortality rate from preventable chronic disease is higher in Queensland than any other state in Australia.<sup>22</sup>

The projected direct and indirect costs of chronic illness are expected to present a challenging burden. Direct health expenditures totalled \$60.8B in 2000-01 - 70% of which came from the public sector. Based on what is known now, national spending on health is projected to increase disproportionately over coming decades compared to Australia's gross domestic product (GDP). Access Economics<sup>23</sup> estimated the indirect costs of illness in 2000-01 to be \$77B. The greatest hope for controlling health expenditure is new cost-effective R&D discoveries combined with prevention programs that modify disease rates and a R&D-driven health workforce that takes great pride in using the health dollar to best effect.

### **National evidence of social and economic gains**

A 1999 review of health and medical research, chaired by Peter Wills,<sup>24</sup> recognised that research could have direct economic benefits. Tremendous medical advances accomplished in the last century have resulted in healthier people, greater life expectancy as well as greater productivity of communities. The Wills Review highlighted that *'Within the last 25 years, mortality rates related to heart disease and stroke have decreased dramatically, vaccines for hepatitis A & B have been developed and Australians live almost completely free of diseases such as polio, tetanus, smallpox, measles, mumps and rubella.'*<sup>25</sup>

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<sup>21</sup> Exceptional Returns: The Value of Investing in Health R&D in Australia prepared for The Australian Society for Medical Research by Access Economics Canberra September 2003.

<sup>22</sup> Queensland Strategy for Chronic Disease 2000-2015. Queensland Health, Queensland Government (<http://www.health.qld.gov.au/qcdsit/>) December 2005

<sup>23</sup> Exceptional Returns: The Value of Investing in Health R&D in Australia prepared for The Australian Society for Medical Research by Access Economics Canberra September 2003

<sup>24</sup> The Virtuous Cycle Working together for health and medical research. Health and Medical Research Strategic Review 1999 (Wills Review)

<sup>25</sup> *ibid* p.161

The Grant Review (2004) demonstrated that commercialisation of health and medical research through biotechnology companies has been growing at 16% per year and that 3,500 to 4,000 knowledge-based jobs have been created in Australia.<sup>26</sup>

Returns to cardiovascular, respiratory and digestive system R&D have been reported as eight-fold, six-fold and five-fold respectively.

The 2003 Access Economics report<sup>27</sup> demonstrated that for every \$1 invested in health and medical research, there is a \$5 return to Australia's economy. Investment in health R&D surpassed every other source of rising living standards. The report also found that investment in health and medical research generated an estimated of \$5.4T in benefits to Australian consumers. The eight year gain in life expectancy has been estimated to be worth over \$2.9T in addition to a \$2.5T gain in associated quality of life.

The report highlighted that *“while it is not always entirely possible to pin down cause and effect, the likely returns from health R&D are so extraordinarily high that the payoff from any strategic portfolio of investments is enormous”*.<sup>28</sup>

OECD data demonstrate that the potential years of life lost due to diseases and other injuries are currently around 3,700 per 100,000 of the Australian population.

Australian health and medical research scientists have a long history of discovery. There are many examples of major breakthroughs that have, or will have, significant impacts on the health, well-being and wealth of Queenslanders. Australian examples highlighted in the Australian Society for Medical Research case studies series II<sup>29</sup> are documented elsewhere.

The most famous Queensland example is the successful development of the human papilloma virus vaccine to prevent cervical cancer,<sup>30</sup> licensed to CSL and then by CSL to Merck. The product Gardasil was released in 2006.

## International evidence

The effects of research on a regional economy extend well beyond the direct activities of the industry. Research organisations, among other things, pay staff, purchase equipment and hire services. Multiplier effects follow. Charney and Pavlakovich<sup>31</sup> estimated in a 2003 study the multiplier effects of \$10M in research spending in Arizona. It considered the number of jobs created, wages, state revenue

<sup>26</sup> Sustaining the Virtuous Cycle for a Healthy, Competitive Australia Investment Review of Health and Medical Research Final Report Dec 2004 (Grant Review)

<sup>27</sup> Exceptional Returns: the value of investing in health R&D in Australia. Prepared by Access Economics for the Australian Society for Medical Research September 2003 accessed 31 July 2007

<sup>28</sup> *ibid* p1

<sup>29</sup> <http://www.asmr.org.au/CSMay03.pdf> accessed August 2007

<sup>30</sup> Professor Ian Frazer and Dr Jian Zhou, University of Queensland, Diamantina Institute,

<sup>31</sup> in Charney A et al (2007). A Strategic Assessment of the Economic Benefits of Investments in Research in Arizona.

and sales, as well as the other financial rewards for a region such as royalties, start-up companies, new technologies and training of new scientists.

Separately, *Measuring the Gains from Medical Research: An Economic Approach* reported that “improvements in health account for almost one half of the actual gain in American living standards in the past 50 years.”<sup>32</sup> The economists concluded that increases in life expectancy in the 1970s and 1980s were worth \$57T to the US. The gains associated with the prevention and treatment of cardiovascular disease alone totalled \$31T.

The report *Exceptional Returns: The Economic Value of America’s Investment in Medical Research*<sup>33</sup> highlighted that US public and private investment of more than \$45B annually in medical research supports hundreds of thousands of skilled jobs at universities, academic medical centres and companies. In 1997, the pharmaceutical industry employed over 260,000 people and generated sales of \$87.1B. Over 1,300 biotechnology firms employed 110,000 people and generated \$9.3B in sales.

Impressive cost savings included: the development of lithium for the treatment of manic depressive illness, resulting in health cost savings of more than \$9B annually; prevention of hip fractures in postmenopausal women at risk for osteoporosis, saving \$333M annually; and a 17-year program investing only \$56M in research on testicular cancer leading to a 91% cure rate and annual savings of \$166M.<sup>34</sup>

There is powerful evidence that investment in health and medical R&D generates social and economic benefits well beyond the obvious direct outcomes. Some of the most profound advances, like the isolation of human stem cells and the mapping of the human genome, have just begun to demonstrate their vast therapeutic potential.

*An expanded investment within Queensland is likely to be low in risk – with the potential for high social and economic returns.*

### 3. Environmental analysis – state of play

Numerous national and international reports have identified a serious disconnect between scientific discoveries and the delivery of better health-improving services.

Translational and clinical research has not kept pace with the advances in basic scientific discovery.<sup>35</sup>

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<sup>32</sup> Murphy KM, Topel RH (2003). *Measuring the Gains from Medical Research: An Economic Approach*. ed. K. M. Murphy and R. H. Topel, 41-73. Chicago: University of Chicago Press.

<sup>33</sup> *Exceptional Returns: The Economic Value of America’s Investment in Medical Research*, May 2000 The Lasker Foundation <http://www.laskerfoundation.org/reports/pdf/exceptional.pdf>

<sup>34</sup> *Exceptional Returns: The Economic Value of America’s Investment in Medical Research*, May 2000 The Lasker Foundation <http://www.laskerfoundation.org/reports/pdf/exceptional.pdf>

<sup>35</sup> <http://nihroadmap.nih.gov/clinicalresearch/overview-translational.asp>

Strengthening Clinical Research - A report from the Academy of Medical Sciences. October 2003 <http://www.acmedsci.ac.uk/p99puid22.html> accessed July 2007

There is a need to “unblock the pipeline” by investing in specific strategies that will translate local scientific discoveries into products and translate proven interventions into clinical practice and health decision-making.

Countries such as the UK,<sup>36</sup> US,<sup>37</sup> Canada,<sup>38</sup> as well as Australian states such as Victoria,<sup>39</sup> have undertaken major reviews. They are implementing strategies and initiatives that target funding towards the translation of basic research into clinical practice in order to achieve social and economics outcomes.

### United States of America

The National Institutes of Health Roadmap<sup>40</sup> has responded to change, articulating a number of aims. One aim is to develop research networks, which connect academic laboratories with healthcare providers and clinicians, in order to facilitate the development, testing and adoption of new treatments. A number of programs are associated with the roadmap including a Clinical and Translational Science Awards program.<sup>41</sup>

States across the US have developed research and innovation strategies to create seed funding for cutting-edge research, build institutes and attract a new talented skilled workforce. An Innovation America<sup>42</sup> report highlighted that states are using their money to: connect silos; encourage cooperation and partnerships; foster collaboration across borders; and develop mechanisms to ensure that R&D investments are strategically focused. The strategies are predicated on merit and excellence.

Arizona, with a population of 6.1M,<sup>43</sup> provides an interesting case study. It created a biosciences niche following a process that included: an investment of \$1B over 20 years to three universities aligning their research focus with key industry clusters in the region; development of a “roadmap” based on industry analysis; investment of \$90M to jump-start the bioscience industry – bringing researchers to the state and creating a not-for-profit Translational Genomics Research Institute; investment of \$440M in research facilities at the three universities; investment of \$100M for

<sup>36</sup> [http://www.ncrr.nih.gov/clinical\\_research\\_resources/](http://www.ncrr.nih.gov/clinical_research_resources/)  
<http://www.ctsaweb.org/about.cfm> accessed October 2007

<sup>37</sup> Mobilizing Science and Technology to Canada’s Advantage. Canada 2007  
[http://www.ic.gc.ca/epic/site/ic1.nsf/en/h\\_00231e.html](http://www.ic.gc.ca/epic/site/ic1.nsf/en/h_00231e.html) accessed August 2007

<sup>38</sup> <http://www.cihr-irsc.gc.ca/e/12679.html>  
<http://www.cihr-irsc.gc.ca/e/29529.html> accessed August 2007

<sup>39</sup> Deloitte Touche Tohmatsu (Insight Economics) (2007). The benefits from translating biomedical research into the health care system. Report to Bio21 Australia.

<sup>40</sup> <http://nihroadmap.nih.gov/> accessed September – October 2007

<sup>41</sup> [http://www.ncrr.nih.gov/clinical\\_research\\_resources/clinical\\_and\\_translational\\_science\\_awards/](http://www.ncrr.nih.gov/clinical_research_resources/clinical_and_translational_science_awards/)  
 accessed September 2007

<sup>42</sup> Innovation America: Investing in Innovation National Governors Association (NGA) Center for Best Practices and the Pew Center on the States  
<http://www.nga.org/Files/pdf/0707INNOVATIONINVEST.PDF>

<sup>43</sup> <http://quickfacts.census.gov/qfd/states/04000.html> accessed October 2007

bioscience and healthcare training; and investment \$270M by the Science Foundation Arizona towards public-private support to attract research talent. It has since been reported in a 2006 evaluation that, overall, 84% of the roadmap actions showed progress.

### United Kingdom

The UK Academy of Medical Sciences report titled *Strengthening Clinical Research*<sup>44</sup> highlighted gaps in translating basic discoveries into innovations that directly benefit patients or prevent disease. A UK review by Sir David Cooksey<sup>45</sup> identified some gaps in translating research into ideas and products, and implementing these ideas and products into clinical practice. The review recommended a number of strategies to target initiatives aimed at knowledge transfer including the establishment of a Translational Medicine Funding Board. It also recommended creating a coordinating entity, the National Institute of Health Research. The institute's role was to enhance translation of research into health outcomes by integrating health research across the UK. Pilot initiatives such as specialist "research translators" were suggested to address the "first gap in translation".<sup>46</sup>

To date measures have been designed to improve the translation of research outcomes into health sector outcomes.

The UK Clinical Research Collaboration has been established to enhance researcher interaction; improve funding structures; involve industry as a key to a future sustainable biomedical research sector - and ultimately improve patient outcomes. It involves a range of health research partners<sup>47</sup> and includes: the key research funding bodies; academia; the National Health Service; regulatory bodies; the bioscience, healthcare and pharmaceutical industries; and patients.<sup>48</sup> A Board and a Board Subgroup oversee the UK Clinical Research Network.<sup>49</sup> The project aims to enhance research infrastructure development including facilities, expertise and funding mechanisms.

Following the publication of the 10-year Science and Innovation Investment Framework in 2004, the UK established the joint Medical Research Council/NHS Health Research Delivery Group to increase coordination between the various government programs funding medical and clinical research.<sup>50</sup>

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<sup>44</sup> Strengthening Clinical Research. A report from the Academy of Medical Sciences. October 2003

<sup>45</sup> A review of UK health research funding. Sir David Cooksey December 2006 [http://www.hm-treasury.gov.uk/media/4/A/pbr06\\_cooksey\\_final\\_report\\_636.pdf](http://www.hm-treasury.gov.uk/media/4/A/pbr06_cooksey_final_report_636.pdf) accessed August 2007)

<sup>46</sup> *ibid* p79

<sup>47</sup> <http://www.ukcrc.org/aboutus/introduction.aspx> accessed 13 September 2007

<sup>48</sup> <http://www.ukcrc.org/aboutus/theukcrcpartners.aspx> and <http://www.ukcrc.org/aboutus/ukcrcboard.aspx>

<sup>49</sup> <http://www.ukcrn.org.uk/index.html> accessed September 2007

<sup>50</sup> Deloitte Touche Tohmatsu (Insight Economics) (2007). The benefits from translating biomedical research into the health care system. Report to Bio21 Australia. accessed August 2007

## Canada

Health research in Canada is funded by both the federal and provincial governments. The Canadian Institutes of Health Research (CIHR), created in 2000 by an Act of Parliament, brought together the different components of health research into a new, single entity. The CIHR is a multi-disciplinary network of 13 virtual institutes. It encourages integrative research that enables basic biomedical research to co-exist with applied clinical research, research into health systems, as well as services and population health research.<sup>51</sup>

The *Canadian Institutes of Health Research Act* states the CIHR's aim as:

*“to excel in the creation of new knowledge and to translate that knowledge from the research setting to real-world applications in order to improve the health of Canadians, provide more effective health services and products and strengthen the healthcare system”.*<sup>52</sup>

The blueprint strategy aims to accelerate and increase the benefits to Canadians from knowledge translation of health research. The CIHR's Knowledge Translation Strategy focuses on:

*“areas where it can make a unique contribution on the basis of its recognised core competencies: researcher training and research funding; its close relationship with the health research community; its ability to develop integrated, strategic national research agendas; and its credibility as a forum for consideration of complex health research issues”.*<sup>53</sup>

The Toronto Discovery District<sup>54</sup> is an interesting case study of a partnership involving government and academic and healthcare institutions. The District<sup>55</sup> brings together three universities, nine teaching hospitals and over 30 specialised medical and related sciences research centres. With more than \$1B directed annually to research activities, it is considered a successful translational cluster. The Medical and Related Sciences Discovery District (MaRS) in Toronto, a major commercialisation facility, draws together leading health researchers, investors and businesses with legal, banking and other commercialisation services in a creative and collaborative environment.<sup>56</sup>

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<sup>51</sup> CIHR - Welcome to the Bio-Century, 2001; S&T Partnerships - The Canadian Way March 2001

<sup>52</sup> CIHR IRSC Innovation in Action Knowledge Translation Strategy 2004-2009

[http://www.irsc.gc.ca/e/documents/kt\\_strategy\\_2004-2009\\_e.pdf](http://www.irsc.gc.ca/e/documents/kt_strategy_2004-2009_e.pdf) p3

<sup>53</sup> *ibid* p6

<http://www.irsc.gc.ca/e/29418.html> accessed October 2007

<sup>54</sup> <http://www.torontodiscoverydistrict.ca/Default.asp> accessed September 2007

<sup>55</sup> [http://www.torontodiscoverydistrict.ca/PDF/TDD\\_Brochure\\_2006.pdf](http://www.torontodiscoverydistrict.ca/PDF/TDD_Brochure_2006.pdf) accessed September 2007

<sup>56</sup> Mobilizing Science and Technology to Canada's Advantage. Canada 2007  
[http://www.ic.gc.ca/epic/site/ic1.nsf/en/h\\_00231e.html](http://www.ic.gc.ca/epic/site/ic1.nsf/en/h_00231e.html) accessed September 2007



## Victoria

Victorian research institutions attract a disproportionate share of funding from the NHMRC. It has developed six key research precincts, which include universities, research institutes, hospitals, biotechnology firms and other companies.

Their roles encompass basic research as well as transferring the research results into clinics and the marketplace.

The report recognises that Victoria's long history of investment in health and medical research has created a strong research base and culture. Testament to Victoria's long-term support strategies is the large number of independent research institutes established over several decades, many of which are located in the grounds of teaching hospitals. Victoria's success is also evident in its large workforce of clinicians, clinician-researchers, scientists and associated staff.

All the above examples highlight the effects of strategic investment in research. Queensland's recent commitment to establish a research base is already having an impact. *However, for Queensland to bridge the gap, a substantially greater level of investment will be required over a sustained period.* Substantial investment will need to be directed at the two translational blocks.

*Research clusters that successfully overcome these blocks are likely to secure an important competitive advantage.*

## 4. Queensland health and medical R&D today

Queensland institutions boast many strengths in health and medical R&D excellence – strengths that are of international standing. Emerging opportunities can also be exploited by the health and medical research institutions, industry and business. These opportunities have the potential to transform health and medical R&D.

### Queensland's investment

The report acknowledges the investment made directly and indirectly by the Queensland Government towards health and medical R&D since 1999. A \$540M State investment has been used to build the biotechnology and health and medical R&D sector. This investment, which has leveraged an additional \$1B in income from non-Queensland Government sources, went predominantly to capital infrastructure. Review of other state jurisdictions shows that an ongoing government investment is critical to successful ventures. This ongoing investment is essential to leverage greater external funds and to optimise the wider returns.

The report identifies a need for overarching coordination and strategic direction. It also acknowledges the benefits of developing and implementing a roadmap to maximise the return on future investment.

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The Queensland Health Systems Review highlighted that “on a per capita basis Queensland invests significantly less on health and medical research than most other states. This is quite concerning in an environment of workforce shortage and global competition for clinicians”.<sup>57</sup>

It is evident that Queensland’s health and medical R&D activity and performance is low compared to national and international benchmarks. Victoria clearly leads in health and medical R&D performance.

From 2001-02 to 2005-06 the Victorian Government allocated on average \$12 per capita to research, compared to \$6 per capita by the Queensland Government. In the same period, Victoria secured commensurately greater per capita expenditure through Australian Government (\$60 compared to \$34) and non-government (\$24 compared to \$11) sources.<sup>58</sup> (refer to Table 1 for 2005-06 comparisons).

**Table 1: Research Expenditure Per Capita for 2005-06**

	<b>Victoria 2005-06</b>	<b>Queensland 2005-06</b>
Australian Government Expenditure on Health Research Per Capita	\$70	\$43
State and Local Expenditure on Health Research Per Capita	\$17	\$8
Non-Government Expenditure on Health Research Per Capita	\$29	\$12
<b>TOTAL</b>	<b>\$116</b>	<b>\$63</b>

(Source: Health Expenditure Australia<sup>59</sup>)

In 2005-06 Victoria reported \$589M in total research expenditure compared to Queensland \$259M.<sup>60</sup> These data suggest a nexus between state investment and the ability to secure Australian Government and other funds for research.

*An investment of 3% of Queensland’s health budget into health and medical R&D would equate to approximately \$245M per year.*

<sup>57</sup> Queensland Health Systems Review Final Report September 2005. p18

<sup>58</sup> These were the best comparative data available to the Review.

<sup>59</sup> Health Expenditure Australia. <http://www.aihw.gov.au/publications/> accessed October 2007

<sup>60</sup> Health Expenditure Australia. <http://www.aihw.gov.au/publications/> accessed October 2007



## Operational infrastructure support

Queensland's independent medical research institutions are currently funded through different departments. For example Queensland Health funds the Queensland Institute of Medical Research. The Mater Medical Research Institute and the Wesley Research Institute are funded through the *Smart State Health and Medical Research Fund Operational Support Program* overseen by the Department of Tourism, Regional Development and Industry (formerly State Development).

The infrastructure support scheme for independent medical research institutes is crucial to support the indirect costs associated with conducting research, including meeting the operational costs of undertaking research not met elsewhere. These schemes should be available to all independent institutes, coordinated by one agency and paid on the basis of documented productivity and peer-reviewed performance.

## Queensland Health

Queensland Health provides infrastructure support to clinical researchers through joint appointments of academic clinical staff and through administrative support to those appointees. The decisions to support such positions are largely related to clinical need. Traditionally, most clinical research has occurred as an add-on activity to clinical and diagnostic laboratory activity. There have been a number of attempts to unbundle the cost structures of teaching hospitals, including the costs of clinical research. However, the resulting estimates are uncertain due to the difficulty in separating additional research care costs from standard care costs and due to the overlap between research and training costs.

Clinicians report that time available for research is decreasing in the face of other clinical and non-clinical including administrative demands. Lack of infrastructure to support and attract clinical trials means fewer trials are being initiated in Queensland hospitals, leading to missed opportunities. Queensland is under-represented in national and international clinical trials but has the potential to change this.

## Industry and other organisations

Smart State policy and State Government investment has seeded a health and medical biotechnology industry cluster. Queensland is capitalising on its outstanding biomedical research base. This research has become the basis of an emerging biotechnology industry that is further extending Queensland's drug and vaccine development pipeline. The State's biotechnology industry has grown from a standing start a decade ago into a substantial sector with 23 drugs<sup>61</sup> currently in clinical trial.

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<sup>61</sup> Biotechnology – Setting New Horizons: Queensland Biotechnology Strategic Plan 2005-2012. Queensland Government  
[http://www.dtrdi.qld.gov.au/dsdweb/v3/quis/templates/content/gui\\_cue\\_cntnhtml.cfm?id=20917](http://www.dtrdi.qld.gov.au/dsdweb/v3/quis/templates/content/gui_cue_cntnhtml.cfm?id=20917)

Queensland's biotechnology industry grew four-fold in the last 10 years.<sup>62</sup> The number of publicly-listed biotechnology firms in Queensland has risen from two to 12. There are approximately 90 companies involved in Queensland's health and medical biotechnology sector – in diagnostics and generics, therapeutics, vaccines, platform technologies, natural products, processing and regulatory support services. This growth is predicted to continue, with 3,500 jobs forecast by 2010 and 16,000 by 2025. By 2025 the market value of the industry is expected to be \$20B, with annual revenues of \$4B. Continued growth will require stronger interaction with the R&D sector and public health.

Queensland has probably underperformed in clinical and translational research aimed at discovering and validating new therapies to treat disease and in implementing proven interventions into clinical practice. However, the establishment of the Queensland Clinical Trials Network,<sup>63</sup> the proposed new Translational Research Institute at the Princess Alexandra Hospital/Mater Hospital and the planned BioPharmaceuticals Australia, a biomanufacturing scale-up facility, will facilitate the discovery and development of drugs and vaccines.

Potential exists to increase the number of contract research organisations and pharmaceutical companies undertaking research in the major Queensland precincts.

### Performance

The key ingredients for performance revolve around people: people with research passion, interest and skills; people with entrepreneurial capabilities and skills including business, marketing and finance skills; and visionary people who can partner, collaborate and make things happen. Research and development also requires capital infrastructure including specialist facilities, recurrent infrastructure funding and access to patients and facilitating organisations. Examples of high-performance research organisations and researchers are scattered in Queensland - organisations with untapped capacity to accelerate performance.

Benchmarking against other states based on NHMRC income suggests that Queensland has achieved some success but there is potential for further substantial improvement.

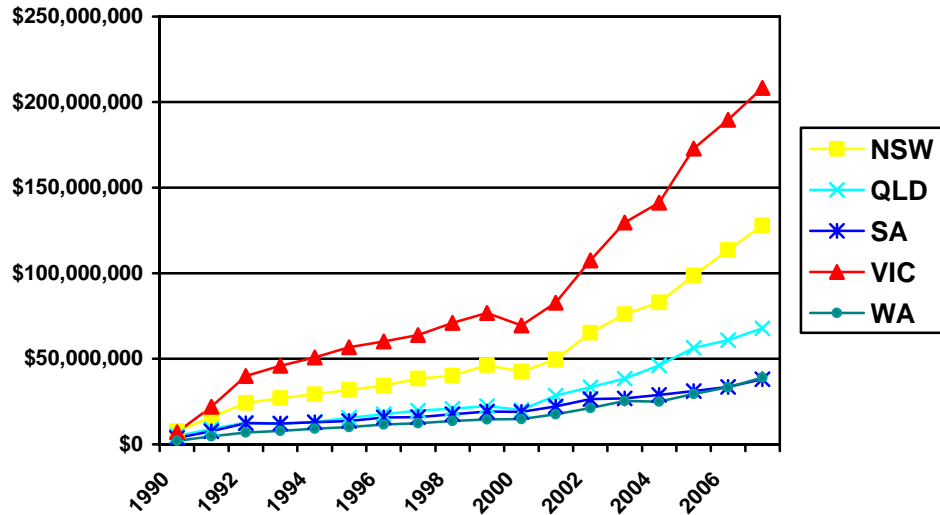
Queensland comprises approximately 20% of Australia's population but has attracted on average 13% of the NHMRC funding pool (refer to Figure 3). In the most recent funding announcement (November 2007), Queensland's share increased to over 14% - \$87.4 million compared to \$67.8M in the previous year. The majority of these funds support basic research.

<sup>62</sup> Smart State Strategy Progress Report 2007: Towards a dynamic future.

[http://www.smartstate.qld.gov.au/resources/publications/progress\\_report\\_2007/index.shtm](http://www.smartstate.qld.gov.au/resources/publications/progress_report_2007/index.shtm).

<sup>63</sup> The Queensland Clinical Trials Network mandate is to provide a visible point of contact for overseas and Australian companies to facilitate clinical trials in Queensland, and to promote and market local clinical trials service providers

At an organisational level, The University of Queensland ranked fourth nationally as a winner of NHMRC grants (\$40.2M in 2007). Of note, the top-ranked organisation secured almost as much funding as all Queensland organisations combined. The University of Melbourne secured \$71.9M or 14.3% of the total funds.



**Figure 3: NHMRC Funding by State 1990-2007**

*(Source: National Health and Medical Research Council)*

Queensland underperforms in relation to program funding, particularly in relation to clinical research. The NHMRC Centres of Clinical Research Excellence (CCRE)<sup>64</sup> program recognises and rewards successful clinical researchers. Of 23 CCREs awarded, Queensland has been awarded only two – the Centre for Clinical Research Excellence in Cardiovascular and Metabolic Disease<sup>65</sup> and the Centre for Clinical Research Excellence in Spinal Pain, Injury and Health.<sup>66</sup>

Based on publications in peer-reviewed journals and peer-reviewed NHMRC grants, Queensland and Queensland hospitals do not perform as well as similar sized institutions elsewhere. There are significantly less clinician-researchers, as well as nursing and allied health researchers, in Queensland teaching hospitals compared to Victoria.

Queensland has a significant and expanding basic research capacity, which can underpin a concerted biomedical and health research effort.

<sup>64</sup> The CCRE program aims to: support clinical (human) research with potential to lead to improved health outcomes for the community; foster training of clinical researchers, particularly those with a capacity for independent research and future leadership roles; and ensure effective translation of research.

<sup>65</sup> Professor Thomas Marwick, University of Queensland (based at the Princess Alexandra Hospital).

<sup>66</sup> Professor Paul Hodges, University of Queensland.

Queensland is enhancing its translational R&D capabilities through initiatives like: the sophisticated new hospital capital infrastructure; the recent investment into the establishment of several outstanding biomedical research institutes at The University of Queensland, Queensland Institute of Medical Research, Queensland University of Technology and Griffith University; and the proposed new Translational Research Institute at the Princess Alexandra Hospital/Mater Hospital.

### **Research culture and other challenges identified through consultations**

In the preparation of this report a series of consultations were undertaken with key stakeholders in health and medical R&D. The consultation process highlighted similar issues to those in the 2005 Queensland Health Systems Review.

*“...in health service delivery settings, health and medical research contributes to a culture of excellence and learning and is important for attracting and retaining good clinicians. In turn, the community in Queensland derives a direct benefit from improved quality of care particularly from research with a focus on delivery of health services and quality and safety”<sup>67</sup>*

Several important themes emerged which are in line with international findings. Systemic, cultural and workforce challenges were identified, including a lack of clinician-researchers, researcher-clinicians and specialist facilities to support translation of basic research into the health care setting.

The attractiveness of a clinician-researcher or academic medicine career is declining due to the widened remuneration gap with clinician peers – not only in private practice (several fold) but also in salaried public sector medical practice. The advent of the post-graduate medical degree, and the minimal financial support to young researchers wishing to undertake a research degree beyond their medical degree, militates heavily against the research career option. Mentorship is often lacking, as university academic departments progressively decline. There is no assured career path for researcher-clinicians, compared to non-researchers. The acquisition of a higher research degree is not valued when clinical appointments are under consideration.

The infrastructure for research is not transparent within the hospital system. While there is some provision for physical research space, the arrangements for payment whilst conducting research, access to support staff and other recurrent resources are not explicit. Further, clinical demands are squeezing research activity out of hospitals because of space limitations.

Increasing national and State requirements are leading to a large administrative burden. Ethical approval and contractual negotiations require ever greater

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<sup>67</sup> Queensland Health Systems Review Final Report September 2005. p18

documentation and extended time frames. Support staff to assist in these processes are few, with much of the less complex documentation left to clinicians.

No mechanisms exist at present that align and interface the activities of basic and clinical research organisations.

There is a need to improve the coordination between Queensland Health hospitals and the university sector, as well as university, industry and health. In addition, it's important the general community better understands the role of health and medical research and clinical trials. Within the healthcare setting - the "breeding ground" for clinical research – a number of barriers and impediments impact and limit ability to deliver on key research outcomes. However, the right leadership, communication and support could change the environment and culture to one that is conducive to research and competitive by international standards.

The consultation process identified a critical need for: academic leadership positions to provide mentorship of young clinicians; the building of research culture; and the building of critical mass through recruiting, training and retaining of clinicians and clinician-researchers. Academic departments in clinical settings need to be strengthened and a greater number of high-quality clinician-researchers appointed in leadership roles. These appointments need to have dedicated time to conduct research, as well as adequate physical space embedded within, or in close proximity to the clinical milieu. They also require access to support staff and resources beyond that which is secured through competitive grants. Queensland will benefit from restoring a collegiate team-based environment for clinical practice, instead of an individual clinician culture. Facilitation of fewer, stronger academic departments may accelerate performance.

Better alignment of purpose – both research and teaching – between Queensland Health, public and private hospitals, medical research institutes and universities would address a number of local challenges. Universities and Queensland Health hospitals must find ways to overcome the numerous obstacles identified through the consultation process, obstacles that discourage young clinicians from aspiring to and pursuing careers in translational and clinical research. These obstacles include: a capacity to conduct research in the hospitals; an increasing demand for healthcare delivery - heavy clinical commitments preclude effective research commitment; a hospital culture that is increasingly militated against research; major financial disincentives to undertake research; and uncertainty of substantial funding from the NHMRC, Smart State or other sources.

These findings are in line with current instabilities in academic medicine recently identified and reported through the International Campaign to Revitalise Academic Medicine,<sup>68</sup> which include:

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<sup>68</sup> Awatsthi S et al. (2005). Five futures for academic medicine: the ICRAM scenarios. *BMJ*; 331:101-104 <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1168885#box1>

- lack of capacity in translational research – that which brings innovations directly to patients
- the substantial gap between best, evidence-based practice and what actually happens
- the canyon between academics and practitioners
- the growing difficulty/perceived impossibility of a single individual being competent in practice, research, and teaching
- use of citation indices in research assessment, which overemphasises the value of basic research and underemphasises the importance of applied research that may bring more immediate benefit to patients
- lack of mutual respect among different categories of researchers—basic, clinical, public health, primary care, applied
- problems with career progression for academics
- the shortage of doctors wanting to enter careers in research
- the earning gap for doctors who enter careers in research and who ideally would be the “best and the brightest,” compared to those who can spend at least some time working in private practice
- research that is often not concerned with the biggest health problems (particularly true in a global context)
- clinicians who are often unimpressed with doctors who concentrate on research, although no clinicians are openly against research
- the high level of medical research that is undertaken by doctors with limited training in research methods—making for poor quality research
- the teaching of medicine by people with very little training in medicine
- great pressures on health services, such that academic medicine is often squeezed and forgotten.

In summary, although good progress has been made towards an internationally-competitive research precinct in Brisbane, Queensland still lags behind other states in research performance. A variety of cultural, systemic and administrative barriers limit the full potential of the research investment made by Government. No overall strategic plan underpins the State’s role and investment in research. These issues appear to be most prominent in the areas identified as critical blocks to research success – translational and clinical research.

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*In order to enhance translational and clinical research, major investment is required using a strategy that will bring about significant reforms under a strong governance structure.*

## **5. Queensland health and medical R&D tomorrow**

The vision, *to strengthen Queensland's health and medical R&D sector - to solve tomorrow's health problems TODAY*, requires action to address the opportunities and impediments identified by this report.

The only way forward is a systematic approach with solutions that address the systems' issues, raised by this report, including culture, workforce issues and commitment to overcoming the two translational blocks. This means developing greater and stronger research and business capacity and leadership, and a stronger Queensland cluster with broad collaborations. If Queensland is to compete locally and internationally and benefit from health and medical R&D, it requires commitment to a strategy with a strong vision and focus on research outcomes. Elements to enhance Queensland's current performance and achieve an internationally are discussed in the following sections.

### **Developing a strategic roadmap**

#### *Setting clear directions – full steam ahead*

The State's city and regional geography should define planning. Precincts of health and medical R&D should be clearly defined and maximised as an identifiable Queensland cluster, ideally in alignment with other planning frameworks such as the new Brisbane city plan. The majority of existing health and medical research institutions are based in metropolitan Brisbane, forming a natural starting point for a major research cluster. These organisations could be linked by a shared vision and strategic roadmap. Capacity building and linkages of the Griffith University/Gold Coast Hospital Knowledge Precinct and North Queensland precinct to the Brisbane precincts might be encouraged through collaborations and a range of agreements.

A shared vision and a unifying approach between Government and non-government agencies, health and medical R&D institutions, research funding organisations, industry and business will benefit the research endeavours and community of Queensland. A new business model and a strategic roadmap may be the starting point to optimise returns-on-investment, both financial and human resource.

A strategy is required to overcome cultural and institutional barriers, and focus the health and medical R&D agenda towards strong collaborative arrangements that render Brisbane a major international research precinct.

Strategies that address the two translational blocks will create opportunities with the potential of social and economic outcomes for the State and Queenslanders in the future.

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## Coordinating a statewide effort supported by Government

In recent years the State Government has strategically invested in the necessary capital infrastructure across the continuum - new hospitals, new research institutes, new networks and the biotechnology industry. In addition, investment is underway into programs to encourage and expand the skills base. The Smart State brand has achieved national recognition and should continue to be reinforced. Having planted the capital seeds, the next phase of operational growth and culture change needs to be driven by Government. A coordinated effort is essential.

Research priorities must be identified and areas of strategic weakness overcome. State Government funding for capital infrastructure, operational/indirect costs and priority-driven research should be allocated in a medium to long-term plan. Queensland would benefit from facilitating international marketing and linkages. Brokering collaborative partnerships to find solutions for key issues amongst the major players - universities, research institutes, private enterprise, biotechnology and pharmaceutical companies, hospitals and community health services - will require an entity with the necessary authority and expertise to influence all stakeholders. The federal Cooperative Research Centres scheme<sup>69</sup> is an example of what can be achieved.

## Investing strategically in research

### *Investing for the future of Queensland and Queenslanders*

The State Government's major capital works program is providing state-of-the-art public hospital capital infrastructure; there is also strong support for research infrastructure in hospitals, universities and independent institutes. The proposed Translational Research Institute at the Princess Alexandra Hospital/Mater Hospital is an important example of targeted investment that will address one of the key identified impediments to the R&D pipeline, while bringing together a range of important organisations in one precinct.

Reviews of international efforts suggest that ongoing government investment is vital to success. Government investment needs to be carefully configured to nurture independent research effort that will secure substantial federal government and non-government investment. At the present time, it is important to focus on investing in order to open up the product and services pipeline of productivity.

In 2005 the NHMRC established an Independent Research Institute Infrastructure Support Scheme in response to identified shortfalls in overhead infrastructure costs for independent medical research institutes. Similarly, Queensland and other state

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<sup>69</sup> <https://www.crc.gov.au/> accessed November 2007



governments<sup>70</sup> have instituted schemes to provide at least partial funding for crucial recurrent, indirect research costs.

An investment strategy to recruit, train and retain people with the necessary talent and skills to compete for national and international research dollars is paramount to future social and economic gains. Queensland Government investment can have a potent multiplier effect, particularly if those funds bring stakeholders into productive collaborative partnerships.

## **Building a translational research capability – linking Smart State and Smart Cities**

### *Securing the greatest health outcomes for Queenslanders and Queensland*

The need to strengthen the interfaces between basic and clinical researchers, university and industry, university and hospitals, research and business is critical to achieve the translation of research and knowledge into service delivery systems.

A sound platform on which to build a world-class Queensland health and medical R&D cluster exists in Brisbane. Major geographical precincts are forming – 109 Central (Woolloongabba to St Lucia) and the Herston/Kelvin Grove precinct. These two precincts sit squarely at either end of the knowledge corridor proposed in the *Smart Cities: rethinking the city centre* report.<sup>71</sup> (refer to Figure 4).

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<sup>70</sup> Victoria has two programs – Operational Infrastructure Support Grants Program (supports independent medical research institutes); and Science, Technology and Innovation Grants Program (supports the development of new private and public sector science and innovation infrastructure) – that can be used to develop of physical capital, human and social capital, and structural capital. New South Wales has a Medical Research Support Program and a Research and Development Capacity Building Infrastructure Grants Program.

<sup>71</sup> Smart State Council (May 2007). The Smart Cities: rethinking the city centre. [http://www.smartstate.qld.gov.au/partnerships/ss\\_councilreports.shtm](http://www.smartstate.qld.gov.au/partnerships/ss_councilreports.shtm) accessed September 2007; <http://www.smartstate.qld.gov.au/> accessed November 2007



**Figure 4: Brisbane Knowledge Cluster – anchored by two health and medical R&D precincts**

The Herston/Kelvin Grove precinct (Royal Brisbane and Women’s Hospital/ Queensland Institute of Medical Research/University of Queensland/Queensland University of Technology) and the Translational Research Institute at the Princess Alexandra/Mater Hospitals represent an important response to the current deficiencies in translational research.

The proposed comprehensive precinct based around the Princess Alexandra Hospital and future Boggo Road EcoScience Precinct - Translational Research Institute, BioPharmaceutical Australia and the Pharmacy Australia Centre of Excellence - constitutes a major initiative that should accelerate the translational research effort, and enhance the image of Queensland research organisations as a major health and medical R&D cluster.

There are opportunities to develop significant additional regional health and medical R&D precincts on the Gold Coast and in Townsville.

While there are some strong linkages within and between these centres, closer associations need to be established between researchers, companies and supporting infrastructure, with the formation of clusters or networks. Such clusters of people and technologies would have the capacity to nurture discoveries, turn them into marketable products and translate them into safe and effective clinical interventions.

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## **Strengthening the clinical research workforce**

### *Providing the very best of health*

This report identifies a need to build and strengthen the clinical research workforce. Current structural arrangements mitigate against an active translational research environment in hospitals and discourage clinicians from successfully combining a clinical and research career. The lack of an overarching research-supportive framework has resulted in an underdeveloped research culture and has led to lack of ability of many clinicians to undertake research. Arresting the decline and turning around academic clinical research departments will promote engagement of more clinicians in research activities and re-establish a research culture. Potentially immense challenges exist in changing the medical culture in Queensland. However, the gains in the future in terms of better health and community services, productive communities and direct and indirect economic and social benefits in the decades to come will be potentially immense.

Explicit support for clinician research positions, in association with universities, needs to be negotiated. Queensland is missing a cadre of clinician-researchers at senior level with substantial dedicated research time. High-quality researchers require access to a modicum of support funding independent of competitive grants, for example research assistants and administrative support staff.

The State must consider a strategy to further attract world-class researchers into key positions, with a particular focus on strengthening academic medical leadership. The significant disincentives currently operating must be removed or neutralised. There are probably insufficient researchers presently in Queensland to fulfil this role. A self-sustaining effort would be beneficial in the medium to long term, once a framework to cultivate home-grown clinical researchers is assembled.

The issues of career pathways, dedicated research time and the remuneration gap for clinician-researchers are critical issues to be addressed if the overall research strategy is to be effective.

## **Increasing the quality of health services research**

### *Conquering the complex issues surrounding modern health care delivery*

Health services research identifies processes to bring health interventions to people as effectively and efficiently as possible. Queensland Health makes an important investment in health services research because successful projects promise immediate benefits to the health system.

Systems are required to improve the integrity of health services research and to optimise the Queensland Health investment. Clinician-researchers, epidemiologists and social scientists are critical to high-quality research in this domain. A strategy is required to strengthen this workforce, targeting education, career development and infrastructure.

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## Establishing governance and monitoring performance

### *Bringing the very best to Queenslanders and Queensland*

Queensland can be a national leader, translating local discoveries into proof-of-concept and translating proven interventions into everyday practice. However, this won't happen without effective governance and leadership arrangements in place.

Developing a concerted effort is a challenge under the existing institutional structures. Staff contributing to the health and medical R&D efforts could be better interconnected. Health and medical R&D resources, responsibilities and accountabilities are spread across a number of government departments. An imperative for a strong coordinated approach with effective governance, budget, accountability arrangements, business systems and processes will ensure efficient and effective implementation of programs and the interconnections to deliver social and economic outcomes.

Moving research and teaching into a framework with clear strategies and key performance indicators has enormous potential to correct the current problems and ongoing skill shortages.

A successful Queensland research effort will require continuous effort. As each building block is established, new issues will emerge. A large investment may be required. Outcomes should be monitored to ensure appropriate goals are established, achieved and adjusted over time. Long-term oversight by a governance body with appropriate knowledge and links to key stakeholder groups represents an effective strategy to perform these functions.

## 6. What are the returns - Smart State gains

### *Healthier Queenslanders and a productive economy*

An immediate investment in translational and clinical health and medical research by the Smart State has the potential to leverage substantial future social and economic returns for Queensland.

The Mayo Clinic<sup>72</sup> which is the first and largest integrated, not-for-profit medical group practice in the world is an example of an institution dedicated/committed to medical education and research as well as patient care. The Mayo Clinic's mission is a good example of what Queensland should strive for "*to provide the best care to every patient every day through integrated clinical practice, education and research*".

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<sup>72</sup> Professor Len Berry has published several articles on lessons from the Mayo Clinic in terms of the brand and the organisation. Building a strong services brand: Lessons from Mayo Clinic (2007); The Collaborative Organization: Leadership Lessons from Mayo Clinic (2004); Clueing in Customers (2003 – Harvard Business Review).

The first and largest integrated, not-for-profit medical group practice in the world. It is an academic institution with major commitments to medical education and research in addition to patient-care.

Research investment will create an environment that is more conducive to recruitment and retention of high-calibre clinicians (medical, nursing and allied health), world-class researchers and skilled support staff.

If the health and medical R&D pipeline is opened up, the social and economic returns will be enhanced.

Although an accurate forecast of benefits has not been established, the following general returns to Queensland are anticipated:

**Social Benefits from**

- a healthier community and workforce
- the attraction and retention of research leaders, clinicians (medical, nursing, allied health), clinician-researchers, business leaders and others
- better, more collaborative, doctors informed by a strong research culture
- expanded availability of a scientifically-trained labour force
- better technical know-how in healthcare delivery
- more rapid access to the latest treatments and services.

**Economic Benefits from**

- improved health delivery outputs in relation to expenditure moderated by health workforce performance, treatment/technology gains and preventative/public medicine
- employment opportunities for Queenslanders
- jobs and incomes that result from the attraction of staff, the start-up of new businesses, and any competitive advantages enjoyed by local businesses when their 'technology' is advanced by research
- catalysts for matching investments from private donors, federal and industry research sponsors, and the research institutions themselves
- additional federal and international research dollar investments
- increased NHMRC and other peer-review research funding
- increased philanthropic support
- attraction of more research and related companies to the Smart State
- increased taxation revenue and increased employment.

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Buxton et al <sup>73</sup> present a selection of studies showing the economic value health research adds to societies (refer to Table 2).

**Table 2: Selection of studies showing the economic value to societies of health research<sup>74</sup>**

Study	Scope of research	Research input costed	Society of interest	Categories covered
Access Economics (2003) (33)	All biomedical	Yes	National: Australia	Intrinsic value to society
Australian Society for Medical Research (2003) (37)	Set of topics, including ulcers	Partially	National: Australia	Direct cost savings to health-care system
Moncayo (2003) (25)	Review of topic: Chagas disease	No	Multinational: Southern Cone countries	Direct cost savings to health-care system; healthy workforce
Rosenberg (2002) (39)	Review based on all biomedical	Partially	National: USA	Direct cost savings to health-care system; healthy workforce; benefits to the economy; intrinsic value to society
Kettler & Modi (2001) (47)	Review includes public sector contribution	No	National: India	Benefits to the economy: employment, exports, import substitution
United States Senate (2000) (37)	Collation/review related to NIH funding	Partially	National: USA	Direct cost savings to health-care system; healthy workforce; benefits to the economy; intrinsic value to society
Gadelha (2000) (40)	Programme: hepatitis B vaccine	Partially	National: Brazil	Benefits to the economy: import substitution
Funding First (2000) (42-48)	All biomedical	Yes	National: USA	Intrinsic value to society
Pardes et al. (1999) (38)	Review based on various research activities	No	National: USA	Direct cost savings to health-care system; healthy workforce; benefits to the economy
Afseth (1997) (27)	Collation of international research on topics including polio and tuberculosis	No	National: Norway	Direct cost savings to health-care system; healthy workforce; benefits to the economy
Cockburn & Henderson (1997) (73)	Public sector research contributing to drug development	No	National: USA	Benefits to the economy: assisting product development
Jacob & McGregor (1997) (28)	Set of health technology assessment projects	No, but possible	Subnational unit: Quebec, Canada	Direct cost savings to health-care system
Davy (1996) (24)	All biomedical: national and subnational	Partially	Subnational unit: Wisconsin, USA	Direct cost savings to health-care system; healthy workforce; benefits to the economy
Silverstein et al. (1995) (22)	Collation/review of specific topics and programmes	No	National: USA	Direct cost savings to health-care system; healthy workforce; benefits to the economy
Kirschner et al. (1994) (23)	Collation/review of specific topics and programmes	No	National: USA	Direct cost savings to health-care system
National Institutes of Health (1993) (29)	Set of projects and programmes	Yes	National: USA	Direct cost savings to health-care system; healthy workforce
Raiten & Berman (1993) (75)	Topic: methodology for producing monoclonal antibodies	Yes	National: USA	Benefits to the economy: employment
Drummond et al. (1992) (30)	Programme: laser therapy for diabetic retinopathy	Yes	National: USA	Direct cost savings to health-care system; healthy workforce
Mansfield (1991, 1998) (35, 36)	All public basic research	Yes	International	Benefits to the economy: rate of return
Fudenberg (1983) (19)	Programme: polio vaccine	Yes	National: USA	Direct cost savings to health-care system; healthy workforce
Mushkin (1979) (17)	All biomedical	Yes	National: USA	Healthy workforce: rate of return
Weisbrod (1971, 1983) (20, 21)	Programme: polio vaccine	Yes	National: USA	Direct cost savings to health-care system; healthy workforce
Council for Scientific Policy (1967) (26)	Topic: international tuberculosis research	No	National: UK	Direct cost savings to health-care system

<sup>73</sup> Buxton et al (2004). Estimating the economic value to societies of the impact of health research: a critical review, Bulletin of World Health Organisation, vol 82, pp 733-9.

<sup>74</sup> Ibid p735

## 7. Conclusion

The report has identified the need for a three-point “G3” strategy for immediate attention to accelerate Queensland’s health and medical R&D. The strategy should encompass strategic investment by government (G1) building critical mass (workforce), through geographical linkages (G2), and strong governance (G3) arrangements:

- Continuing Government financial and policy support is required for Queensland to establish a world-class health and medical R&D cluster. Additional funding is required to overcome strategic blocks in the health and medical R&D pipeline to enhance translational and clinical research.
- Activity should be focused in precincts to foster effective collaborations among R&D organisations and build a world-recognised Queensland cluster.
- Coordination of effort through strong governance with all stakeholders sharing a common vision and purpose will encourage strong alignment of research and development, building Queensland’s health and medical R&D organisations into a prominent, effective and competitive research cluster.

These broad strategy areas require immediate attention to accelerate Queensland’s health and medical R&D.

By investing today in translational and clinical health and medical research, the Smart State can leverage substantial future social and economic returns for Queensland. This investment will create an environment that is more conducive to the recruitment and retention of high-calibre clinicians, world-class researchers, business leaders and skilled research and administrative support staff. It will lead to improved health and medical R&D outputs, to improved delivery of cost effective health services. and most, significantly, solving tomorrow’s health problems.

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