CONTENTS

CHAIRMAN’S FOREWORD 5
ACKNOWLEDGEMENTS 7
EXECUTIVE SUMMARY 9

1 INTRODUCTION 17

1.1 WHY A REVIEW? 17

1.2 THE REVIEW PROCESS 17
   1.2.1 Initial consultation and issues paper (September to October 2012) 17
   1.2.2 Further consultation, data analysis and discussion paper (November to December 2012) 18
   1.2.3 Final consultation and data analysis (January to April 2013) 18
   1.2.4 Final report 18

1.3 THE CASE FOR CHANGE 19
   1.3.1 How does Sydney’s performance in health and medical research compare? 19
   1.3.2 Internal fragmentation 23
   1.3.3 The changing landscape of health and medical research 25

1.4 THE WAY FORWARD 26
   1.4.1 Three scenarios 26
   1.4.2 The framework for reform 27
   1.4.3 Conclusion 27

2 SETTING STRATEGIC PRIORITY AREAS FOR RESEARCH FOCUS 29

2.1 WHY ESTABLISH STRATEGIC PRIORITY AREAS? 29

2.2 CRITERIA FOR IDENTIFYING POTENTIAL STRATEGIC PRIORITY AREAS 30
   2.2.1 Priority areas must draw on disciplines that have sufficient capacity, scale, quality and demonstrated (academic) impact 30
   2.2.2 Priority areas must intersect with national and international health priorities 34
   2.2.3 Priority areas must align with research that inspires researchers 36

2.3 CANDIDATE STRATEGIC PRIORITY AREAS FOR RESEARCH FOCUS 36
   2.3.1 Obesity, diabetes and cardiovascular disease 37
   2.3.2 Cancer 39
   2.3.3 Mental health and neuroscience 42
   2.3.4 Infectious diseases 44
   2.3.5 Recommendation for strategic priority areas for research focus 46

2.4 COMMON ELEMENTS OF SPARCs 46
   2.4.1 Introduction 46
   2.4.2 Cross-cutting themes 46
   2.4.3 Whole life span 50
   2.4.4 Translation pipeline (vertical integration) 51

2.5 CONCLUSION 53
### 3 FACILITATING RESEARCH EXCELLENCE AND IMPACT

#### 3.1 PARTNERSHIPS FOR RESEARCH TRANSLATION
- 3.1.1 Research partnerships with health care providers
- 3.1.2 Research partnerships with industry

#### 3.2 INFRASTRUCTURE FOR RESEARCH CAPABILITY
- 3.2.1 Current state of Sydney’s major research infrastructure
- 3.2.2 Future directions for major research infrastructure

#### 3.3 STAFFING FOR RESEARCH EXCELLENCE
- 3.3.1 Current staff recruitment, retention and development at Sydney
- 3.3.2 Future directions

### 4 REFORMING GOVERNANCE AND STRUCTURE

#### 4.1 CONTEXT: INCREASING INTEGRATION BETWEEN THE RESEARCH AND HEALTH SECTORS

#### 4.2 GOVERNANCE AND STRUCTURE FOR THE SPARCs
- 4.2.1 Introduction
- 4.2.2 Analysis of current levels of collaboration in the SPARCs
- 4.2.3 Modus operandi: the matrix approach
- 4.2.4 Governance: a scalable framework
- 4.2.5 Strengthened senior executive support and oversight for large-scale cross-faculty collaborative efforts

#### 4.3 STRUCTURE AND GOVERNANCE OF EXISTING ORGANISATIONAL UNITS AND AFFILIATED ENTITIES
- 4.3.1 Current arrangements
- 4.3.2 Future directions

#### 4.4 CONCLUSION
5 ENHANCING BUSINESS PROCESSES AND ICT SYSTEMS TO SUPPORT COLLABORATION

5.1 CONTEXT: EFFECTIVE ICT RELIES ON STRATEGIC BUSINESS PROCESSES

5.2 CURRENT STATE OF AFFAIRS AT SYDNEY

5.2.1 Infrastructure

5.2.2 Interconnectivity between networks – the ‘firewall’ issue

5.2.3 Data-sharing

5.2.4 Access credentials

5.2.5 Academic profile system

5.2.6 Sharing data between corporate systems

5.2.7 Identity management

5.3 FUTURE DIRECTIONS

5.3.1 Infrastructure upgrade

5.3.2 Integration of corporate systems

5.3.3 Inter-institutional agreements

5.3.4 University-wide governance

6 IMPLEMENTATION

6.1 DELIVERING ON THE TERMS OF REFERENCE

6.1.1 Implementing the recommendations

6.1.2 Resources for implementation

6.1.3 Executive Steering Committee membership

6.1.4 Terms of Reference for the Executive Steering Committee

APPENDICES

APPENDIX A

TERMS OF REFERENCE

APPENDIX B

INDIVIDUALS AND GROUPS WHO HAVE PARTICIPATED IN THIS REVIEW

APPENDIX C

FIELD OF RESEARCH CODES FOR HEALTH AND MEDICAL RESEARCH AT SIX-DIGIT LEVEL

APPENDIX D

EXAMPLES OF GENERIC BARLOW PLOTS

APPENDIX E

STAFF INFORMATION FOR FIGURE 1.7

GLOSSARY
I am pleased to present this final report of the Health and Medical Research Strategic Review on behalf of the Advisory Committee. We were asked by the Vice-Chancellor to conduct a strategic review of the University of Sydney’s health and medical research in order to better position the University and strengthen its capacity to respond to major changes occurring within the health and medical research sector across Australia and worldwide. This report makes recommendations as to how this can be achieved over the next 10 years.

During the course of this review I have had the opportunity to meet many people engaged in many different areas of health and medical research across the University’s network. I was struck by their deep commitment to research excellence and their strong desire to make a tangible difference to health outcomes nationally and globally. These qualities are consonant with the report’s recommendations and will be valuable to the implementation process.

High-quality health and medical research is a powerful driver of innovation and is essential to the effectiveness of our health services and improved community wellbeing.

Australian governments are investing over $4 billion annually in health and medical research; increasingly they are looking to the research community to help tackle the complex factors driving growth in health expenditure. The NSW Government alone has an annual health budget of $17 billion; and according to a recent report by the Grattan Institute, government budget projections for the next decade indicate there will be sustained increases in government spending, especially in the health sector.

These circumstances are changing not only the health-care environment but also the health research landscape. Researchers need to be well positioned not only to continue the important quest for discovery but also to focus explicitly on the health challenges of primary concern to funders and providers of health care services.

The University of Sydney has a pre-eminent position in health and medical research in NSW and Australia. This position has been established over many decades, building on the skills, commitment and dedication of the research workforce in the University and in the well-respected institutes and centres affiliated with it, as well as on strong performance in competitive grants, excellent research outcomes, substantial new capital investment, and ongoing connections across a vast and diverse clinical network.

This review has found, however, that despite these strengths and the scale and breadth of its research, the University of Sydney is not being assessed as first in Australia as often as could be expected, and in some areas of health and medical research is being outperformed by other Go8 universities.

Through a process of consultation, analysis and benchmarking the Advisory Committee is advocating a number of recommendations and actions which, if implemented over the next 10 years, will re-position the University to achieve the following vision:

**The University of Sydney will be recognised as a world leader in health and medical research and will deliver outcomes of significant benefit for the health and wellbeing of society.**

Implementing the review recommendations will position the University to play a leading role in redefining how health and medical research will contribute to meeting significant societal challenges.

I commend this report to the Vice-Chancellor. It has been a pleasure and privilege to Chair this review, and I extend my thanks to all those who have provided input to it and to those who have worked on this report.

Mr Peter Wills AC
ACKNOWLEDGEMENTS

The chairman of the review, Mr Peter Wills AC, would like to acknowledge and thank those who participated in the review at all phases.

Special thanks are given to the members of the Advisory Committee:

- Professor Michael Good, AO, Australia Fellow, Griffith University
- Professor Stephen Leeder, AO, Chairman, Western Sydney Local Health District, Director, Menzies Centre for Health Policy
- Hon. Ron Phillips, Chairman, Sydney Local Health District
- Professor Carol Pollock, Chairman, Northern Sydney Local Health District, Professor Medicine, Northern Clinical School
- Professor Russell Lansbury, AM, Emeritus Professor, Sydney Business School
- Professor Jill Trewhella, Deputy Vice-Chancellor, Research
- Professor Bruce Robinson, AM, Dean, Sydney Medical School, Chairman, Division of Medicine, Nursing, Dentistry and Pharmacy
- Professor Kathryn Refshauge, Dean, Faculty of Health Sciences

SECRETARIAT

- Annette Schmiede, Strategic Advisor
- Roni Roberts, Executive Manager, Strategic Research Reviews and Major Projects
- Ewan Coates, Data analysis and support
- Sydney Research Analytics and Data Strategy Team, Data analysis and support
- Tim Haydon, Writing and editing

The review team would like to thank Professor Graham Mann for his assistance in data analysis and careful critical review of findings.
The University of Sydney (Sydney) has a proud tradition of health and medical research that has scale, quality, and breadth of capability, as well as extensive links to the state health system. This Health and Medical Research Strategic Review (the review) was undertaken to ensure that, in a time of tightening research budgets and significant government reform in health and in research more broadly, Sydney is well placed to advance its interests and maintain its strong position. The review has focused on how Sydney can optimise the comprehensive resources of its health and medical research over the next 10 years.

SETTING THE SCENE

In the past year, major reviews commissioned by the state and Australian governments have called for research to have greater impact on health-care practice, on the delivery of health services and on the development of evidence-based health policy. The Chief Scientist’s National Research Investment Plan is also calling for more targeted investment in research aligned with national priorities, including population health and wellbeing. These reviews and plans are taking place in increasingly straitened fiscal environments, which will only intensify the calls for evidence that health outcomes are improving as a result of public investment in research.

In this rapidly evolving landscape, an examination of the University of Sydney’s health and medical research indicates there are compelling reasons for change. Close consideration of the available data from a number of perspectives shows that the position of health and medical research at Sydney is under intense pressure from strong competitors.

Through extensive consultation, the review identified three main challenges for health and medical research at Sydney:

– How to strategically focus the efforts of the University’s health and medical research community around a set of clear priorities that respond to society’s health needs.

– How to address, through structural and governance reform, what is now an unwieldy, complex and hard-to-understand research enterprise, while maintaining the benefits of local innovation and discovery.

– How to build multiple networks of researchers by providing reliable access to information, resources and infrastructure that are essential to enabling and augmenting collaboration.

THE VISION

The review concluded that a first step would be to establish a vision to guide the way forward:

The University of Sydney will be recognised as a world leader in health and medical research and will deliver outcomes of significant benefit for the health and wellbeing of society.

This vision will be realised by harnessing the world-class research undertaken across the University’s integrated network of faculties, affiliated research institutes and hospitals and by enabling researchers to collaborate strategically around common goals.

REALISING THE VISION

To realise the vision, Sydney will achieve four strategic objectives.

1. Identify and support strategic priority areas for research focus that leverage the University’s research excellence, align with our researchers’ values, and deliver significant benefits for society.

2. Facilitate research excellence and impact by making Sydney’s strengths in the Strategic Priority Areas for Research Collaboration (SPARC) highly visible to health care providers and industry, to expedite partnerships and opportunities for translation and commercialisation, and by making “outstanding staff supported by state-of-the-art research facilities” the hallmarks of research excellence at Sydney.

3. Establish strong, effective governance with clear lines of authority, accountability and responsibility to enhance overall research performance and enable greater integration with the health care provider network to increase translation into better health outcomes for individuals, communities and populations.

4. Develop business processes and information and communication technology (ICT) systems to facilitate cross-disciplinary, cross-faculty and cross-organisational health and medical research.
A summary follows of the review’s recommendations and key actions for each of these four strategic objectives that set the frame for responding to the Terms of Reference (Appendix A). Additional actions are detailed in the body of the report (pale yellow boxes).

SETTING PRIORITIES FOR STRATEGIC RESEARCH

STRATEGIC OBJECTIVE 1
Identify and support strategic priority areas for research focus that leverage research excellence, align with our researchers’ values, and deliver significant benefits for society.

Selection of strategic priority areas for research focus must be criteria-driven and evidence-based. The criteria for identifying priority areas are demonstrated research strengths that address significant national and international health challenges and that will inspire the creativity and innovation of our researchers. The evidence for research strengths drew upon analysis and benchmarking of research performance data. Four priority areas were identified to serve as focal points for research activities across the University’s multiple campuses and partner organisations and to maximise community impact at each of the geographic hubs of health delivery activity where University research is conducted.

RECOMMENDATION 1
Support the following four strategic priority areas for research focus:
– obesity, diabetes and cardiovascular disease
– cancer
– mental health and neuroscience
– infectious diseases.
Each of these will be known as a Strategic Priority Area for Research Collaboration, or SPARC.

KEY ACTIONS
– Develop and implement strategic plans for each of the four SPARCs.
– Harmonise the leadership and governance of the SPARCs so there is transparency and clarity both internally and externally with regard to decision-making and authority (see Recommendation 6).
– Review the SPARCs two years after establishment and every five years thereafter to ensure University research investment continues to be aligned with research strengths and health priorities.

The recommended SPARCs are strategically focused on delivering outcomes for specific disease groups. Yet feedback from the consultation process identified certain common capabilities to improve health outcomes across all disease groups that merit specific attention. Three such ‘cross-cutting themes’ have been nominated because they have widespread implications and are critical to attaining outcomes of recognised national significance.

RECOMMENDATION 2
In each of the SPARCs, optimise the University’s collective capacity to:
– contribute to:
  • integrated health care – for improved health and wellbeing of the individual
  • population health and health services – for improved health outcomes for all Australians
  • Aboriginal and Torres Strait Islander health – for improved health outcomes for these particularly disadvantaged groups within the Australian community.
– consider health at all stages of life
– develop a vertically integrated translation pipeline, from basic research through to clinical practice, policy and products.

KEY ACTIONS
– Invest in the four SPARCs to deliver practice and policy outcomes in the cross-cutting themes.
– Promote partnerships between researchers and health-care practitioners that address research questions arising directly from practice across all health settings.
– Appoint a Director of Aboriginal and Torres Strait Islander research responsible for establishing and chairing an Aboriginal research network, as recommended in the University of Sydney Wingara Mura – Bunga Barrabugu (Wingara Mura) strategy.

FACILITATING RESEARCH EXCELLENCE AND IMPACT

STRATEGIC OBJECTIVE 2
Facilitate research excellence and impact by making Sydney’s strengths in the SPARCs highly visible to health care providers and industry, to expedite partnerships and opportunities for translation and commercialisation, and by making outstanding staff supported by state-of-the-art research facilities the hallmarks of research excellence at Sydney.

Sydney undertakes research across the spectrum of medicine, nursing, health sciences, allied health, public health, health services and health policy. This engagement in health care at all levels positions Sydney well to meet the demand for translational research. Establishing translational research practices that are truly integrated with health-care provision through the fostering of stronger partnerships offers a major opportunity for Sydney. To take it up requires: increased research activity and collaboration across all the health faculties; an integrated strategy to translate research
into health policy development; and improved mechanisms to facilitate two-way knowledge translation between researchers and providers. In addition, Sydney should increase its engagement with industry. This will require more support for researchers to develop their ideas with a view to commercialisation, and a coherent strategic view of where the University’s health and medical research leads the field and where opportunities for commercialisation lie.

**RECOMMENDATION 3**
Support each SPARC to:

- partner with health care providers to develop and implement an integrated strategy to optimise the translation of research into improved health-care practice and policy
- strengthen industry-supported innovation across the care continuum.

**KEY ACTIONS**

- Demonstrate support for strong collaboration with the health system by prioritising partnerships, such as by encouraging and supporting applications to the National Health and Medical Research Council (NHMRC) Partnership for Better Health Program.
- Proactively seek community, health care provider and industry input in forming the research agenda and opportunities for research translation within each SPARC, eg through the NSW Peak Community Participation Council (PCPC), and workshops with health care provider networks (for example Local Health Districts, Medicare Locals, industry forums, etc).
- Formalise agreements to work with the NSW Health Agency for Clinical Innovation and the Clinical Excellence Commission to improve evidence-based research translation into clinical practice.
- Partner with primary and community care providers to increase research training opportunities and to foster a stronger research culture within the primary care and community setting.
- Develop a more strategic approach to clinical trials that brings together those involved in clinical trials across the University research community – internal and affiliated groups – to enhance translation.

Research excellence requires state-of-the-art research facilities. The University is developing and implementing a strategic framework for centrally managed core facilities, starting with those needed for the Charles Perkins Centre. This framework will maximise University-wide investment in high-cost, state-of-the-art research infrastructure, provide a robust approach to identifying research infrastructure aligned with the SPARCs, and ensure that core facilities have sustainable operating models, including ongoing investment, to deliver the appropriate expert support, maintenance and, where appropriate, research and development, to keep the equipment state-of-the-art.

**RECOMMENDATION 4**
Implement the strategy for consolidating, managing and investing in high-cost core research facilities and capabilities. Provide an IT platform to facilitate access and enhance research collaboration.
KEY ACTIONS
– Support the University’s core research facilities program, focusing initially on research infrastructure necessary for the SPARCs, and thereby support collaborative access to facilities across the health network.
Research excellence also requires, self-evidently, outstanding researchers. As the University develops its strategy for health and medical research, it is timely to place renewed emphasis on the development of support and training for its researchers. A greater commitment should be given to programs for attracting, developing and retaining researchers of the highest quality who are capable of working in collaborative, cross-disciplinary teams as well as conducting discipline-focused research.

RECOMMENDATION 5
Establish comprehensive recruitment, retention and development programs to:
– attract new researchers, especially within the SPARCs
– provide mentoring and skills development for researchers at all stages of career
– provide skills development opportunities to prepare researchers for membership and leadership of collaborative research partnerships.

KEY ACTIONS
– Encourage and support greater numbers of research fellowship applications, balancing early, mid-and established-career applicants to support strong leadership today and in the future.
– Work with the NSW Ministry of Health to establish an elite researcher scheme to attract leading Australian and international researchers to NSW to work in fields of mutual interest to the ministry and the University.
– Establish recruitment and mentoring schemes to encourage and support more Aboriginal and Torres Strait Islanders to become health and medical researchers, beginning with the recruitment of students to postgraduate study from undergraduate cohorts within and beyond Sydney.
– Provide training for University researchers to develop their capacities for membership and leadership of collaborative research partnerships.

REFORMING STRUCTURE AND GOVERNANCE

EXECUTIVE SUMMARY

The matrix approach: cross-disciplinary thematic research draws on the strengths of faculty-based disciplines
The success of the SPARCs and the strength of Sydney’s health and medical research overall will depend greatly on the effectiveness of the structural and governance arrangements that support them. In terms of the SPARCs, Sydney has already taken several actions to promote cross-disciplinary, cross-faculty and cross-organisational research collaborations that also respond to the needs and expectations of government, funders and society – principally through the Charles Perkins Centre (CPC), the Sydney Research Networks Scheme (SyReNS), and networks such as the Cancer Research Network and the Sydney Health Policy Network. However, feedback to the review indicated a need for greater clarity about how such collaborative ventures are governed and operate, how smaller networks could progress as they become successful, and how agreements are made and operational support is provided. It is in this context that the review formulated the underlying modus operandi of these collaborative research networks that span disciplines, faculties and in some cases organisations, and developed a framework for strengthening and harmonising their governance, taking into account that they operate at different scales.

**RECOMMENDATION 6**
Align the governance of the SPARCs with the scalable governance framework for collaborative research networks, and formally recognise that the modus operandi of the SPARCs is the matrix approach which integrates faculty-based disciplinary excellence and cross-disciplinary engagement.

**KEY ACTIONS**
- Adopt the governance framework for collaborative research networks that are cross-disciplinary, cross-faculty and cross-organisational (for example medical research institutes, health care and industry partners).
- Using a transparent competitive process, select and appoint academic directors for each of the SPARCs and charge each with developing its strategy.
- Form a SPARC leadership group from the academic directors of the SPARCs and make it responsible for monitoring and reporting on all the SPARCs.
- Recognise the SPARCs as the University’s formal mechanism for connecting with the NSW Research Hubs (NSW Hubs).

Implementing the proposed strategy to enhance health and medical research collaboration at Sydney will require senior-level oversight and support. The review is recommending therefore that the University establish a new Pro-Vice-Chancellor position, reporting to the Deputy Vice-Chancellor, Research, to oversee the coordination and support of the SPARCs and the centrally managed core research facilities program.

**RECOMMENDATION 7**
Establish a new Pro Vice-Chancellor, Research (PVCR), position to oversee the implementation of the SPARCs and the necessary collaborative infrastructure, and to provide oversight and support for the performance and outcomes of the large-scale cross-faculty research collaborations and partnerships.

**KEY ACTIONS**
- Recruit and appoint the Pro Vice-Chancellor, Research.
- Establish a team within the Research Portfolio to support the PVCR with the implementation and ongoing oversight of the SPARCs.

Data on research performance, collaboration, coherence and focus clearly suggest that some of the key health and medical disciplines are fragmented by geography as well as by organisational structures. This weakens the disciplines themselves and compromises their capacity to
support cross-disciplinary and cross-faculty collaborations. Consolidation of the organisational units responsible for nurturing these key disciplines may therefore be warranted. The review heard that geographical, and intellectual, isolation is felt particularly by researchers in Health Sciences (currently the only faculty on the Lidcombe Campus) and Nursing and Midwifery (currently in sub-optimal facilities on Mallett Street). With the completion of the CPC building, there will be an important opportunity to collocate cognate disciplines, and in particular to bring researchers in Nursing and Midwifery, and Health Sciences onto the Camperdown Campus in a health precinct around the CPC building.

**RECOMMENDATION 8**

Require each of the faculties involved in health and medical research to individually and collectively consider their internal structures (schools, research groups) so they are optimising research disciplinary excellence and engagement with the SPARCs.

**KEY ACTIONS**

- Support the faculties with data analysis and tools to consider options for strengthening key disciplines, with particular emphasis on those disciplines essential for the SPARCs.

**RECOMMENDATION 9**

Collocate the health faculties into a smaller number of precincts to minimise geographical isolation of particular research groups and to maximise opportunities for collaboration and the development of critical mass.

**KEY ACTIONS**

- Capitalise on the occupation of the CPC building and attendant decanting of space to strategically collocate health disciplines and create a coherent health and medical research precinct on the Camperdown Campus.
- Conduct a broad consultation to explore how decision-making and planning within and between the health divisions might be improved.

There has been a proliferation of research centres both within the University and affiliated externally with it. These range from viable large-scale operations to unsustainable small-scale groupings. Some are recognised brands. Many place an unnecessary administrative burden on the University, and their activities could easily be incorporated into existing organisational units.

**RECOMMENDATION 10**

Strengthen the requirements in the University Centres Policy to provide more focused reviews of sustainability and risk. Provide resources for the Group Secretary Office (GSO) to complete reviews of all centres and institutes.

**KEY ACTIONS**

- Review all internal health and medical research entities in line with the amended Centres Policy and where appropriate wind up or amalgamate entities to strengthen critical mass, improve coordination and increase efficiencies.
- Provide resources for the GSO to develop and maintain a comprehensive list of all health and medical research entities associated with the University.
- Establish a single point of responsibility for centres administration to enable planning, resourcing and reporting in a cost-effective manner.

The medical research institutes (MRIs) are critically important to the University’s medical research community. However, issues of financial sustainability, blurred reporting lines and accountabilities, and the University’s legal liability in the event of a finding against an institute are unresolved. Secure and strategic partnering between the University, the independent institutes and the hospital-owned institutes would provide a solid foundation for managing the University’s relationships with the proposed NSW Hubs and national Integrated Health Research Centres. The governance framework (Recommendation 6) with its formal collaboration agreements offers that opportunity.

**RECOMMENDATION 11**

Actively seek strategic engagement with medical research institutes, health-care providers and industry and support their participation in and benefit from the SPARCs.

**KEY ACTIONS**

- Initiate round tables and workshops to engage potential participants broadly, as was done for the CPC, in developing research strategies for each of the SPARCs.

**ENHANCING BUSINESS PROCESSES AND ICT SYSTEMS**

**STRATEGIC OBJECTIVE 4**

Develop business processes and ICT systems to facilitate cross-disciplinary, cross-faculty and cross-organisational health and medical research.

A constant theme heard by the review has been the need to invest in and align key business processes and ICT systems to support collaborative health and medical research across the University and with external partner organisations. Notwithstanding the significant improvements in ICT systems and infrastructure over the past couple of years, the review has concluded that further investments in technology will not be optimised unless the underlying business processes are developed and governed in a more coherent, strategic fashion.
RECOMMENDATION 12
Establish senior executive-level governance of University-wide ICT capabilities to achieve alignment and coherence in policies, processes and systems to enhance support for cross-disciplinary, cross-faculty and cross-organisational collaborative health and medical research at Sydney.

KEY ACTIONS
– Accelerate investment in the current upgrade to the network across the University to ensure appropriate and adequate bandwidth for research purposes.
– Develop ICT systems capable of supporting, monitoring and reporting on large-scale research collaborations.
– Develop agreements with all external research partners to streamline communications, connectivity and data-sharing across all health and medical networks and work sites.

DELIVERING ON THE STRATEGY
Achieving the strategy proposed in this report will take several years; there are few quick fixes when grappling with the complexities of maximising the outcomes of health and medical research. Therefore sustained leadership and political commitment will be necessary to ensure that this vision for Sydney to attain national pre-eminence and greater international recognition in important areas of health and medical research is realised within the next decade.

The Australian community invests $4 billion in health and medical research every year. The review’s recommendations have been framed to position the University to succeed in a research landscape that continuously changes. The recommendations, like research itself, will not produce immediate results; they will however provide a solid foundation to strengthen and energise health and medical research at Sydney.

Implementing change will require work and resources. To carry it out and ensure the changes endure, the University as a whole must be engaged. Implementation must be planned carefully, with wide consultation to refine concepts and approaches.

It is critical that the University now respond to the report and commit to its recommendations. Planning their implementation will then require senior leadership and support, and strong grass-roots backing.

RECOMMENDATION 13
Establish an Executive Steering Committee reporting to the Vice-Chancellor to plan and oversee implementation of the recommendations. Establish an independent chair for the committee, to be appointed by the Vice-Chancellor.

KEY ACTIONS
– Develop a clear implementation plan that reflects the priorities of the recommendations and includes resourcing and a timetable, to be endorsed by the Senior Executive Group (SEG) Research Committee for approval by SEG.
– Appoint to the Executive Steering Committee
  – senior members of the University Executive who are able to ensure the University’s commitment to integrated education and research is reflected in implementation of the health and medical research strategy; and the business processes and systems support the strategy; and
  – a senior representative of the NSW health ministry able to ensure the University health and medical research strategy is appropriately integrated with and supports the NSW health delivery system.

HOW WILL WE KNOW IF THE STRATEGY IS A SUCCESS?
The strategy will be successful when, in health and medical research, Sydney is:
– the university of choice for research leaders and future research leaders
– first in the nation more often, and higher in international league tables
– recognised by the health system for its research strengths and for its capabilities in translating research into practice at all levels – medical diagnostics and therapeutics, nursing, primary health care, preventive health care, allied health, health services and health policy
– showing increased funding and high-quality outputs for health and medical research.
1 INTRODUCTION

1.1 WHY A REVIEW?
The University of Sydney has a proud tradition of health and medical research that has scale, quality and breadth of capability, as well as extensive links to the state health system.

It is one of the largest health and medical research enterprises in Australia, and produces high-quality research outputs across diverse fields. In 2012, some 1850 researchers contributed to these outputs and earned $210 million in research income. The 2012 Excellence in Research Australia (ERA 2012) quality assessment rated 16 of the 17 health and medical sciences fields of research (FoRs) at Sydney as ‘above’ or ‘well above’ world standard.

Researchers are predominantly based in the Faculty of Medicine, but a significant portion are also distributed through about half of the University’s other 15 faculties. Layered on the faculty structures is a complex network of interdependent research entities as well as several external affiliated research entities, each established in response to local or historical needs and conditions.

Clinical research and training are supported by relationships with the state’s major metropolitan Local Health Districts (LHDs) and its Rural Health Network; as a result, Sydney’s research and teaching activities are geographically spread across the state. These University clinical training programs produce around 30 percent of NSW’s graduates destined for careers as health professionals across the broadest range of disciplines of any Australian university.

As governments (both state and Australian) and communities increasingly look to health and medical research for solutions to their rapidly growing health needs and for evidence of impact on public health, the importance of the University’s contribution in health and medical research and training to the national and state health systems and the wellbeing of the population cannot be overstated.

There is evidence, however, that, notwithstanding the breadth, scale and quality of health and medical research at Sydney, insufficient attention has been paid in recent years to clearly articulating a strategy that is responsive to the rapidly changing national and international environment in which that research operates, and then to supporting it with optimised organisational structures and processes. For example, given the scale, strength and breadth of Sydney’s research, fewer areas than one would expect are assessed ‘first’ in Australia by the conventional indicators – international rankings, and high-level, long-term benchmarking against research income, publications and citations. In many key areas the rankings and benchmarking data show the University is being outperformed. It is also often said that it is hard to understand how the University makes decisions about health and medical research, or to discern who has authority or who is accountable.

Against this background, the Sydney Health and Medical Research Strategic Review was initiated in September 2012.

1.2 THE REVIEW PROCESS

1.2.1 INITIAL CONSULTATION AND ISSUES PAPER (SEPTEMBER TO OCTOBER 2012)
The review began with broad consultation on the challenges facing Sydney’s health and medical research and what steps should be taken to strengthen its capacity to respond to these challenges as well as to take advantage of the opportunities now on offer. Input was received from a wide range of researchers, faculty deans and heads of school; institute and centre directors, including independent medical research institute directors; health service providers, and government. The quality and scope of the research being undertaken throughout the University were considered – including how well organisational structures align with and support capabilities in key disciplines and cross-disciplinary areas, and how far institutional processes and systems build and, importantly, maintain the necessary capabilities for productive health and medical research. The initial findings of the review were presented in an issues paper, published on 29 October.
1.2.2 FURTHER CONSULTATION, DATA ANALYSIS AND DISCUSSION PAPER (NOVEMBER TO DECEMBER 2012)

Early views, as well as preliminary analysis of performance data, were set out in a discussion paper (published 13 December), which identified three significant challenges facing health and medical research at Sydney:

– How to strategically focus the efforts of the University’s health and medical research community around a set of clear priorities that respond to society’s health needs.

– How to address, through structural and governance reform, what is now an unwieldy, complex hard-to-understand research enterprise, while maintaining the benefits of local innovation and discovery.

– How to support multiple networks of researchers by providing reliable access to information, resources and infrastructure that are essential to enabling and augmenting collaboration.

The discussion paper then proposed three courses of action in response to these challenges.

First, Sydney needs to focus on research that is both truly excellent and responsive to health priorities. As discussed in the University’s 2011–2015 White Paper, health and medical researchers across the University urgently need to develop a collective vision. The current plethora of research endeavours across faculties, schools, institutes, centres, laboratories and hospitals, combined with many staff holding numerous different academic and clinical positions, produces many excellent results – but it also produces a tail of lower-quality output which dulls the University’s reputation and affects its ranking. This complexity also inhibits the setting of goals and priorities required to bring the clarity of purpose and intent necessary to engage successfully with the big-vision ideas that drive major funding decisions from both government and non-government sources.

Second, there is a need to address the current weaknesses in the structure and governance of health and medical research to enable greater coordination across divisions, faculties, institutes, centres and academic units. Such coordination is critical to the University’s capacity to build scale where needed and to respond quickly to opportunities. The current state of affairs tends to encourage innovative, entrepreneurial behaviour that may maximise a result locally at a point in time, while simultaneously undermining a larger, more strategic intent with longer-term benefits for the University’s broader research community. It also results in the duplication of research facilities and administrative services and hence intensifies unproductive competition for limited funding. In all these ways, it fails to maximise the potential of the research enterprise.

Third, there is a need to build enterprise-wide corporate processes and systems (for example finance, human resources), ICT infrastructure and core research facilities, in order to support world-class health and medical research. The University’s corporate processes and systems and information and communication technology must be capable of supporting networked and collaborative research conducted in multiple, often geographically dispersed, settings. Furthermore, the major research equipment and facilities required for large-scale collaborative programs must be available and accessible to all.

1.2.3 FINAL CONSULTATION AND DATA ANALYSIS (JANUARY TO APRIL 2013)

A final round of consultations and data analysis refined the review’s findings, but did nothing to diminish the concerns raised in the issues paper or the preliminary conclusions drawn in the discussion paper. Indeed the resounding view from stakeholders is that complacency is the enemy. Significantly, there is strong support for reforms to ensure Sydney’s health and medical research strengthens its competitive position academically as well as its relevance to society’s health needs. At the same time it is widely recognised that making these decisions and changes will be challenging.

Already the University has launched a bold initiative in establishing the Charles Perkins Centre (CPC). This is a model for multi-disciplinary, cross-organisational collaboration that brings together strong disciplines to solve complex research challenges and deliver real-world solutions addressing pressing health needs. Ensuring the CPC initiative is successfully implemented and meets the needs of the University and society-at-large will be the evidence that significant change can be embraced.

1.2.4 FINAL REPORT

This document, the final report, concludes the review process. It provides a synthesis of the relevant data, the key positions and preferences voiced during the consultation phases, and the main arguments articulated in the discussion paper. Based on this information, it presents the case for change, a framework for reform, data and discussion around the key issues, a series of recommendations, and essential as well as suggested actions to implement the recommendations.

1.3 THE CASE FOR CHANGE

While the review has identified significant strengths in health and medical research at Sydney, there are compelling reasons for change. In brief: close consideration of the available data from a number of perspectives shows health and medical research at Sydney is under pressure; given the University’s size, it should more often be first in the nation; other universities are leap-frogging it in international rankings; the proportion of mid-career (level B) researchers at the University, a critically important source of future research leaders, is declining; Sydney’s complex internal structures and relationships are difficult to navigate, adding costs to its transactions and impeding its capacity to develop coordinated, strategic responses that allow it to compete effectively.

1.3.1 HOW DOES SYDNEY’S PERFORMANCE IN HEALTH AND MEDICAL RESEARCH COMPARE?

While the ERA 2012 assessment highlighted the strength and breadth of health and medical research at Sydney, there was relative underperformance in the basic biomedical sciences, being rated only ‘at world standard’ in important FoRs such as Medicinal and Biomolecular Chemistry, Biochemistry and Cell Biology, and Microbiology. In contrast, in two of these three FoRs, the University of Queensland (UQ) is consistently ‘above world standard’ and the University of Melbourne (Melbourne), Monash and the University of NSW (UNSW) all show stronger performance. Sydney’s underperformance means there is a deficit in capacity to feed the important translation pipeline (leading to implementation and health policy development) that starts with basic research.

The Higher Education Research Data Collection (HERDC) data show that:
- the total competitive grant income for health and medical research at Sydney over the period 2005–11 was consistently second to Melbourne, with UQ strongly challenging for third position and Monash also on the rise (Figure 1.1)
- in overall NHMRC awarded income for the period 2005–12 Melbourne is on an upward trajectory with the data for Sydney suggesting it has peaked (Figure 1.2)
- the 2013 data for NHMRC Project Grants awarded show Sydney has dropped to third position behind Monash and Melbourne (Figure 1.3)
- the 2008–12 data for NHMRC Program Grants (which provide support for teams of high-calibre researchers to pursue broad-based, multi-disciplinary and collaborative research) show that Melbourne won $88 million compared with Sydney’s $65 million, and that UNSW is almost on a par with Sydney (Figure 1.4).

**Figure 1.1** Distribution between Go8 universities of HERDC research income (2005–11)

<table>
<thead>
<tr>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>500</td>
<td>600</td>
<td>700</td>
<td>800</td>
<td>900</td>
<td>1000</td>
</tr>
</tbody>
</table>

Source: HERDC data
**Figure 1.2** Total NHMRC income awarded to Go8 universities (2005–12)

![Total NHMRC income awarded to Go8 universities (2005–12)](image1)

*Source: NHMRC data*²

**Figure 1.3** NHMRC Project Grants awarded to Go8 universities (2005–13)

![NHMRC Project Grants awarded to Go8 universities (2005–13)](image2)

*Source: NHMRC data*³

*Note: 2006–08 data are high due to a brief period when joint venture income was reportable.*

---


In the international rankings\(^5\), medicine (and related sub-fields) at Sydney is largely maintaining its position, which is consistently below Melbourne’s; medicine at other universities is incrementally improving. Most startling is the rise of medicine at Melbourne itself, from 76th position in 2007 to 35th in 2012 in the ARWU (Shanghai Jiao Tong) ranking, which is based entirely on research indicators. By comparison, medicine at Sydney is yet to be ranked in the top 100, and sits in the 101–150 range along with UNSW. Nature Publishing Group, recognised as a publisher of high-impact scientific and medical research, announced on 21 March 2013 that Melbourne “cemented top spot in Australia and also improved its regional ranking to sixth across the Asia-Pacific”, while Sydney is “up fourth from fifth in 2011” in Australia, behind the Australian National University (ANU) and UQ.

One can quite rightly argue that each of these benchmarking and ranking exercises uses methodology fraught with challengeable assumptions, incomplete data and subjective measures. Nevertheless, considering the impact they have on reputation, which influences research funding streams and international student enrolment, the consistency of the messages from such a variety of data sets and methodologies means that Sydney must pay attention.

In terms of PhD students enrolled in health and medical research, recruitment to Sydney both nationally and internationally is excellent. Government higher education statistics\(^6\) report that there are approximately 1344 PhD students at Sydney (including 201 international students), compared to 1069 PhD students at Melbourne (235 international), 591 at UQ (130 international), 663 at UNSW (133 international) and 432 at Monash (108 international). The larger cohort of PhD students at Sydney translates into a larger amount of research block funding\(^7\), however it does not appear to result in the additional quantum of high-quality research that would be expected.

Data from Human Resources reveal concerns about the University’s academic staff profile in health and medical research. Sydney is seeing a significant reduction in the proportion of early to mid-career (level B) researchers (Figure 1.5). This trend has been sustained over a period of seven years and must be reversed. Early to mid-career staff are a critical pipeline for the future research workforce and leaders.

\(^5\) Major ranking systems (with percentage contribution of research, sub-fields ranked): Academic Ranking of World Universities, ARWU, from Shanghai Jiao Tong University (100 per cent, Medicine); Quacquarelli Symonds, QS (60 per cent, Medicine); Times Higher Education World University Rankings, THE (54 per cent, Clinical, Pre-Clinical and Health). Research outputs (as a rate per FTE) are clearly identified as the driver, either directly or indirectly, for outcomes across each of the three major rankings systems – especially publication rates in high-quality journals.

\(^6\) www.highereducationstatistics.deewr.gov.au

\(^7\) The government block funding formulae are set so that about 50 per cent of the funding allocations are based on higher-degree completions and load.
A contributing factor to the downward trend in level B research staff might be the fact that Sydney has done poorly in the proportion of research fellowships awarded from the NHMRC from 2005 to 2012. Over that period Sydney attracted close to $80 million less funding than Melbourne, $26 million less than Monash, and $3.6 million less than UQ. Further, Sydney is fourth behind Melbourne, Monash and UQ in winning mid-career and established fellowships, and third behind Melbourne and Monash in early-career fellowships (Figure 1.6).

Figure 1.5 Decline in proportion of level B health and medical researchers at the University (2002–12)

Figure 1.6 Fellowship grant income for Go8 universities by type (aggregated for 2005–12)

Source: NHMRC data
FELLOWSHIPS TERMINOLOGY
For the purposes of this review:
– ‘early‑career fellowships’ refers to NHMRC Early Career Fellowships (Australian and overseas)
– ‘mid‑career fellowships’ refers to NHMRC Career Development Fellowships and Translating Research into Practice (TRIP) fellowships
– ‘established‑career fellowships’ refers to NHMRC Research Fellowships, Practitioner Fellowships and Australia Fellowships.

Examination of the relative numbers of fellowships being applied for and awarded indicates that Sydney’s early‑career researchers enjoyed success rates equal to Melbourne’s, but applied for far fewer. For mid‑career and established‑career fellowships Sydney’s success rates were well down (seventh and sixth respectively among the Go8), and again far fewer of Sydney’s researchers applied for them compared to Melbourne’s.

These performance data indicate that new strategies and approaches are needed at least to maintain, but preferably to strengthen, Sydney’s competitive position. However, the organisational and structural complexity of health and medical research at Sydney makes it difficult to develop or agree upon a coherent and integrated strategy to accomplish this. This organisational complexity has many causes: geographical dispersion is driven by the need for clinical student placements; clinical research requires clinical settings that are part of the health system; attracting top clinical practitioners to hospital campuses where teaching and research training are done requires quality research spaces; translation of research into practice requires close relationships and two‑way exchanges with those in the health delivery system. Accepting that there are, or were, good reasons behind the establishment of so many entities and relationships, the sheer number and diversity of research endeavours across faculties, schools, institutes, centres, networks, laboratories and hospitals are nonetheless barriers to developing and agreeing on priorities for strategic focus.

1.3.2 INTERNAL FRAGMENTATION
1.3.2.1 Geographic dispersal of research effort
The geographic separation of faculties, institutes and centres (Figure 1.7), while it may be necessary for clinical training and practice, makes cross‑disciplinary and cross‑organisational collaboration around identified themes of research focus difficult, especially in the absence of state‑of‑the‑art communications technology and corporate processes and systems to adequately support collaborative research teams.

Figure 1.7 Distribution of University health and medical research locations across metropolitan Sydney

Note: The size of each circle is scaled to numbers of staff; for a breakdown of staff at each location, see Appendix E.
1.3.2.2 Dissipation of research effort and competition for resources through sub-scale entities

The proliferation of sub-scale research entities competing for recognition and support for their own distinctive research programs dissipates effort and results in expensive duplication of administration as well as counterproductive competition for resources. Table 1.1 shows the numbers of research centres and institutes with a health and medical research focus on the register maintained by the Group Secretary Office (GSO) in the Office of General Counsel. Most of the entities host researchers with multiple affiliations, making it difficult, if not impossible to know which entities are contributing what to the research enterprise. The sheer number suggests that many must be sub-scale. This was also the conclusion drawn by an earlier, independent analysis of HERDC data (2006–08) which found that as many as half of the 100 health and medical research entities associated with the Faculty of Medicine had fewer than five ERA-eligible staff associated with them.¹

Table 1.1 Centres/entities on GSO register with a focus on health and medical research

<table>
<thead>
<tr>
<th>Category</th>
<th>Focus on Health and Medical Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal centres</td>
<td>24</td>
</tr>
<tr>
<td>External entities</td>
<td>142</td>
</tr>
<tr>
<td>Internal and external</td>
<td>166</td>
</tr>
</tbody>
</table>

Note: This table does not include networks or centres not listed on the GSO register.

1.3.2.3 Lack of clear, commonly agreed research priorities

Even with the new divisional structure implemented since 2011 as a result of the White Paper (see 4.1.6.1 Faculties and divisions), the health and medical faculties have not agreed on an integrated and common set of research priorities. The research themes for strategic focus nominated in recent years by the faculties (Figure 1.8) do not sufficiently distinguish those areas of research that will receive differential investment and support. There appears to be considerable overlap. On the other hand, conventions for naming research themes differ between faculties – “healthy ageing” in Dentistry, for example, may mean something quite different from “healthy ageing” in Health Sciences – so the degree of overlap or potential for integration is unclear. Furthermore, with the exception of Medicine, the faculties have too many themes for their size and scope to create focus, build scale and achieve and maintain pre-eminence in any one of them.

Figure 1.8 Nominated themes of strategic research focus in the health and medical faculties

<table>
<thead>
<tr>
<th>Theme</th>
<th>DENTISTRY</th>
<th>NURSING</th>
<th>MEDICINE</th>
<th>PHARMACY</th>
<th>HEALTH SCIENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEALTHY AGING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANCER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(NEUROSCIENCE) AND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MENTAL HEALTH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHRONIC DISEASES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBSTETRIC DIABETES AND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARDIOVASCULAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIDWIFERY, REPRODUCTIVE,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATERNAL, AND CHILD HEALTH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFECTION AND IMMUNOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESPIRATORY DISEASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACUTE, CRITICAL, AND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRAUMA CARE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTHRITIS AND MUSCULOSKELETAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INJURIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEALTH CARE PRACTICE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDICAL IMAGING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMUNICATION AND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPEECH DISORDERS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: A circle indicates where the Faculty of Nursing and Midwifery has declared a strong research focus as part of the theme of chronic diseases.

An issue that compromises the ability to reach agreement on priorities is the perceived dominance of Medicine in setting the research agenda. This is a result both of the faculty’s sheer size and of the prominence and influence of medicine in the broader context of health research. This has the effect of making other research disciplines and faculties feel marginalised. Figure 1.9 shows the relative full-time equivalent (FTE) count for the health and medical faculties, as well as the breakdown of general to academic staff. The disparity in scale of the Faculty of Medicine with respect to the other faculties is evident, as well as the fact that it has a general-to-academic staff ratio of more than 1, with the largest number of general staff being HEO6 (Figure 1.10). A review of job titles for these staff indicates that a high proportion is general administration, raising the question whether the apparent high administrative load is a consequence of fragmentation and duplication. Answering this question will, however, require additional interrogation and validation of the data – an example of how critical it is to have accurate and comprehensive HR data for strategic planning.

¹ University of Sydney. (2010), Analysis of health and medical research (Barlow Report).
Recent reviews at state and national levels are pointing to major reforms around research funding and priorities. State and Australian governments are looking to implement integrated research strategies that address major community health challenges and reduce health care costs. These strategies contemplate partnerships and collaboration between all areas of the health and medical sector and are expected to be supported with significant funding. The NSW Government is contemplating a system of geographical research hubs, while the Australian government has proposed Integrated Health Research Centres (IHRCs).

**Recent Reviews of Health and Medical Research**

There have been two recent reviews of health and medical research:

- The Australian Government’s ‘Strategic Review of Health and Medical Research in Australia 2013’ is hereafter referred to as the **McKeon Review**.
- The NSW Government’s ‘NSW Health and Medical Research Strategic Review 2012’ is hereafter referred to as the **NSW Review**.

The reforms are in part driven by what is perceived as a looming crisis for health care in Australia as people are living longer, the population profile is ageing, and health care costs are rising rapidly in times of severe fiscal constraints that are likely to persist. These trends resemble those in Europe and North America, and the responses to them there are similar to the responses in Australia.
Many of the opportunities for health and medical research that can streamline health care costs require effective cross-disciplinary collaboration and importantly call for the engagement of allied health professionals and those who deliver health care outside hospitals, in primary care and community settings. Both the NSW Review\(^9\) and the McKeon Review\(^10\) have emphasised the importance of these approaches.

Technological innovation – advances in communications technology (eHealth) and health and medical technology – holds great potential to deliver health care more efficiently and cheaply. A key to successful innovation will be greater understanding of needs in the different health delivery settings. Technological innovation also has potential for developing NSW industry. This prospect has not escaped the NSW Government, which this financial year established a Medical Devices Fund worth $5 million a year to support competitive technology development and commercialisation.

**“Many of the recommendations in the Review focus on improving the way we manage our current research resources – supporting greater collaboration between research organisations, having a priority-driven approach to research and innovation, and focusing on translation of research evidence into better patient care and health outcomes.”**

---

NSW Health and Medical Research Strategic Review

With eight of its 16 faculties contributing to health and medical research, Sydney is well placed to capitalise on these opportunities. But doing so will require the University to be able to make decisions quickly and efficiently, engage faculties and disciplines effectively in the tasks at hand, and communicate clearly an integrated, strategic focus.

**“While historically Australia’s health and medical research performance has been strong by international standards, notably in the areas of biomedical and clinical research, realising the potential value from health and medical research requires it to be deeply embedded into the health system. New thinking, strategies and processes are needed to drive improvements in healthcare delivery through a rejuvenated and fully integrated health and medical research sector.”**

---

McKeon Review

Failure to position the University to take advantage of the new funding opportunities that are emerging, given that research funding from all sources is under severe pressure\(^11\), will place health and medical research at Sydney under even more intense pressure and continue to exacerbate unproductive internal competition for funding. Economic stresses in the higher education and research sectors are increasing and there is no prospect of a reversal of this trend or a reversal of chronic government underfunding of research in general.

1.4 THE WAY FORWARD

Given the current and coming challenges in health and medical research, what must Sydney do to ensure sustained research excellence, to achieve high-impact health outcomes for society, and to maintain a competitive position nationally and internationally?

1.4.1 THREE SCENARIOS

Broadly, there are three options for the University’s future in health and medical research:

**No change**

Continue to use current mechanisms to drive research performance and strategic planning, that is:

– faculty strategies
– academic performance management
– University policies (centres, controlled entities, associated and affiliated entities)
– DVCR ‘compacts’ and strategic funding
– incremental improvement to corporate systems.

Likely outcomes: Sydney health and medical research would suffer in an increasingly competitive environment, and would be unable to take advantage of the opportunities anticipated as government and non-government funding streams look for more integrated research strategies.

**Minor reform**

In addition to the mechanisms in 1, reform governance and structures to enable more integrated, coordinated and focused planning:

– reform divisional structures to achieve truly integrated strategic planning
– collocate cognate disciplines to build critical mass and strength.

Likely outcomes: Sydney would be better positioned to respond to opportunities than in 1, but still not optimised.

**Major reform**

Proactively implement targeted strategies that respond to the changing internal and external drivers, that is:

– do 1 and 2
– prioritise investment and support research in targeted health priority areas where Sydney can have impact
– amend University policies to more clearly define and assess centres and institutes against the review’s proposed strategy

---


– develop collaboration and partnership agreements that align with the strategy in order to manage collaborations and partnerships at multiple levels (from formal networks through to large-scale multi-faculty research centres)
– align the architecture of corporate systems (for example HR and Finance) to enable management of cross-disciplinary collaborations at all levels and to enable coherent monitoring, review and assessment.

Likely outcomes: Sydney would truly optimise its capacity to be the university of choice for research leaders and future research leaders, the first in the nation more often and higher in the international league tables, be recognised by the health system for its research strengths and for its capabilities in translating research into practice at all levels – medical diagnostics and therapeutics, nursing, primary health care, preventive health care, allied health, health services and health policy – as well as increasing funding and research outputs for health and medical research at Sydney.

Having weighed the options, the Advisory Committee is in favour of taking up the challenge to realise Sydney’s true potential in health and medical research and therefore supports the scenario for major reform.

1.4.2 THE FRAMEWORK FOR REFORM

1.4.2.1 Vision
The review proposes the following vision for health and medical research at Sydney:

_The University of Sydney will be recognised as a world leader in health and medical research and will deliver outcomes of significant benefit for the health and wellbeing of society._

This vision will be accomplished by harnessing excellent research undertaken across its integrated network of faculties, affiliated research institutes and hospitals and by collaborating strategically around common goals.

1.4.2.2 Principles
In giving effect to the vision, the reforms should be guided by a number of important principles:

**Reward excellence**
Invest in areas that are, or are able to develop, high-quality and innovative research and be internationally recognised.

**Support collaboration**
Develop critical mass and scale in areas where opportunities exist for innovative cross-disciplinary research collaborations, as well as for strategic engagement with industry and expanded health-delivery systems, including allied health, primary care and community settings.

**Provide enabling research infrastructure**
Equitably support researchers by providing access to the information and facilities required to increase research quality and collaboration.

**Ensure transparency and accountability**
Implement governance and structures supported by corporate systems and processes that make it possible for all stakeholders to readily engage with how decisions are made and to enable ongoing improvement, reform and ultimately transformational change in what research is done, how it is done and the outcomes achieved.

1.4.2.3 Strategic objectives
Four strategic objectives will guide the recommendations and actions set out in the following chapters. These strategic objectives will assist in translating the vision into a clear set of coherent actions and enable progress to be reviewed and success measured over time:

1. Identify and support strategic priority areas for research focus that leverage research excellence, align with our researchers’ values, and deliver significant benefits for society.
2. Facilitate research excellence and impact by making Sydney’s strengths in the Strategic Priority Areas for Research Collaboration (SPARC) highly visible to health care providers and industry, to facilitate partnerships and opportunities for translation and commercialisation, and by making “outstanding staff supported by state-of-the-art research facilities” the hallmarks of research excellence at Sydney.
3. Establish strong, effective governance with clear lines of authority, accountability and responsibility to enhance overall research performance and enable greater integration with the health care provider network to increase translation into better health outcomes for individuals, communities and populations.
4. Develop business processes and ICT systems to facilitate cross-disciplinary, cross-faculty and cross-organisational health and medical research.

1.4.3 CONCLUSION
In summary, Sydney needs major reform to strengthen particular health and medical research disciplines (in comparison to its major competitors) and to build capacity to bring together multi-disciplinary teams focused on priority research areas with outcomes for individual, community and population health. To achieve the desired outcomes, these multi-disciplinary teams will need to be flexible, well governed and capably led. Sydney’s performance in health and medical research overall will benefit greatly from concentrating on and building critical mass in cross-disciplinary and cross-organisational collaborations around key themes at the intersection of disciplinary strengths and health priorities.
2 Setting Strategic Priority Areas for Research Focus

One of the central challenges identified during the review has been how the University’s diverse and extensive health and medical research community can focus its efforts strategically on clear priorities that respond to societal as well as emerging government imperatives. This challenge is addressed by strategic objective 1, and discussed in this chapter.

STRATEGIC OBJECTIVE 1
Identify and support strategic priority areas for research focus that leverage research excellence, align with our researchers’ values, and deliver significant benefits for society.

2.1 WHY ESTABLISH STRATEGIC PRIORITY AREAS?

The review discussion paper concluded that “while there is discipline strength and breadth in health and medical research at Sydney, our strengths are not sufficiently aligned, cohesively organised or thematically united to optimise their effectiveness”.

Throughout the review process, it has been evident that the University is not optimising its strengths in a way that does justice to the collective efforts of its health and medical researchers. A lack of focus on a set of clearly articulated priority areas has impeded the integration and coordination of the research effort, which is carried out in many small-scale units across the University’s health and medical research community within both the faculties and the large number of associated institutes and centres.

Setting strategic priority areas for research focus will enable the University to build the scale and critical mass required for sustainability and impact. This approach is in line with the tenor and recommendations of both the McKeon Review and the NSW Review.

Importantly, priority areas should not be established at the expense of research excellence generally; the latter must continue to be supported, for example via the Deputy Vice-Chancellor, Research (DVCR) programs. Priority areas should, however, receive additional investment so that they can improve coordination and interconnectedness across the research community and thus achieve optimal scale and focus. Furthermore, priority status for additional investment is not meant to be permanent. Every designated priority area should become self-sustaining over time. Other areas of research may then qualify for additional support as priority areas if they meet the criteria.

Finally, the outcomes and effects of research undertaken in one priority area will not, of course, be limited to that area but will benefit other priority areas as well as other research generally. Research in the basic biomedical sciences, for example, will necessarily be important for all the priority areas, and in all likelihood will have ramifications well beyond them.

"The national research priorities and goals are necessarily broad. However, more specific priorities for health and medical research need to be determined. These should be identified by the application of a transparent priority setting process that involves all stakeholders and uses robust criteria. As well as considering specific diseases, this should also include a consideration of population groups (e.g. Aboriginal health), types of research (e.g. fundamental research, intervention research, health systems research) and ensure there is flexibility to conduct research on emerging and urgent health issues."

NSW Ministry of Health submission to McKeon Review (p. 105)

12 sydney.edu.au/strategy/research/
Health-and-Medical-Research-Strategic-Review-Discussion-Paper.pdf
2.2 CRITERIA FOR IDENTIFYING POTENTIAL STRATEGIC PRIORITY AREAS

To identify candidate strategic priority areas for research focus, as well as the elements that might be common to all such areas, the review first considered the comments of a wide range of stakeholders (Appendix B). Indicators of the scale, quality and effect of research outputs were then considered in order to identify Sydney’s strengths in health research. Next, national and international health priorities were examined to determine which might benefit most from the focusing and aligning of Sydney’s strengths into a coherent strategy. In this respect, priority areas were identified in terms of the health issue(s) being addressed, and measures of success will include effects on the health of individuals, communities and the population. Since the final choices for research priorities must rightly be influenced by the preferences, passions and ambitions of the researchers themselves, the review also took into consideration what we refer to as ‘researchers’ values’, as expressed to the review during its consultation phases.

In summary, the review identified areas in which Sydney has (a) the demonstrated research strength to (b) address significant national and international health challenges and which (c) will inspire the creativity and innovation of its researchers. These broad criteria, discussed more fully below, will be reassessed over time and refined where necessary.

2.2.1 PRIORITY AREAS MUST DRAW ON DISCIPLINES THAT HAVE SUFFICIENT CAPACITY, SCALE, QUALITY AND DEMONSTRATED (ACADEMIC) IMPACT

The primary data available for assessing research strength come from the HERDC of research income and research outputs and from ERA data on research quality. These data sets are comprehensive, verified and standardised in the collections across all Australian universities, which means they are useful for benchmarking. In addition to the HERDC and ERA data, there are publicly available citation data that provide a measure of the impact of publications on FoRs. While all these data sets have their limitations (notably when the analysis uses FoR codes at a four-digit level, thus aggregating very different specialties of clinical sciences), they nonetheless can be used to draw certain conclusions.

2.2.1.1 FoR analysis of researchers

The data from the 43 percent of Sydney health and medical researchers who have self-nominated the FoR codes they identify with indicate a remarkable breadth of research expertise. At the most refined level of specialty discrimination (six-digit codes), this sample of health and medical researchers identifies with 382 different FoR codes. This breadth of expertise does, however, come at the expense of depth in many cases: almost half of these FoRs (47 percent) have three or fewer researchers, and 85 percent have fewer than 20 researchers. Aggregating the data to the four-digit level, there are 88 codes nominated, with more than 86 percent of these having fewer than 20 researchers.

The available data on research outputs are more complete and comprehensive due to government reporting requirements, and these show an even broader distribution of FoRs. The 9565 research outputs published by health and medical researchers in the three years from 2010 to 2012 were coded to 428 different six-digit FoRs; 85 percent of these codes have fewer than 50 publications, and 53 percent have fewer than 10 publications.

This FoR analysis illustrates the breadth of health and medical research at Sydney. This breadth may, on the one hand, provide scope and flexibility for responding to opportunities. On the other, it may inhibit capacity to build the critical mass required for sustained research excellence and significant societal impact. By focusing strategically on certain priorities and ensuring research strength in key disciplines, the University could build this critical mass and lead the field nationally and internationally in specific areas.

A review of Sydney’s ERA 2012 performance in FoRs with more than 20 researchers shows that those with the largest number of researchers (that is, more than 300 researchers in Clinical Sciences, Public Health and Health Services, and Oncology and Carcinogenesis) each rated ‘well above world standard’ (Figure 2.1), suggesting that large scale does lead to high quality. The results are mixed for FoRs with smaller numbers of researchers even though the numbers are still substantial, indicating that other factors come into play.

13 FoR codes are layered. There are 22 broad discipline areas coded with two digits, each of which is subdivided into sub-disciplines with a four-digit code, each of which is further subdivided into specialty disciplines with a six-digit code. In all, there are 157 four-digit codes and 1385 six-digit codes. The health and medical sciences two-digit code (11) is where the majority of health and medical researchers self-code, though there are additional codes that are relevant. A complete set of the agreed six-digit health and medical research codes used in the analyses is available at Appendix C.
Figure 2.1 Four-digit FoRs with which more than 20 researchers identify

Note: Grey bars indicate FoR codes ranked at a 5 (‘well above world standard’). Light blue bars indicate FoR codes ranked at a 4 (‘above world standard’). Dark blue bars indicate FoR codes ranked at a 3 (‘world standard’).

2.2.1.2 FoR analysis of funding
An examination of Sydney’s share of NHMRC funding according to FoR supports the idea that scale and quality correlate with competitiveness. In the Clinical Sciences, and Public Health and Health Services FoRs the University is ranked first in the Go8 for share of NHMRC income (2005–12), taking 24–25 percent of what are the two largest NHMRC-funded FoRs (Table 2.1). For each of the remaining FoRs where Sydney was rated ‘well above world standard’ the share of Go8 income received was 18–30 percent, with a Go8 rank of first or second. Two striking anomalies in the correlation are Medical Biochemistry and Metabolomics, which received a ‘well above world standard’ rating and yet is fifth in NHMRC share of income, and Biomedical Engineering, which rated only ‘above world standard’ and yet is first in NHMRC share of income, taking a remarkable 48 percent of what is admittedly a relatively small total. The latter rating may be an effect of engineering disciplines being rated by a different panel in the ERA assessment against discipline-specific criteria. The former is something to explore given that Medical Biochemistry and Metabolomics, a basic science discipline, is an important feeder for the translation pipeline (see also 2.4.4 Translation pipeline).

---

14 The health and medical research FoR comparison of income for Go8 universities is only possible for NHMRC grants as the Go8 shared data sets do not have this FoR breakdown for non-NHMRC research income.
Table 2.1  NHMRC income awarded by FoR (aggregated for 2005–12)

<table>
<thead>
<tr>
<th>FOR NAME</th>
<th>SYDNEY SHARE IN $ (%) OF TOTAL</th>
<th>TOTAL GO8 NHMRC FUNDING IN $</th>
<th>GO8 RANK</th>
<th>ERA RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Sciences</td>
<td>145,659,133 (24%)</td>
<td>598,099,007</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Public Health and Health Services</td>
<td>126,004,518 (25%)</td>
<td>503,026,184</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Cardiovascular Medicine and Haematology</td>
<td>85,877,586 (35%)</td>
<td>247,826,092</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Oncology and Carcinogenesis</td>
<td>47,296,602 (23%)</td>
<td>207,268,947</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Neurosciences</td>
<td>43,659,444 (13%)</td>
<td>342,252,291</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Medical Microbiology</td>
<td>37,829,051 (25%)</td>
<td>150,213,598</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Pharmacology and Pharmaceutical Sciences</td>
<td>32,416,075 (18%)</td>
<td>117,616,734</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Paediatrics and Reproductive Medicine</td>
<td>20,180,818 (12%)</td>
<td>165,958,086</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Immunology</td>
<td>9,648,205 (3%)</td>
<td>306,917,514</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Other Medical and Health Sciences</td>
<td>8,789,971 (11%)</td>
<td>73,422,411</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Psychology</td>
<td>7,603,579 (20%)</td>
<td>37,591,356</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Nutrition and Dietetics</td>
<td>6,412,131 (21%)</td>
<td>29,741,849</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>2,453,195 (48%)</td>
<td>5,096,249</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Medical Physiology</td>
<td>2,220,160 (6%)</td>
<td>37,069,577</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Dentistry</td>
<td>1,953,242 (8%)</td>
<td>24,997,292</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Medical Biochemistry and Metabolomics</td>
<td>1,237,724 (10%)</td>
<td>12,012,175</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Nursing</td>
<td>1,291,741 (30%)</td>
<td>4,306,744</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Human Movement and Sports Science</td>
<td>290,032 (4%)</td>
<td>7,742,363</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: NHMRC data15

2.2.1.3 For analysis of citation rates
Go8 benchmarking of publication citation rates in the FoR codes is another indicator of relative volume and impact. Figure 2.2 compares citations for health and medical research FoRs. Those FoRs in which Sydney ranked ‘well above world standard’, had more than 20 researchers self-identifying, and earned the highest share of NHMRC income, also produced a high volume of citations. But the citation analysis illustrates too the stiff competition Sydney is facing in particular FoRs: for example, from Melbourne and Monash in Clinical Sciences, Public Health and Health Services, Cardiovascular Medicine and Haematology, and Paediatrics and Reproductive Health; from Melbourne, UNSW and Monash in Neurosciences and in Medical Microbiology; from Melbourne in Oncology and Carcinogenesis; and from Melbourne, UNSW and UQ in Psychology.

In summary, as measured by scale, quality and academic impact, Sydney’s greatest strengths in clinical research are in cancer (Oncology and Carcinogenesis) and cardiovascular disease (Cardiovascular Medicine and Haematology), with strength also in nursing and allied health (for example Nursing, Pharmacology and Pharmaceutical Sciences, Nutrition and Dietetics) and in the critically important area of Public Health and Health Services. However, the current environment is highly competitive, so it will be necessary to focus and align these strengths strategically in order to improve the University’s position.

2.2.2 PRIORITY AREAS MUST INTERSECT WITH NATIONAL AND INTERNATIONAL HEALTH PRIORITIES
In addition to being areas of research strength at the University, candidate priority areas should be responsive to the health and medical needs of the Australian and international communities. Australia’s needs are articulated in Australian and state governments’ reviews and policies, and reflected in funding support from government and non-government agencies and industry and from individual and corporate philanthropy.
Figure 2.2 Go8 comparison of number of citations in FoRs associated with health and medical research (aggregated for 2007–11)

<table>
<thead>
<tr>
<th>FoR</th>
<th>Adelaide</th>
<th>ANU</th>
<th>Melbourne</th>
<th>Monash</th>
<th>Sydney</th>
<th>UNSW</th>
<th>UQ</th>
<th>UWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0807</td>
<td>14</td>
<td>25</td>
<td>33</td>
<td>42</td>
<td>66</td>
<td>65</td>
<td>56</td>
<td>15</td>
</tr>
<tr>
<td>0903</td>
<td>120</td>
<td>37</td>
<td>236</td>
<td>117</td>
<td>7</td>
<td>130</td>
<td>265</td>
<td>139</td>
</tr>
<tr>
<td>1004</td>
<td>3</td>
<td>4</td>
<td>14</td>
<td>7</td>
<td>10</td>
<td>3</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>1101</td>
<td>65</td>
<td>38</td>
<td>155</td>
<td>121</td>
<td>488</td>
<td>334</td>
<td>244</td>
<td>244</td>
</tr>
<tr>
<td>1102</td>
<td>170</td>
<td>48</td>
<td>572</td>
<td>322</td>
<td>3.956</td>
<td>2.630</td>
<td>2.042</td>
<td>2.322</td>
</tr>
<tr>
<td>1103</td>
<td>1.418</td>
<td>504</td>
<td>504</td>
<td>3.956</td>
<td>2.630</td>
<td>3.632</td>
<td>1.637</td>
<td></td>
</tr>
<tr>
<td>1104</td>
<td>9</td>
<td>4</td>
<td>27</td>
<td>36</td>
<td>12</td>
<td>16</td>
<td>45</td>
<td>19</td>
</tr>
<tr>
<td>1105</td>
<td>221</td>
<td>6</td>
<td>222</td>
<td>17</td>
<td>181</td>
<td>11</td>
<td>133</td>
<td>89</td>
</tr>
<tr>
<td>1106</td>
<td>58</td>
<td>33</td>
<td>290</td>
<td>186</td>
<td>428</td>
<td>181</td>
<td>428</td>
<td>293</td>
</tr>
<tr>
<td>1107</td>
<td>141</td>
<td>131</td>
<td>509</td>
<td>396</td>
<td>251</td>
<td>212</td>
<td>243</td>
<td>276</td>
</tr>
<tr>
<td>1108</td>
<td>73</td>
<td>70</td>
<td>299</td>
<td>240</td>
<td>204</td>
<td>215</td>
<td>331</td>
<td>81</td>
</tr>
<tr>
<td>1109</td>
<td>231</td>
<td>148</td>
<td>1.242</td>
<td>625</td>
<td>810</td>
<td>602</td>
<td>543</td>
<td>401</td>
</tr>
<tr>
<td>1110</td>
<td>92</td>
<td>37</td>
<td>213</td>
<td>293</td>
<td>124</td>
<td>241</td>
<td>114</td>
<td>208</td>
</tr>
<tr>
<td>1111</td>
<td>50</td>
<td>13</td>
<td>34</td>
<td>63</td>
<td>124</td>
<td>18</td>
<td>75</td>
<td>57</td>
</tr>
<tr>
<td>1112</td>
<td>138</td>
<td>39</td>
<td>484</td>
<td>181</td>
<td>124</td>
<td>336</td>
<td>18</td>
<td>75</td>
</tr>
<tr>
<td>1113</td>
<td>135</td>
<td>52</td>
<td>466</td>
<td>33</td>
<td>592</td>
<td>336</td>
<td>18</td>
<td>75</td>
</tr>
<tr>
<td>1114</td>
<td>320</td>
<td>133</td>
<td>793</td>
<td>488</td>
<td>288</td>
<td>150</td>
<td>72</td>
<td>77</td>
</tr>
<tr>
<td>1115</td>
<td>216</td>
<td>99</td>
<td>471</td>
<td>634</td>
<td>759</td>
<td>334</td>
<td>400</td>
<td>445</td>
</tr>
<tr>
<td>1116</td>
<td>171</td>
<td>44</td>
<td>271</td>
<td>193</td>
<td>802</td>
<td>235</td>
<td>388</td>
<td>191</td>
</tr>
<tr>
<td>1117</td>
<td>703</td>
<td>488</td>
<td>1.753</td>
<td>1.489</td>
<td>1.860</td>
<td>1.203</td>
<td>1.363</td>
<td>819</td>
</tr>
<tr>
<td>1199</td>
<td>10</td>
<td>4</td>
<td>43</td>
<td>20</td>
<td>32</td>
<td>33</td>
<td>29</td>
<td>11</td>
</tr>
<tr>
<td>1302</td>
<td>38</td>
<td>10</td>
<td>110</td>
<td>147</td>
<td>183</td>
<td>51</td>
<td>208</td>
<td>103</td>
</tr>
<tr>
<td>1603</td>
<td>11</td>
<td>41</td>
<td>24</td>
<td>11</td>
<td>17</td>
<td>6</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>1605</td>
<td>75</td>
<td>227</td>
<td>182</td>
<td>153</td>
<td>186</td>
<td>155</td>
<td>231</td>
<td>78</td>
</tr>
<tr>
<td>1701</td>
<td>252</td>
<td>269</td>
<td>849</td>
<td>670</td>
<td>800</td>
<td>946</td>
<td>1.059</td>
<td>383</td>
</tr>
<tr>
<td>2201</td>
<td>12</td>
<td>19</td>
<td>45</td>
<td>39</td>
<td>47</td>
<td>21</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>2202</td>
<td>21</td>
<td>47</td>
<td>57</td>
<td>46</td>
<td>100</td>
<td>42</td>
<td>42</td>
<td>18</td>
</tr>
</tbody>
</table>

An obvious starting point is the nine National Health Priority areas (NHPAs): arthritis, asthma, cancer, cardiovascular disease, dementia, diabetes, injury, mental health and obesity.

Related to these, but presenting another perspective, is the Australian Institute of Health and Welfare’s (AIHW) analysis of disease burden on the population. In its 2012 report on Australia’s health, the AIHW identifies the major areas of concern by using a measure of disability-adjusted life years, or DALYs. DALYs estimate the years of life lost due to premature death, coupled with years of healthy life lost due to disability. Comparing DALYs across disease groups yields a list of health priorities closely aligned, but not synonymous, with the NHPAs: musculoskeletal disease, respiratory disease, cancer, cardiovascular disease, neurological and sense disorders, diabetes and mental disorders. Figure 2.3 compares the significance of these disease groups in terms of the health burden on Australians.

Australia’s health priorities are reflected in those of the global community. For example, the World Health Organisation (WHO) has committed to making non-communicable diseases (also known as chronic diseases) a priority and to achieving the goals set by the UN’s Declaration on Non-Communicable Diseases in September 2011. That declaration called for a multi-pronged campaign by governments, industry and civil society to set up by 2013 the plans needed to curb the risk factors for four groups of non-communicable diseases – cardiovascular diseases, cancers, chronic respiratory diseases and diabetes. There is thus a strong international driver for investment in research and development in these areas.

*Research in Australia is largely investigator initiated. While the Panel supports this approach and research across the spectrum of research areas, a portion of investment should be strategically focused to ensure key priorities are addressed.*

McKeon Review, 2012 Report

Also growing rapidly in national and international importance are emerging and re-emerging infectious diseases such as malaria, HIV and AIDS, tuberculosis and influenza. The WHO recognises these as major causes of morbidity, mortality, socioeconomic disruption and economic instability, and has developed multiple initiatives to address them. Five of its eight international health days relate to infectious diseases (tuberculosis, immunisation, malaria, hepatitis and AIDS). Infectious diseases research is also explicitly recognised in the UN Millennium Development Goals, by the Gates Foundation through its Grand Challenges initiatives, and by the World Bank through its more than $1 billion funding of multi-country responses to avian influenza and other zoonotic diseases. In Australia, national and state governments are renewing their efforts to address these diseases in the light of the evolution and spread of drug-resistant pathogens and the disproportionate effect many infectious diseases have on disadvantaged groups.

---

The NHMRC in its ‘Strategic plan 2010–12’ lists emerging infectious disease threats as one of the major health issues likely to arise, and maintains national centres in HIV, hepatitis, sexually transmitted diseases and tuberculosis.

As the major funder of health and medical research in Australia, the NHMRC’s funding profile is critically important in considering candidate priority areas. A comparison of the funding profiles from 2003 and 2012 (Table 2.2) reveals that cancer research takes by far the largest share of funding (32 percent), followed by cardiovascular disease (19 percent), with diabetes and mental health next (12 percent and 11 percent respectively).

The fastest growing funding priority, however, is research relating to obesity (717 percent growth). Dementia, mental health, diabetes and injury research also show growth much greater than the overall growth rate (all more than 350 percent compared to 290 percent). It is clear that national investment in cancer, obesity, diabetes and cardiovascular disease, and mental health and dementia is extremely strong.

Importantly, the NHMRC’s self-designated priority of Aboriginal and Torres Strait Islander health also shows a substantial increase in funding (498 percent) over the period.

Philanthropy is another source of funding for health and medical research, though on a much smaller scale than government funding. Aggregated national figures are not available for philanthropic donations to health and medical research overall, let alone by disease group, because reporting is not mandatory for the sector. However, in the University’s experience health and medicine attract significant philanthropic attention (accounting for about 40 percent of the $80 million in development funds raised by the University in 2012).

One of the most popular areas for philanthropy at the University is cancer research, to the extent that a capital investment fund has been established from donations and is currently worth about $50 million and yields between $1 million and $1.5 million per year to support cancer research. Cancer is also a state priority for research funding. The Cancer Institute NSW (CINSW) was established in 2003 as Australia’s first state-wide, government-funded cancer control agency to lessen the impact of cancer in NSW by supporting cancer health care professionals (including nurses, doctors and psychologists) and developing programs to evaluate the quality of cancer treatment and care in NSW. It disburses $30 million annually to support research collaboration “between academic and clinical leaders with both substantial cancer treatment facilities and commendable programs in relevant research disciplines to integrate into interdisciplinary and translational enterprises focusing on cancer control”.

The outline given here of Australian and global health priorities and of the distribution of research funding from different sources highlights the areas of health of greatest concern to the wider community. The University’s candidates for priority areas should intersect with these.

![Table 2.2](https://www.nhmrc.gov.au/grants/research-funding-statistics-and-data/national-health-priority-areas-nhpas)
2.2.3 PRIORITY AREAS MUST ALIGN WITH RESEARCH THAT INSPIRES RESEARCHERS
Finally, the strategic priority areas for research focus will need to inspire researchers themselves. There are three primary indicators of this essential alignment between candidate priority areas and researchers’ values: the number of academic staff already engaged in research in the area, the existing efforts of researchers to establish networks and collaborations in the area, and the views expressed by health and medical researchers during the review’s consultation process. Each of the candidate priority areas discussed in the next section has demonstrated a high degree of alignment in this regard (for details see the subsection on each priority area).

2.3 CANDIDATE STRATEGIC PRIORITY AREAS FOR RESEARCH FOCUS
Based on a detailed consideration of Sydney’s research activities at the intersection of research excellence, researchers’ values, and society’s health needs, the Advisory Committee has identified four candidates for strategic prioritisation:

– obesity, diabetes and cardiovascular disease
– cancer
– mental health and neuroscience
– infectious diseases.

In each of these areas there is strong potential to achieve large-scale collaboration, to establish and maintain the University’s national and international pre-eminence, and to deliver high-impact outcomes for the health system and society. Furthermore, the four areas together represent a portfolio of research embracing both mature and emerging areas of strength and focus.

The following sections provide additional context for these four candidate priority areas. To demonstrate the specific strengths at the University that will be leveraged, we have drawn upon different data sets: in some cases FoR data, in others keyword search data because of the breadth of disciplines that need to be brought to bear. The data also address how Sydney’s strongest competitors are performing in the priority areas.

Each candidate priority area is discussed in four subsections:

– **Context and significance** – corresponding to the criterion for health impact
– **Sydney’s track record** – corresponding to the criterion for research excellence
– **Current state of research at Sydney** – corresponding to the criterion for alignment with researchers’ values
– **Future directions** – corresponding very loosely to the review’s recommendations and actions.

2.3.1 OBESITY, DIABETES AND CARDIOVASCULAR DISEASE

2.3.1.1 Context and significance
Obesity, diabetes and cardiovascular disease – and related conditions such as renal disease, breast cancer and colorectal cancer – have been identified by the World Health Organisation as the major threat to the health and wellbeing of the global community. In Australia, they are the leading causes of mortality and disease burden and their prevalence is rising rapidly, with diabetes predicted to become the major cause of ill health and mortality by 2016.

2.3.1.2 Sydney’s track record in obesity, diabetes and cardiovascular disease research
The FoR analysis in section 2.2.1 shows that Sydney is dominant in Cardiovascular Medicine and Haematology and very strong in Nutrition and Dietetics. Moreover, the University applied successfully to the Education Infrastructure Fund and won $95 million in funding for support for the CPC, a $385 million University-wide research and education facility initiative whose mission is to research ways to prevent or mitigate the effects of obesity, diabetes and cardiovascular disease. To assist in developing the business case for the CPC that was presented to the University Senate in 2010, a keyword search was employed to generate a broader picture of research outputs in the areas of obesity and nutrition, diabetes and cardiovascular disease. This analysis showed Sydney is a strong and highly influential player in these fields. Sydney produced 23 percent of all Go8 research outputs (Figure 2.4), rated second in Go8 citation average, and was a strong collaborator with three other Go8 universities. The top-ranked journals for Sydney publications, measured by volume and citations, are among the top-ranked journals for all of the Go8. Over half of the Go8’s top 20 journals by volume also appear in Sydney’s top 20 journals by volume. Nevertheless, while Sydney’s position was and continues to be strong in this area, Melbourne remains a very strong challenger.

18 www.abs.gov.au/ausstats/abs@.nsf/Products/6BAD463E482C6970CA2579C6000F6AF7/popandocument
19 The report on the keyword search is available in eAppendix 1.
Aerial view of the building (under construction) that will form the physical hub of the broader Charles Perkins Centre initiative (April 2013).
2.3.1.3 Current state of obesity, diabetes and cardiovascular disease research at Sydney

Sydney’s recognised strengths in research relating to obesity, diabetes and cardiovascular disease, together with the national and global significance of these chronic conditions, were the drivers for establishing the CPC. The building that is to be a research and education hub for the CPC is now near completion (Image 1); staff are scheduled to move in by Semester One, 2014. Though the facility is on the Camperdown Campus, the CPC academic program extends well beyond it. The hub will house state-of-the-art core research facilities and accommodate about 900 researchers and 2000 students.

**Scale of research activity**

There were 651 authors and 537 publications associated with obesity, diabetes and cardiovascular disease research at Sydney in 2011 (2012 HERDC data).

The CPC is inherently cross disciplinary and aims to support collaborations and activities across the entire University and beyond, and not only with researchers in health and medicine. An important strategy for increasing the societal impact of the CPC’s research has been to take a holistic approach to the problems of obesity, diabetes and cardiovascular disease by engaging behavioural and social scientists in the research agenda as well as experts in the humanities, thus extending the traditional ‘bench to bedside’ paradigm to ‘bench to bedside to community’. The strategy also extends in the opposite direction, such that the University addresses research questions framed by the broader community itself, including those who deliver health care (see 3.1.1).

The CPC research strategy was developed over more than two years and involved contributions from more than 300 researchers as well as broad stakeholder consultation, including with affiliated and non-affiliated medical research institutes (MRIs), hospitals, industry, other universities, governments and NGOs. There is now an agreed strategy that defines the CPC’s research domains, themes and nodes of activity across the University research community. The scale and scope of this strategy constitute Sydney’s unique positioning in this area.

The income earned from investing $33 million of University development funds, including money raised from the auction of a Picasso painting donated anonymously, has been directed to support 11 new chairs for the CPC. These are currently being recruited in a coordinated international search. These chairs will strengthen a range of disciplines needed for the comprehensive approach being taken and will include metabolic systems biology; obesity science; psychology;
2.3.1.4 Future directions
To maintain the momentum of the CPC initiative and optimise its research potential, the University must now invest in developing and implementing the mechanisms to support it. The CPC research and education hub will need state-of-the-art research infrastructure to draw the best researchers from around the world that will be needed for its ambitious agenda. The CPC vision depends upon being able to draw expertise from multiple faculties, geographical hubs and health networks to support a coherent research agenda for maximum impact on health. The University is yet to demonstrate that its mechanisms for multi-disciplinary governance and management are effective, and new capabilities are required in our corporate systems (for example Finance, HR) and business processes to support and encourage collaboration across administrative and geographical boundaries.

Establish strong governance, business processes and systems to support collaboration and engagement essential to the success of the CPC’s mission and to ensure the CPC research and education hub is a vibrant collaborator with state-of-the-art research infrastructure.

2.3.2 CANCER
2.3.2.1 Context and significance
Cancer has a high impact on the health of Australians and of the world population. An estimated 124,910 new cases of cancer were diagnosed in Australia in 2012, with that number set to rise to 150,000 by 2020; one in two men and one in three women will be diagnosed with cancer by the age of 85. Cancer is a leading cause of death in Australia, accounting for about 3 in 10 deaths, with more than 42,800 people estimated to have died from it in 2010. A large proportion (30 percent) of cancer deaths are linked to five leading behavioural and dietary risks: obesity, low fruit and vegetable intake, lack of physical activity, tobacco use, and alcohol use. Globally, cancer-causing viral infections such as HBV/HCV and HPV are responsible for up to 20 percent of cancer deaths in low- and middle-income countries.

Despite these sobering statistics, substantial progress has been made in the fight against cancer. More than 60 percent of people diagnosed with cancer in Australia will now survive more than five years after diagnosis; and the average death rate has fallen by 16 percent, with greater successes reported in certain classes of cancer. Continued progress is obviously needed in prevention and treatment — through greater understanding and education about risk factors, improved and new diagnostics for early detection, and new therapeutics. The NSW Government, through CINSW, has invested in a comprehensive blueprint, the NSW Cancer Plan 2011–15, which sets priorities for reducing the incidence of cancer, increasing survival with cancer, and improving the quality of life for people with cancer as well as their carers.

2.3.2.2 Sydney’s track record in cancer research
The University has a long history of productivity and excellence in cancer research. In the Oncology and Carcinogenesis FoR, Sydney captured almost a quarter of the NHMRC funding and rated ‘well above world standard’ in ERA 2012 (Table 2.1). Cancer cell biology is associated with more than twice the number of research grants than any other FoR at Sydney; and within the Oncology and Carcinogenesis, the subcategory ‘not elsewhere classified’ contains the greatest number of highly cited articles, with the School of Public Health associated with the largest proportion of these.

While the greatest volume of activity is within the Faculty of Medicine, there are substantial and significant contributions from other faculties, especially Science, Health Sciences, Pharmacy, and Nursing and Midwifery. In terms of publications per author, Science is notably ranked highest, with Psychology a strong player. On the Camperdown Campus the NHMRC Clinical Trials Centre, the Central Clinical School (with its affiliates in the Centenary Institute), the School of Public Health, and the non-Medicine faculties collectively, constitute a strong geographical hub for cancer research, as does the Westmead Campus. Another significant node for cancer research is at the Kolling Institute, in the Northern Clinical School.

A comparison of the total volume of highly cited articles on cancer research among the Go8 universities demonstrates that Sydney leads, with Melbourne close behind (Figure 2.5). Closer examination of the publication data reveals that Sydney publishes much more in total, indicating this research strength is being diluted by a high volume of low-impact publications (Figure 2.6), putting us in sixth place among the Go8 in average citations per article.
Figure 2.5  Number of articles that include cancer research ranked in the 90th percentile for citations (2004–08)

Source: Scopus

Figure 2.6  Number of articles that include cancer research with fewer than five citations (2004–08)

Source: Scopus
2.3.2.3 Current state of cancer research at Sydney

Cancer research at Sydney is well funded because it is the University’s largest single area of philanthropy, enabling the establishment of a cancer research fund which supports the multi-faculty Cancer Research Network.

Scale of research activity
There were 367 authors and 303 publications associated with cancer research at Sydney in 2011 (2012 HERDC data).

The University has an active affiliation with, and has invested $5 million of capital funds in, the Chris O’Brien Lifehouse at Royal Prince Alfred (RPA). Lifehouse aims “to combine all facets of clinical care; surgery, medical and radiation oncology, research, integrative medicine and support services for patients, their families and carers to ensure better outcomes for everyone living with cancer” and provides an opportunity for the translation of research results into practice for many stages of cancer, from diagnosis and treatment to care, with respect both to physical and mental health. A significant portion of the NHMRC Clinical Trials Centre, as well as researchers from Nursing and Midwifery, and Science (Psychology), are scheduled to occupy the clinical research facilities there.

The University’s Cancer Research Network was established in 2006. Following an external strategic review in 2007, the network for the most part engaged in grassroots development and support activities. In November 2010 the University convened a high-level round table of all its major stakeholders in cancer research in order to achieve consensus that “cancer research should now be further developed with the support of a strategic plan, under specific leadership that is accountable for cancer research strategy”. While those at the meeting agreed a strategic approach to investments was needed, there was no consensus on what form leadership should take.

The round table coincided with a policy change at the CINSW, which traditionally has supplied about a third of external funding for cancer research at the University. CINSW was keen to see a more collaborative and translational focus to cancer research in NSW. The mechanism they chose was to establish a number of translational cancer research centres and slightly smaller-scale units; henceforth the majority of CINSW funds for research would flow directly to and through these centres and units.

The process for establishing the centres and units was competitive, and Sydney was successful in each of its bids, all of which were collaborative. Sydney now leads two of four centres (one at Camperdown, one at Westmead) and is a key participant in another centre (a paediatric centre, primarily through the Children’s Medical Research Institute). A consortium led from the Kolling Institute was funded as one of the three smaller-scale units.

As a result of the round table, it was agreed that Sydney should make significant strategic investments from its cancer research fund in each of the centres and the unit it was part of, particularly with a view to establishing new high-level leadership for cancer research. For each of the two centres that Sydney leads, the University supported the proposal to appoint a new chair.

The Cancer Research Network has proposed a new governance structure: a Network Council with responsibility for strategy development, and a new management committee to support implementation of the strategy. The council is to have representation from the University’s key administrative areas and disciplines, as well as from the new translational cancer research centres and unit.

2.3.2.4 Future directions

The existence of the cancer research fund means there will be continued investment in this area of research.

Strengthen governance and recognition of the Cancer Research Network by bringing it into alignment with the review’s recommended governance model for large-scale collaboration that broadly engages Medicine, Nursing and Allied Health.

The Cancer Research Network with its council has many of the attributes, but not all, of the review’s recommended governance model for large-scale collaboration (Chapter 4). With some adjustment it could be brought into alignment with this model, and would thus be formally recognised and more effective in its important role of providing strategic support for cancer research.

The challenge for this area is to focus investment so as to increase the average quality of research outputs and distinguish Sydney’s contribution to cancer research in what is a crowded space so as to maximise competitiveness for state and Australian government funding. It will also be necessary to increase engagement between researchers in the Faculty of Medicine and those in the nursing and allied health disciplines in order to expand Sydney’s breadth of impact on health practice and hence its competitive edge.
2.3.3 MENTAL HEALTH AND NEUROSCIENCE

2.3.3.1 Context and significance

Scale of research activity
There were 357 authors and 300 publications associated with mental health and neuroscience research at Sydney in 2011 (2012 HERDC data).

The 2007 National Survey of Mental Health and Well-being by the Australian Bureau of Statistics\(^\text{21}\) found that an estimated 3.2 million Australians (20 percent of the population aged between 16 and 85) had had a mental disorder in the previous twelve months. The Burden of Disease and Injury in Australia\(^\text{22}\) study indicated that mental disorders constitute the leading cause of disability burden in Australia, accounting for an estimated 24 percent of the total years lost due to disability. A 2012 study of mental health services by the Australian Institute of Health and Welfare\(^\text{23}\) revealed that about 8 percent of the population received public or private mental health services in 2009–10, costing more than $6.3 billion; that state and territory expenditure on specialised mental health services increased annually by an average of 5.4 percent over the five years to 2009–10; and that in the following year (2010–11) nearly 12 percent of all patient visits to General Practitioners were related to mental health.

Diseases of the brain and mind, including substance abuse, clinical depression and dementia, are now becoming a significant focus of federal and state government attention and community concern. For example, the NSW Government has established the Mental Health Commission to monitor, review and improve the mental health system, recognising the significant impost on the community from these conditions; and the Australian government has made mental health a key priority for funding. In addition the Council of Australian Governments (COAG) has endorsed a Roadmap for National Mental Health Reform 2012–22 which outlines the directions governments will take over the next 10 years to achieve real improvements in the lives of people with mental illness, their families, carers and communities.

Mental health is determined by a complex interplay of socioeconomic, biological and environmental factors that are yet to be fully understood. Research in neuroscience and mental health has high potential to contribute to understanding these factors, and to have an impact on individual, community and population health.

2.3.3.2 Sydney’s track record in mental health and neuroscience research

Neuroscience research is a very crowded space nationally, with four of the Go8 universities having a substantial volume of publication citations (Figure 2.2). Melbourne is dominant, with 63 percent more citations than Sydney. Comparison of ERA rankings tells a slightly different story, however, with Sydney, Melbourne and UNSW rated in the second tier (‘above world standard’), and UQ and Monash each rated in the top tier (‘well above world standard’). Given the relatively smaller sizes of the UQ and Monash neuroscience efforts, it appears that their strategies may be to focus more on quality than quantity.

Although Neuroscience is the FoR code with Sydney’s fourth largest number of research outputs and impact as measured by citations (Figure 2.2), putting it on par with Oncology and Carcinogenesis, it attracts a much smaller share of NHMRC income (13 percent), with Sydney ranking third (Table 2.1).

Psychology is also a crowded space, with strong competition from Melbourne, UNSW and UQ, as evidenced by the citation data (Figure 2.2). In ERA rankings, Psychology at Sydney attained only the second tier of ‘above world standard.’ In terms of NHMRC income, however, Psychology does better: it won 20 percent of the national share, putting Sydney in second place (Table 2.1).

The Brain and Mind Research Institute (BMRI) is a well-recognised brand for the University, and its leaders have been very effective advocates, especially with regard to mental health policy and community engagement. But while the BMRI is a centre of high-quality research outputs in mental health and neuroscience (Figure 2.7), it is responsible for only a small proportion of the University’s outputs in these fields (Figure 2.8).

A significant amount of neuroscience and mental health research is carried out in many parts of the University, with researchers associated with multiple entities in the faculties of Medicine, Nursing and Midwifery, Pharmacy, Health Sciences, and Science (especially Psychology).

\(^{21}\) The results of this survey were used to inform COAG’s ‘Roadmap for national mental health reform 2012–22’.


2.3.3.3 Current state of mental health and neuroscience research at Sydney

Researchers at the BMRI regularly collaborate with other researchers: 88 percent of their publications cite some sort of collaborative effort. Significantly, however, there is an evident lack of collaboration internally where it would seem to be highly desirable, e.g., with the School of Psychology in the Faculty of Science: less than 5 percent of publication outputs for the BMRI or Psychology have co-authors from the other unit (2007–11 data).

The data indicate that Sydney has strong potential in mental health and neuroscience but that the competition is stiff. The current arrangement whereby the BMRI is administratively in the Faculty of Medicine and has a multi-faculty governing board, has led to operational improvements for the BMRI. However, the arrangement has not resolved the role of the BMRI in the University’s strategy for mental health and neuroscience. In the absence of any clarity on this matter the creation of a Medicine-led neuroscience and mental health research theme (Figure 1.8) has led to further ambiguity and confusion, which has impeded efforts to set a broadly agreed strategy and goals.

Figure 2.7  Comparison of impact of publications produced by BMRI versus other University entities 2007–11

Source: Taken from IRMA
Note: The high quality of research from the BMRI is evident by comparing the average number of citations received with the number of publications produced.
2.3.3.4 Future directions

To strengthen the University’s competitive position in mental health and neuroscience, it is necessary to achieve greater alignment and cohesion around an agreed research strategy and engage more broadly with the best that Sydney has to offer – as is the case for CPC and cancer. The strategy should build upon the strong brand and external reputation of the BMRI, but it should also strengthen the discipline of neuroscience and increase strategic collaboration across the University.

Develop a strategy to strengthen the essential disciplines of neuroscience and psychology.

2.3.4 INFECTIOUS DISEASES

2.3.4.1 Context and significance

The NHMRC lists emerging infectious diseases as a priority area for research investment. In recent years, HIV, hepatitis C, avian and pandemic influenza, agents of bioterrorism, Hendra, chlamydia and so on have all elicited urgent research initiatives from the NHMRC. Indeed the Australian government has recognised the importance of these diseases by maintaining national strategies (and national centres) in HIV, hepatitis B and C, sexually transmitted infections, and tuberculosis.

2.3.4.2 Sydney’s track record in infection diseases research

Sydney has research expertise in infectious diseases as well as in the underlying biomedical sciences of medical microbiology and immunology that are critical to understanding and mitigating the effects of infection. In 2012–13, Sydney won two multi-million dollar NHMRC Centres of Research Excellence grants: one in critical infectious diseases; another in tuberculosis control – from discovery to public health practice and policy.

Infectious Diseases is a six-digit FoR that sits under Clinical Sciences, so benchmarking NHMRC income and ERA performance is not possible. Nevertheless, Sydney’s infectious diseases research wins the second highest number of grants under the Clinical Sciences FoR, and Sydney’s citations further indicate substantial activity, with 2786 citations in 2007–11. Medical Microbiology and Immunology, as four-digit FoRs, can be benchmarked; and as fundamental disciplines that support research in infectious diseases they provide some useful indications. In Medical Microbiology, Sydney ranks first among the Go8 universities in share of NHMRC income (Table 2.1) and was rated in the top tier in ERA 2012, along with UQ, Monash and Adelaide. In Immunology, Sydney has significant capability but is less strong, ranking sixth in share of NHMRC income (Table 2.1).

Scale of research activity

There were 474 authors and 337 publications associated with infectious diseases research at Sydney in 2011 (2012 HERDC data).

Figure 2.8 Spread of University research outputs in mental health and neuroscience (aggregated for 2007–11)

Source: IRMA 2013

Figure 2.9 Go8 comparison of number of citations for 1107 (Immunology) and 1108 (Medical Microbiology) (aggregated for 2007–11)

Source: Thomson Web of Science 2011
and in the second tier in ERA 2012, while Melbourne, ANU, UQ and UNSW were all in the top tier. From the citation data across both FoRs (Figure 2.9), it is evident that competition is intense, with Melbourne and Monash dominant overall, Sydney and UQ close behind, followed by a not-too-distant UWA and UNSW.

Sydney’s expertise in infectious diseases and the basic biomedical sciences that support it is spread across its health and medical research community. The bulk of the outputs in infectious diseases research is produced by the Faculty of Medicine, though when normalised to outputs per researcher it is apparent that the faculties of Science and Veterinary Science contribute significantly; each of these also has sustained grant income. While no single department/school entity within the Faculty of Medicine can claim the bulk of the outputs, there is a clear concentration of volume and quality at the Westmead and Camperdown campuses, with significant activity in tuberculosis, malaria, hepatitis C, HIV and drug resistance. When considering citations in Microbiology, Clinical Sciences (infectious diseases, clinical microbiology, venereology only), Immunology and Medical Microbiology, it is evident that Sydney draws substantial expertise from multiple faculties (Figure 2.10).

The FoR analysis, and the recent successes in NHMRC Centres of Research Excellence grants, demonstrate that Sydney has at least emerging strengths in the area of infectious diseases research and that it can draw upon capacity across the University, but also that it is a highly contested space.

2.3.4.3 Current state of infectious diseases research at Sydney

Since 2010, the Sydney Emerging Infections and Biosecurity (SEIB) Institute – a ‘virtual’ institute – has engaged a network of researchers across the campus and from multiple faculties. The network was initially supported by the Faculty of Medicine. In 2012, the SyReNS provided further support for the related Sydney Infectious Diseases and Biosecurity Research Network (SIBRN). SIBRN aimed to increase the scope of the SEIB Institute’s collaborations and research by going beyond the faculties of Medicine and Veterinary Science and establishing nodes in the Arts and Social Sciences, and Science. The discipline leaders within the network reflect this broadened horizon and are drawn from Agriculture, Law, Arts and Social Sciences, Medicine, Nursing and Midwifery, Pharmacy, Science, and Veterinary Science. The SEIB Institute has to date been successful in raising the visibility of its research network and actively promoting communication between its geographically and administratively dispersed multi-disciplinary groups.

Figure 2.10 Average Scopus citations for publications in Microbiology, Clinical Sciences, Medical Microbiology and Immunology (aggregated for 2007–11)

Source: IRMA 2013
Note: Microbiology, Medical Microbiology and Immunology include all six-digit sub-codes. Clinical Sciences includes six-digit sub-codes for three areas only: infectious diseases, clinical microbiology, venereology.
2.3.4.4 Future directions

Set specific research aims and KPIs for the Sydney Emerging Infectious Disease network to drive cohesion and focus to measure progress.

SEIB is the newest of Sydney’s health and medical research networks established to address significant health issues. It should be supported to continue developing both its network and new collaborations. Its governance should be aligned with that of the recommended governance model. Critical to the long-term success of this network will be the setting of specific research aims and key performance indicators to define and measure the expected outputs in order to establish Sydney’s pre-eminence in particular areas. Depending on its evolution over the next three to five years, SEIB could remain as a loose federation of researchers with common interests, or it could develop into a fully-fledged initiative of scale requiring more formal governance.

2.3.5 RECOMMENDATION FOR STRATEGIC PRIORITY AREAS FOR RESEARCH FOCUS

The four candidate areas are well positioned at the intersection of the University’s research strength, national and international health needs, and researchers’ values. They have demonstrated potential for Sydney to realise large-scale collaboration, deliver high-impact outcomes for the health system and the wider community, and achieve national and international pre-eminence. The Advisory Committee therefore makes this recommendation:

**RECOMMENDATION 1**

Support the following four strategic priority areas for research focus:
- obesity, diabetes and cardiovascular disease
- cancer
- mental health and neuroscience
- infectious diseases.

These priority areas should serve to integrate research activities across the University’s campuses and to maximise impact at each of the eight geographic hubs of health delivery activity where University research is conducted. In this way, the University will be better positioned to align itself with the NSW Government’s plan to focus support for health and medical research through a system of geographic hubs, and better prepared for the Australian government’s proposed Integrated Health Research Centres.

Key to the success of all four strategic priority areas for research focus will be effective collaboration. The review has therefore coined this acronym to refer to them: SPARC for Strategic Priority Area for Research Collaboration.

For brevity, strategic priority areas will henceforth in this document be referred to as SPARCs.

Four bright SPARCs

Collaboration will be key to the success of Sydney’s strategic priority areas for research focus. Consequently they will be known as Strategic Priority Areas for Research Collaboration, or SPARCs.

It is important to note that the boundaries between SPARCs are fuzzy. For example, some cancers are caused by infection, while obesity is a risk factor for others; and mental health issues are important in managing and mitigating chronic diseases. This means the outputs of the SPARCs are likely to yield a whole much greater than the apparent potential of their individual parts. This interdependence is an obvious advantage, given the objective of delivering significant health benefits to individuals, communities and the population.

2.4 COMMON ELEMENTS OF SPARCs

2.4.1 INTRODUCTION

During the review it became apparent that the SPARCs, each of which focuses on a specific disease group, would nevertheless have elements in common. Broadly these common elements are shared themes of: integrated health care, population health and health services, and Aboriginal and Torres Strait Islander health; a shared emphasis on developing a vertically integrated translational pipeline encompassing all stages of research through to implementation in health practice and policy; and a shared commitment to health and medical research across the whole life span. All these common elements are discussed in the following pages.
2.4.2 CROSS-CUTTING THEMES
The consultation process drew attention to some generic health outcomes that cut across all the disease groups covered by the four SPARCs. We refer to these as ‘cross-cutting themes’. The review is nominating three such cross-cutting themes for strategic attention because they have wide implications and are critical to attaining outcomes of national significance. They are:

- integrated health care – for improved health and wellbeing of the individual
- population health and health services – for improved health outcomes for all Australians
- Aboriginal and Torres Strait Islander health – for improved health outcomes for these particularly disadvantaged groups within the Australian community.

These themes are priorities for state and Australian governments, other funders and the health system. In addition, in his recent recommendations to the Prime Minister’s Science, Engineering and Innovation Council, Australia’s Chief Scientist selected Promoting Population Health and Wellbeing as one of five national strategic research priorities and an area for priority research expenditure and investment.

The three cross-cutting themes must not be seen as a constraint on the SPARCs. On the contrary, they are intended to stimulate new research ideas and undertakings in areas of particular interest to the nation’s health. Adopting them should encourage and enrich the University’s research efforts, and building capabilities in them should contribute to strategic positioning, reputation and competitiveness.

2.4.2.1 Integrated health care
Individual health and wellbeing require integrated health care delivery, from the delivery of specialised care in hospital settings, to the delivery of primary care in community settings by general practitioners, allied health professionals, dentists, nurse practitioners, community pharmacists and so on. Effective prevention, early intervention, and management of health issues in home and community settings will improve health outcomes and, critically, reduce health care costs, given that by far the greatest burden of disease is managed by primary care.

Ideally, improvements in integrated health care are based on the synthesis of evidence from basic research through applied research, clinical research and health services research. Primary and community care provide significant opportunities for the meaningful translation of
research findings directly to health care delivery. Authentic partnerships between researchers and health care practitioners at all levels, including in developing research questions arising directly from clinical practice, have great potential to improve health care.

The growing interest in research relating to nursing, primary care and allied health care is a particular opportunity for Sydney – with its faculties of Health Sciences, Nursing and Midwifery, Pharmacy, and Dentistry – to produce innovative research applications extending to all health care settings.

2.4.2.2 Population health and health services

Population health focuses on collective wellbeing, and concerns the way we live our lives, our environment, what we eat, our access to health services and the quality of those services. Those who work in population health seek solutions to problems that prevent us from enjoying a healthy life. They provide critical tools and analyses for the development of health policy and the improvement of health services.

In the Public Health and Health Services FoR, Sydney has considerable strength. In ERA 2012, Sydney was one of only two universities that earned the highest rating (‘well above world standard’), the other being ANU; and in NHMRC funding Sydney earns the largest share, although UNSW is close behind (Figure 2.12).

The School of Public Health has extensive capabilities and research programs in public health, health economics, health services research and economic evaluation. The school’s academics and researchers have collaborations across the University as well as externally, particularly in the areas of obesity, diabetes and cardiovascular disease, clinical trials, health workforce, health inequalities, ageing, health expenditure, and health policy.

The Faculty of Health Sciences is home to the Health Systems and Global Populations Research Group, which has a range of initiatives including health informatics and health system governance, as well as a particular interest in how health systems affect populations.

Several institutes and research groups have developed in-house capacity in health economics and health services research. These include the George Institute for Global Health and the NHMRC Clinical Trials Centre.

The Sydney Health Policy Network sponsored by the Menzies Centre for Health Policy is also well placed and has a framework for bringing cross-disciplinary skills to bear to assist in translating research findings to policy that can have a high impact on population health.

Support the expansion of the Sydney Health Policy Network, including a strategy to bring in associated research groups in health economics and health services research to develop critical mass.

These strong foundations provide excellent opportunities to further expand Sydney’s capabilities and capacity in this increasingly important field and to connect it more strongly to the SPARCs.

Figure 2.12 NHMRC grants awarded for Public Health and Health Services (aggregated for 2007-12)
2.4.2.3 Aboriginal and Torres Strait Islander health

It is well recognised that Aboriginal and Torres Strait Islander peoples and communities suffer a greater burden of disease than non-Aboriginal Australians. The difference in life expectancy is currently estimated to be between 13 and 17 years. Half of all first Australians are living with a disability or long-term health condition. Many of the risk factors for diabetes and cardiovascular disease are elevated in Aboriginal and Torres Strait Islander communities, leading to higher incidences of these diseases. Compared to non-Aboriginal Australians the mortality rates for mental and behavioural disorders are a staggering 5.5 times higher in men and 2.2 times higher in women. The story continues with infection. Tuberculosis remains a greater risk for Aboriginal and Torres Strait Islander peoples, particularly for those in central and northern Australia. HIV infections among Aboriginal people are reported to be more or less on par with those of non-Aboriginal Australians; however, the reported exposure due to intravenous drug use was higher for Aboriginal Australians – 16 percent of new infections compared with 2 percent for non-Aboriginal Australians. The incidence of cancer among Aboriginal peoples appears no higher than among non-Aboriginal, but the gap in access to appropriate and timely medical help means Aboriginal peoples have a higher mortality rate.

Access to health services is just one of the distinct regional challenges in improving health outcomes for Aboriginal and Torres Strait Islanders. Other challenges include the levels of social disadvantage and the difficulty in collecting reliable data.

Sydney has been making some advances with regard to Aboriginal and Torres Strait Islander health research. For example, the Poche Centre for Indigenous Health was set up in 2008 and focuses research collaborations on:

- access to health services
- vascular risk and chronic disease
- childhood and adolescent health
- wellbeing and social and cultural determinants of health.

Figure 2.13 Numbers of research grants relating to Aboriginal and Torres Strait Islander health across faculties (2009–11)

Source: Taken from IRMA
SETTING STRATEGIC PRIORITY AREAS FOR RESEARCH FOCUS
“The Indigenous health gap accounted for 59% of the total burden of disease for Indigenous Australians in 2003, indicating a very large potential for health gain. Non-communicable diseases explained 70% of the health gap. Tobacco (17%), high body mass (16%), physical inactivity (12%), high blood cholesterol (7%) and alcohol (4%) were the main risk factors contributing to the health gap. While the 26% of Indigenous Australians residing in remote areas experienced a disproportionate amount of the health gap (40%) compared with non-remote areas, the majority of the health gap affects residents of non-remote areas.”


Also, a growing number of research grants at Sydney support research relevant to Aboriginal and Torres Strait Islander health, predominantly in the Faculty of Medicine (Figure 2.13). There is potential to increase this research income by working closely with Aboriginal and Torres Strait Islander communities in the context of the University’s Wingara Mura – Bunggaba Barrabug initiative to promote Aboriginal and Torres Strait Islander engagement. Finally, the Faculty of Health Sciences is partnering with the AIHW to establish the National Centre for Aboriginal and Torres Strait Islander Statistics. This initiative aims to provide reliable health data for all first Australians, regardless of where they live.

Strengthen collaboration between the Poche Centre, DVCISS and DVCR to support research that directly addresses questions of importance to Aboriginal and Torres Strait Islander health.

All these University assets can be capitalised on and enhanced by the four SPARCs in the course of achieving improved health outcomes for Aboriginal and Torres Strait Islander peoples. Although the University’s portfolio of research grants in this area is growing (Figure 2.13), there is considerable untapped potential. The University should prioritise increasing the number of funding applications in this area, particularly given that it is an NHMRC priority (Table 2.2). The planned appointment of a Director, Aboriginal and Torres Strait Islander Health as a Deputy Vice-Chancellor, Indigenous Strategy and Services (DVCISS)/DVCR cross-portfolio initiative (part of Wingara Mura) will be an important step in achieving this goal.

2.4.3 WHOLE LIFE SPAN

To achieve maximum health impact, activities in the four SPARCs should encompass the whole life span, from ‘a healthy start to life’ through to ‘healthy ageing’.

It is increasingly understood that healthy beginnings enhance long-term quality of life and achieve tremendous savings in health care. Research is continually informing us of the importance of factors influencing pre-conception, conception, birth and childhood. These periods present golden opportunities for interventions that save lives or establish healthy behaviours for life.

Of mounting concern as individuals live longer and population distributions age is the question of healthy ageing. Maintaining an affordable health care system will depend increasingly on strategies that support healthy ageing and build capacity for health care in the community and at home.

Research to optimise health outcomes and healthy choices at all stages of life depends upon medical doctors, nurses and allied health researchers working collaboratively and considering all health care delivery settings.

Figure 2.14 The SPARCs with the cross cutting themes and the whole life span
2.4.4 TRANSLATION PIPELINE (VERTICAL INTEGRATION)
The potential for impact in each of the SPARCs will be maximised if research outputs can be translated into medical and health care practices, health policies and, where appropriate, industry engagement and commercialisation. The ultimate objective is to develop vertically integrated translational capabilities, so that a strong basic research program feeds excellent clinical research which in turn leads to influential real-world outcomes.

Currently Sydney’s capabilities at each stage of this translation pipeline are variable, but to achieve or maintain national pre-eminence in the SPARCs we should seek opportunities to improve our strengths at every stage.

In numbers of researchers and research outputs, Sydney is strongest in the Clinical Sciences, and Public Health and Health Services FoRs, and as a result is very strong in clinical research and policy development. Yet to maintain Sydney’s competitive position in these areas will depend to some extent on its having strength in the basic sciences that feed the clinical sciences that keep clinical research at the cutting edge. However, a comparison of Sydney’s performance in some of these basic sciences with that of other Go8 universities reveals that Sydney underperforms in what is already a weak area nationally (Table 2.3).

Furthermore, the 2012 Life Sciences Review identified the potential for researchers in biomedical sciences at the Cumberland Campus to become intellectually isolated, and recommended moving them to the Camperdown Campus. This collocation would be one way to strengthen the basic sciences at Sydney.

At the other end of the translation pipeline, consideration must be given to understanding the needs of end users. Translation into health care practice will be enhanced if Sydney’s research community develops a better understanding of the needs of the end users who provide health services to individuals and to population groups, and of the consumers (carers as well as patients) who use those services. Engaging with these groups better will assist in clarifying what they are looking for from research. This will depend upon building relationships, especially with those who deliver health care – an issue addressed in Chapter 3.

An important element in the translation pipeline is clinical trials. These are critical for testing new drugs, treatments and devices to take to market, as well as for generating non-commercial outcomes to improve health and reduce health care costs. The clinical trials sector in Australia is worth around $1 billion a year. According to 2006–11 data from the US Clinical Trials Registry, Australia ranked 12th in the world for industry-sponsored trials.28

The University has great strength in clinical trials. Both the NHMRC Clinical Trials Centre and the George Institute for Global Health have significant clinical-trial expertise and experience and excellent reputations as leaders in the field. The George has been awarded more than $250 million in contracts for clinical trials over the last decade. By strategically leveraging the combined capabilities of the Clinical Trials Centre, the George and other clinical trials activity being undertaken through the University’s clinical schools, hospitals and research institutes, Sydney could position itself to become Australia’s leading clinical trial network. This network would provide one of the largest patient recruitment pools in the country.

Figure 2.15 The SPARCs with the cross-cutting themes, whole life span and translational pipeline

---

A more strategic approach to clinical trials has the potential to deliver significant benefits. Bringing together those involved in clinical trials from across the University, supporting them with streamlined administration, and establishing agreed priorities would substantially strengthen Sydney’s capacity to translate research results into health outcomes.

Another element of the translation pipeline that warrants greater attention at Sydney is commercialisation, which is discussed in Chapter 3.

2.5 CONCLUSION

The strategic objective of supporting SPARCs, together with cross-cutting themes, a whole-of-life research emphasis and a vertically integrated translation pipeline, provides a coherent focal point for Sydney’s health and medical research within which goals can be set and outcomes measured.

RECOMMENDATION 2

For each of the SPARCs, optimise the University’s collective capacity to:

– contribute to:
  + integrated health care – for improved health and wellbeing of the individual
  + population health and health services – for improved health outcomes for all Australians
  + Aboriginal and Torres Strait Islander health – for improved health outcomes for these particularly disadvantaged groups within the Australian community.

– consider health at all stages of life
  – develop a vertically integrated translation pipeline, from basic research through to clinical practice, policy and products.

If Sydney is to become pre-eminent in these SPARCs, it must also attract top-quality researchers at all career stages and support their development. Critically, it must build their ability to work in, and eventually lead, large-scale collaborative ventures, including those that transcend organisational boundaries, in order to attract funding for larger research programs. These issues are taken up in Chapter 3.

Furthermore, success in realising the benefits of large-scale collaborations will depend on strong leadership and governance (discussed in Chapter 4), on Sydney’s capacity to support the research effort with the necessary large-scale research equipment and facilities (discussed in Chapter 3), and on its capacity to develop corporate systems and business processes that support collaboration across the University and with the health system at large (discussed in Chapter 5).

Table 2.3  Comparison of ERA performance among Go8 universities in some basic sciences

<table>
<thead>
<tr>
<th>FOR</th>
<th>FOR NAME</th>
<th>ANU</th>
<th>MELB</th>
<th>UWA</th>
<th>ADELAIDE</th>
<th>UNSW</th>
<th>UQ</th>
<th>MONASH</th>
<th>SYDNEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>304</td>
<td>Medicinal and Biomolecular Chemistry</td>
<td>-</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>601</td>
<td>Biochemistry and Cell Biology</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>604</td>
<td>Genetics</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>606</td>
<td>Microbiology</td>
<td>4</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>608</td>
<td>Physiology</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: ARC ERA Results 2012:
– 5 (‘well above world standard’),
– 4 (‘above world standard’),
– 3 (‘world standard’),
– 2 (‘below world standard’),
– Blank (‘unreported’).
3 FACILITATING RESEARCH EXCELLENCE AND IMPACT

This chapter considers how Sydney can assist the SPARCs to achieve both academic excellence and societal impact. It discusses how the University can increase impact by building strategic partnerships with health care providers and with industry, and support excellence by providing state-of-the-art research infrastructure and by recruiting top researchers at all stages of career and offering them further training and development. Other support mechanisms – structure and governance, and business processes and corporate systems – are discussed in Chapters 4 and 5 respectively.

STRATEGIC OBJECTIVE 2
Facilitate research excellence and impact by making Sydney’s strengths in the Strategic Priority Areas for Research Collaboration (SPARC) highly visible to health care providers and industry, to facilitate partnerships and opportunities for translation and commercialisation, and by making “outstanding staff supported by state-of-the-art research facilities” the hallmarks of research excellence at Sydney.

3.1 PARTNERSHIPS FOR RESEARCH TRANSLATION
Translating Sydney’s health and medical research into real-world outcomes will be enhanced by stronger partnerships with the health care system at all levels, from hospitals to primary and community care settings, and with industry.

3.1.1 RESEARCH PARTNERSHIPS WITH HEALTH CARE PROVIDERS

3.1.1.1 Context and significance
Increasing emphasis on bridging the evidence–practice gap through partnerships
It is now well recognised that much health and medical research does not in itself lead to improved health outcomes, or that when it does, the time lag between discovery and implementation can be years if not decades. Increasing the amount of research that gets translated, as well as accelerating the translation process, are now high priorities on the national and international research and research funding agendas. The NHMRC, for example, launched its new Research Translation Faculty in 2012, “a major strategic initiative” intended to “support more effective and accelerated translation of health and medical research into improved policy and practice in Australia”. Its Partnership for Better Health funding program seeks to “facilitate the routine use of research in Australia’s health and health care system”.

The Partnership for Better Health program is indicative of the increasing awareness that translation is significantly enhanced by strong partnerships between researchers and practitioners. The Integrated Health Research Centres recommended by the McKeon Review, similarly, are explicitly intended to “combine hospital and community-care networks, universities and research organisations such as medical research institutes” to create centres of excellence and drive the translation of research into clinical practice. The McKeon recommendation draws on the examples and experiences of a growing number of centres overseas that have been designed to support stronger partnership between one or more universities and health care providers, focusing on research, clinical services, education and training. Such centres are operating in Canada, the Netherlands, Singapore, Sweden, the United Kingdom and the United States. Researcher–practitioner partnerships are becoming understood not as mono-directional mechanisms, whereby new evidence is passed from the research environment over to the clinical environment rather like a baton is handed over in a relay race, but as an integrated, bi-directional exchange of ideas and information, sometimes referred to as ‘knowledge translation’.

Trend towards integrated two-way knowledge translation
A recent addition to the NHMRC’s Partnership for Better Health program is the Partnership Centres scheme. The guidelines call explicitly for research to be applied across the spectrum from clinical practice to management and policy. Measures of success in this scheme include “ongoing linkage and exchange between ... end users of research and researchers as an integral part of all aspects of the Centre’s work”. Such integration is a departure from the tradition of conceiving research translation as something to be considered after the research is completed. Even the theme for each centre is a matter for negotiation between research partners and health system partners.
An example of the international trend towards stronger integration of research and practice is evident in recent policy work by the Canadian Institutes of Health Research (CIHR). The CIHR’s rubric for this integrative process is “knowledge translation”, which it defines as “a dynamic and iterative process ... to improve the health of Canadians, provide more effective health services and products and strengthen the health care system”. Integrated knowledge translation is therefore largely outcomes-oriented, is a mutual process between researchers and knowledge users, and results in knowledge exchange and mutual learning. Importantly, it proactively engages the end users of research knowledge in the entire research process, including shaping that process, that is, “determining the research questions, deciding on the methodology, being involved in data collection and tools development, interpreting the findings, and helping disseminate the research results”.

Trend towards greater engagement with primary and community health care
Despite the importance of primary and community care in the delivery of health services and their role in the maintenance of healthy communities, they currently have few links with the research community and universities. One of the challenges is that the primary and community care sector is a vast network of service providers, many supported through public money but many more working as private practitioners who lack the time and resources to consider questions of research. Nevertheless, as research funders and governments look to the research community to develop stronger partnerships and collaborations with health care providers, there is an increasing emphasis on extending this engagement beyond the acute tertiary-care context, with its strong focus on hospitals, to include primary and community care.

Exemplifying the trend towards greater engagement with primary and community health care (mentioned above), the Australian government-initiated Medicare Locals have been tasked with coordinating primary health care delivery and identifying community needs and gaps in services. They will have strong links to local hospital networks, local communities, health professionals and service providers including general practitioners, allied health professionals and Aboriginal medical services.

Complexity of health care delivery
The health care system in NSW – the immediate context for partnerships between University researchers and health practitioners – is wide-ranging and complex, largely because of the multifaceted historical relationships between national and state governments, especially around funding responsibilities for different parts of the system.

Major health system reforms agreed by the Australian and state governments and introduced in the last few years have sought to address the complexities and create a more integrated health system that enables patients to move seamlessly across the health sector, improving continuity of care and health outcomes.

In NSW, the Ministry of Health (NSW Health) organises health care delivery through eight metropolitan and seven rural and regional Local Health Districts (LHDs). As part of their service agreements with the Ministry of Health, all LHDs are required to develop research strategies; these are all at different stages of progress.

In response to the NSW Review, NSW Health is in the process of establishing eight geographical research hubs across the Sydney, Newcastle and Illawarra metropolitan LHDs. The aim is to enhance collaboration, translation and the efficient sharing of expensive equipment, buildings and support services.

<table>
<thead>
<tr>
<th>NSW HEALTH LOCAL HEALTH DISTRICTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metropolitan</strong></td>
</tr>
<tr>
<td>- Central Coast</td>
</tr>
<tr>
<td>- Illawarra Shoalhaven</td>
</tr>
<tr>
<td>- Nepean Blue Mountains</td>
</tr>
<tr>
<td>- Northern Sydney</td>
</tr>
<tr>
<td>- South Eastern Sydney</td>
</tr>
<tr>
<td>- South Western Sydney</td>
</tr>
<tr>
<td>- Sydney</td>
</tr>
<tr>
<td>- Western Sydney</td>
</tr>
<tr>
<td><strong>Rural and Regional</strong></td>
</tr>
<tr>
<td>- Far West</td>
</tr>
<tr>
<td>- Hunter New England</td>
</tr>
<tr>
<td>- Mid North Coast</td>
</tr>
<tr>
<td>- Murrumbidgee</td>
</tr>
<tr>
<td>- Northern NSW</td>
</tr>
<tr>
<td>- Southern NSW</td>
</tr>
<tr>
<td>- Western NSW</td>
</tr>
</tbody>
</table>

Academic value of translational research
Ironically, perhaps, translational research that responds to needs defined from within the health system, both practice and policy, may not always translate back into academic impact. There are several reasons for this. It is not always easy to publish such research in peer-reviewed journals. If developed as intellectual property, the results of such research can be restricted by commercial-in-confidence concerns and their wider availability delayed. ‘Grey’ literature, in the form of research reports, may not count in research-performance metrics. Therefore, if researchers and research entities are to be seriously encouraged to do more translational work, new ways of measuring impact on health-services policy and delivery and of including it
in performance metrics are required that go beyond the traditional academic indicators of publications and citations. Measuring research impact is difficult and there are no agreed metrics or data collection; nonetheless, governments are showing an increasing interest in doing so.

3.1.1.2 Current state of Sydney’s research partnering with health care providers

Sydney’s Faculty of Medicine has for many years been a major University partner in research at hospitals in four of NSW’s metropolitan LHDs (Sydney, Northern Sydney, Western Sydney, Nepean Blue Mountains) and is active within three of the rural and regional LHDs (Northern, Western, Far West). Each of the four metropolitan LHDs has one or more University-affiliated medical research institutes associated with its hospital campus: associated with Royal Prince Alfred Hospital are the Centenary Institute, Heart Research Institute, Woolcock Institute, George Institute for Global Health and, most recently, Lifehouse; associated with Concord Hospital is the ANZAC Institute; with Royal North Shore Hospital is the Kolling Institute; and with Westmead Hospital are the Westmead Millennium Institute, Children’s Medical Research Institute and Kids Research Institute. The faculties of Health Sciences and Nursing and Midwifery have activities in all 15 LHDs in NSW, as well as with the Sydney Children’s Hospitals Network, the Justice and Forensic Mental Health Network, and the St Vincent’s Health Network.

Through these existing partnerships with LHDs and health networks, the University may find itself ‘automatically’ engaged with the new geographical research hubs to be established in response to the NSW Review.

Sydney now also has an opportunity to engage with the new Medicare Locals. Through its Westmead hub, the University has already established close links with one of the first of these new primary health care providers to be up and running, the Western Sydney Medicare Local. As more Medicare Locals are established, further opportunities for engagement will arise.

Successful partnering with the health care system to date is largely a product of the University’s recognised research strengths in clinical and health sciences and of the University–hospital–health-provider partnership in clinical training and education. These established partnerships can in turn lead to new partnerships. This is exemplified by the University’s recent investment in a health workforce special-interest group, involving researchers, students, policy makers, industry bodies and other interested community parties, who will be putting together health workforce development strategies, including training, recruitment and retention. In another example, the University is undertaking research to inform the planning of new ways to support the costs of clinical placements within the health care system, in the context of the wider health system reforms.

Through its strengths in public health and health services research, Sydney has developed distinctive research skills relevant to policy makers and health service managers. Health service managers at times bemoan the lack of information and interest in helping them develop evidence-based policy. An excellent counter-example of this is the Sydney Health Policy Network, sponsored by the Menzies Centre for Health Policy, which has established a framework for bringing together the disciplines needed to take research findings through to policy.

An important example of innovative partnering between researchers and the health care community, and one that is aligned with the mental health and neuroscience SPARC, is the recent announcement of an NHMRC Partnership Centre on Dealing with Cognitive and Related Functional Decline in Older People. The University, through researchers in its Northern Clinical School, has just entered into a new type of funding agreement with the NHMRC and four community partners to establish this unique centre. It is to be supported by a combination of government and non-government funding to the tune of $25 million over five years, with about $20.5 million coming from the NHMRC and the remainder from the community partners – HammondCare (NSW), Alzheimer’s Australia Inc (National), Brightwater Care Group (WA) and Helping Hand (SA). The centre, which will be headquartered at Hornsby Hospital, is to deliver nine major outcomes through research-improved quality of care for older people with dementia and their carers; improved service planning; developing and implementing new approaches to supporting informal carers; assisting with the end-of-life decision-making process; reducing stigma; building the size and quality of the aged care workforce; improving regulations; promoting responsible medication management; developing and disseminating up-to-date clinical guidelines; and implementing proven models of care.

Other important mechanisms for supporting partnerships with health care providers in all settings are the NHMRC Partnership Projects and the Australian Research Council (ARC) Linkage grants. But the story here is not so positive. Whereas Melbourne’s participation in Partnership Projects is steadily increasing, Sydney’s is dramatically decreasing (Figure 3.1). Curiously, while Sydney’s success rate has remained largely stable, its number of submissions to the scheme has steadily dropped, from 11 in 2008 to just three in 2012. In the ARC Linkage scheme, UNSW has been strongest over the 2009–12 period, with Melbourne second and Sydney third (Figure 3.2). If Sydney can increase its participation and success in these schemes, they will provide significant opportunities to support the strategy for greater engagement with the health system.
Figure 3.1  NHMRC Partnership Project grants awarded to Go8 universities (application years 2008–12)

Source: NHMRC datasets

Figure 3.2  ARC Linkage grants relating to health and medical research awarded to Go8 universities (aggregated for commencement years 2009–12)

Source: ARC datasets

Note: The data are for grants awarded in FoRs 1101–1109.

Future directions for partnering with health care providers

The difficulty of establishing truly integrated, translational research practices, and the current strong focus of health and medical research generally at the acute care/medical intervention stage of health care delivery, present a major opportunity for Sydney. But to take up this opportunity will require several initiatives. It will require a stronger focus on the research done by all the health faculties. It will require an integrated strategy to translate research into health policy development – the Sydney Health Policy Network offers a platform to achieve this. And it will require improved mechanisms for two-way knowledge translation between researchers and providers – to facilitate this, the University should establish formal partnerships with the NSW Ministry of Health’s Agency for Clinical Innovation and with the Clinical Excellence Commission.

All these initiatives should form part of a coherent, integrated strategy for the SPARCs, where the University’s high-quality research can contribute most. There will also need to be an effective, structured framework through which the SPARCs can engage with the LHDs, the forthcoming Research Hubs and Medicare Locals, and with the foreshadowed Integrated Health Research Centres and Academic Health Science Centres. Such a framework is proposed in Chapter 4. It will be crucial in building the trust required for large-scale collaboration and cooperation.

The review has been told that to form the research hub at Westmead (where the University is a partner), it took 11 years of careful management to nurture relationships between multiple independent entities with strong identities so as to reach a point where the mutual benefits of collaboration have become apparent and equipment is shared. Admittedly, this was done without a funding incentive – which has been foreshadowed by the recent NSW Review. Nonetheless, the Westmead experience shows that negotiating mutually satisfactory relationships and outcomes with multiple stakeholders can be complex and slow.

On a promising note, Sydney has some important competitive advantages in terms of expanding its partnerships with the health system and the emerging new health research entities. First, the University’s research strengths already span medicine, nursing, health sciences, allied health, public health, health services and health policy. This means it is well placed to respond to the call for more meaningful translation through stronger partnerships with health care at all levels, from acute hospital-based care to primary and community care. Second, the proposed SPARCs focus explicitly on disease groups of major societal significance, which bodes well for health system partnerships and means Sydney will be closely aligned with the recommendations in the McKeon Review.

There is one final matter to consider in terms of future directions: if the academic value of translational research remains low, it will prove a disincentive to establishing partnerships for research impact. The University will therefore need to consider how to reassess translational research in connection with output rewards. Internally, the criteria for academic promotion will need to be reconsidered. Externally, the University should advocate for greater recognition in the funding system of the societal impact of health and medical research.

RESEARCH PARTNERSHIPS WITH INDUSTRY

Context and significance

Commercialisation is an important bridge that takes innovative research outputs from universities, research institutes and hospitals through to industry and then to market while protecting intellectual property.

Size of the biomedical industry in Australia

The biomedical industry in Australia is substantial, and includes both pharmaceuticals and medical technologies. According to the most recent data the Australian pharmaceutical industry had an annual turnover of about $18 billion, employed more than 40,000 people, and generated nearly $4 billion in exports in 2010–11. The Australian medical technologies industry had sales of $1.9 billion in 2011 and employed more than 17,500 people. NSW leads the nation in the biomedical industry: 75 percent of multinational pharmaceutical companies have their head offices in the state.

Industry investment in Australian R&D is weak
In spite of its size, the Australian biomedical industry invests little in research and development; the level of investment is weaker than in other OECD countries. The McKeon Review and the NSW Review have both pointed to shortcomings of industry and of government in contributing to this problem. According to the McKeon Review, the failure to realise the full benefits from research is due to lack of industry funding for early clinical projects (that is, pre-commercialisation development funding) and an immature commercialisation environment. The NSW Review concluded that the NSW Government has failed to exploit commercialisation opportunities and failed to collaborate effectively with industry.

Decline of in-house research in the industry sector
The Australian biomedical industry is also affected by international trends in industry research. A 2012 OECD report\(^33\) has highlighted the challenges the pharmaceutical industry is facing globally as in-house research declines. This decline is common across all industry sectors. As a result, pharmaceutical companies are looking to collaborate with other companies, universities and research institutes. Such collaborations require strong relationships between university-based researchers and industry, as well as effective communication across what are distinct cultures with very different values and goals.

Poor business understanding and skills in the research sector
The decline of in-house industry research presents an opportunity for the research sector. However, as previous reviews have noted, an impediment to commercialisation in Australia is that researchers generally have a poor understanding of industry and the commercial world. This is not helped by the current reward system for researchers that fails to encourage commercialisation activities. Most importantly, reviews have highlighted the shortage of skills for translating research outputs into investment-ready opportunities or business plans. People with commercialisation skills who specialise in medical fields are scarce; conversely, few researchers acquire business skills as part of their education. The skills shortage is compounded by a lack of funding for ‘proof of concept’ trials that might give industry the confidence to adopt research outputs into their product lines.

---


---

Figure 3.3 University IP patent portfolio for health and medical research held by CDIP

![Figure 3.3](chart.png)
Unwieldy IP processes in the research sector
The other major obstacle to effective partnering between the research sector and industry is the process for securing agreements regarding intellectual property ownership and management. The Australian Chief Scientist’s National Research Investment Plan seeks to set strategic priorities for Australian research, has identified universities’ different approaches to intellectual property protection as a major impediment to the translation and commercialisation of their research results. And at some universities, as well as in LHDs, the systems for dealing with intellectual property are cumbersome and time consuming.

McKeon Review recommendations
The McKeon Review made several recommendations to address the challenges for commercialisation raised here. The most significant are: (1) to increase support for research commercialisation, including the establishment of a $250 million Translational Biotech Fund to match industry investment in early-stage development; and (2) to enhance the commercialisation environment by encouraging freer interchange between researchers and industry and by organising around precincts for commercialisation.

3.1.2.2 Current state of Sydney’s research partnering with industry
The University enterprise includes three health and medical research innovation precincts: Westmead, Royal North Shore and RPA. All provide opportunities to link researchers more effectively with industry. Westmead and Royal North Shore have had relationships with external providers of commercialisation services, although the Queensland-based UniQuest, which was working with Westmead, has recently announced its withdrawal from the arrangement.

The University has a central Commercial Development and Industry Partnerships (CDIP) unit that works across all campuses, CDIP works with Sydney’s research community to identify ideas with market potential, and supports researchers in patenting, IP protection and engaging with likely industry partners. Thus, CDIP operates at the nexus of research and industry. CDIP has been undergoing reform to address the problems of its predecessor, Sydnovate, which was perceived to be insufficiently focused on researcher needs and too inflexible to foster linkages between researchers and industry. Input to the review from CDIP, nonetheless, emphasised the difficulties it experiences with health and medical research at Sydney in identifying strengths and finding out which researcher is doing what. This situation is improving somewhat through CDIP’s engagement in the DVCR compacts34 process with the faculties, where priorities for research support are agreed, including support for researchers to assist them in acquiring the confidence and skills to operate in commercial environments.

A recent IP audit of the University’s patent portfolio identified more than 60 biotech patent families. Much of this patent activity is in the Faculty of Medicine’s themes of Infectious Disease, Cancer and Respiratory Disease (Figure 3.3). The families can be categorised as revenue generating (15 percent), in partnership (39 percent), and unrealised or partnership-seeking (46 percent). CDIP’s evaluation of commercial opportunities for a portfolio of this kind has identified significant untapped potential in the themes of Infectious Disease, Neurosciences, Ophthalmology and Respiratory Disease.

The CPC has as one of its goals to link research and industry and hence improve the flow of innovation and commercialisation in support of its mandate. Through its pan-University research program and its core research facilities, the CPC is establishing relationships with industries that supply technologies for health and medical research and clinical practice. In addition, the CPC is exploring incubation facilities and an entrepreneur-in-residence position as part of a concerted program to increase entrepreneurial activity both at the CPC and the University and to increase the translation of CPC research into practice and use.

3.1.2.3 Future directions for partnering with industry
To engage with industry effectively a systematic approach is required by Sydney’s commercialisation office and by its research community as a whole, with a coherent strategic view of what the University is good at and what research is suitable for commercialisation. A culture must be fostered which encourages and supports researchers in developing their research ideas with a view to translation and commercialisation. One obvious mechanism for doing so is the ARC Linkage scheme. Currently Sydney is third behind UNSW and Melbourne in numbers of Linkage awards (Figure 3.2), which suggests there is opportunity to increase participation and success in this scheme.

An area with exceptional commercialisation potential is the work on eHealth technology by Sydney’s biomedical engineering group in the Faculty of Engineering and Information Technology (Engineering and IT). Given that this group attracted almost half (48 percent) the national share of NHMRC income (2005–12), opportunities should exist for stimulating industry interest. This group, like the broader health and medical research community, should also be competitive for funding from the NSW Government’s recently established Medical Devices Fund, designed to take innovation to market and increase uptake in the health system. It is intended that the SPARCs will seek to form close relationships with industry in much the same way as the CPC is doing currently.

34 Biannual meetings between the DVCR and each faculty to agree on strategic investments.
Opportunities also exist for the University’s innovation precincts to develop strategic relationships to realise efficiencies and improve the prospects for commercialisation. CDIP and Royal North Shore recently began discussions on how to leverage collective resources, and the recent withdrawal of UniQuest provides an opportunity to expand these discussions to Westmead.

**RECOMMENDATION 3**
Support each SPARC to:
- partner with health care providers to develop and implement an integrated strategy to optimise the translation of research into improved health care practice and policy, and
- strengthen industry-supported innovation across the care continuum.

### 3.2 INFRASTRUCTURE FOR RESEARCH CAPABILITY

To support the SPARCs, and research generally, Sydney needs state-of-the-art research equipment as well as the collaborative platforms to take full advantage of it.

#### 3.2.1 CURRENT STATE OF SYDNEY’S MAJOR RESEARCH INFRASTRUCTURE

Submissions to the review indicated that current practices for acquiring and managing major research equipment across the University are uncoordinated and inconsistent. Examples were given of expensive research equipment that had been duplicated across the University and, as a result, was either being under-utilised or had insufficient operational resources to maintain it as state-of-the art. Researchers also reported difficulties in identifying where infrastructure critical to their research is located and how to access it.

Due to the high cost of, and rapid advances in, biomedical research technology and equipment, it is difficult for any single research group on its own to justify the cost of new high-end equipment. Collaboration on grants to purchase equipment is therefore usually essential, and Sydney researchers often succeed in obtaining such capital funding. But robust plans for ongoing maintenance and access are seldom put in place at the time of purchase, in part because there are so few options for resourcing these essential activities. The long-term result can be that equipment languishes underused and becomes outdated, while researchers cannot access equipment or must pay a premium unnecessarily to access services externally.

Other universities, notably Monash and UNSW, have addressed these issues by implementing centrally managed core facilities for major research infrastructure, so that investments in expensive equipment can have maximum benefit to their research communities. While Sydney does not yet have a comprehensive portfolio of core facilities, some initiatives are already in place to support specific core facilities. One example is the equipment housed in the Bosch and Centenary Institutes, which is shared by their health and medical research communities. Another example is Sydney Microscopy and Microanalysis (SMM), which supports University-wide needs for microscopy. SMM evolved from a decision by the University in the 1950s to establish an Electron Microscopy Unit to serve researchers. That investment led to Sydney becoming a national leader and hosting the Australian government-funded Australian Microscopy & Microanalysis Research Facility as part of the National Collaborative Research Infrastructure Strategy (now Collaborative Research Infrastructure Scheme).

These initiatives show how a more coordinated approach to infrastructure management has delivered increased financial efficiencies, provided more researchers with access to state-of-the-art equipment and technical support services, and, more significantly, facilitated greater collaboration between researchers, stimulating and enabling cross-disciplinary research as well as opportunities to partner with industry.

Unfortunately, despite the widely recognised benefits of core facilities, most universities are still struggling with inadequate operational funding. There are nonetheless lessons to be learnt from the current initiatives at Sydney. For instance, SMM has recently formed a management committee of deans and representatives of the major user faculties and has developed a transparent funding model that balances a user-pays charge with funding allocated through the University Economic Model (UEM). This experience can be a model for other core facilities.

Many comments in submissions and in the consultations support the need for a strategic framework for identifying, managing and investing in core research facilities at the University. They noted the expected benefits of this approach at the CPC, and that the opportunity to develop new core research infrastructure capabilities and to put existing facilities on a firmer financial footing would benefit all University research. Further, they noted that new systems and processes must ensure access for all researchers across the network, minimising financial and other imposts that would drive individuals to ‘go it alone’.
The review also heard repeatedly that in order to overcome a significant barrier to collaboration across the vast, complex network of research entities, an IT platform is urgently needed which makes easily visible to researchers across the extended network all the shareable resources available to them and their research – not only physical resources such as specialised equipment, but also aggregated research data in the health sector, and information on the expertise of researchers in other faculties or locations, on research interest groups and on current projects.

3.2.2 FUTURE DIRECTIONS FOR MAJOR RESEARCH INFRASTRUCTURE

Promote the unique opportunity provided by the CPC to demonstrate how core research facilities can deliver savings and a sustainable platform that can serve the wider University community.

The Research Development and Collaboration unit in the DVCR Portfolio is already responding to these issues by developing and implementing a strategic framework for centrally managed core facilities. The starting point is the core facilities for the CPC research hub, where there is both a unique opportunity and an urgent need to ensure that it serves the larger Obesity, Diabetes and Cardiovascular Disease SPARC as well as the other SPARCs. The strategic framework will maximise University-wide investment in high-cost, state-of-the-art research infrastructure, provide a robust approach to identifying research infrastructure aligned with and necessary for research priorities, and ensure that core facilities have sustainable operating models (including ongoing investment, expert support and maintenance, research and development) to keep equipment in state-of-the-art condition.

It should be noted that while the Research Portfolio proposes core facilities will be managed centrally, it is intended that the equipment itself will be distributed across the University’s multiple campuses to meet the needs of researchers. Where appropriate, ‘hubs’ of specific capabilities will be located on some campuses, with ‘spokes’ to deliver capability as needed to other campuses, as well as to partner with others for reciprocal usage arrangements. Given the scale of research on the Camperdown Campus it may even be appropriate to have multiple locations for a given core facility on the one campus.

It will be critically important to establish systems that enable access, training and education for researchers across the network, with consistent, sustainable and transparent costing and funding models aligned with the University Economic Model. The University is currently defining the requirements for a single IT platform that will provide easy access to major research infrastructure for external as well as internal researchers and from any location (campuses, institutes, hospitals, community settings). The platform is likely to be installed within the next year. This IT platform, together with systems for training and education, should improve access to research infrastructure, ensure greater use is made of it, and develop greater expertise in using it, ultimately leading to greater collaboration between researchers and better research outcomes.

Core infrastructure facilities should also have appropriate governance and management structures. They should have in-built mechanisms for receiving advice, reporting and evaluation to ensure they remain aligned with University and faculty research strategies and researcher needs, as well as remain financially viable. Such mechanisms would be an improvement on current arrangements of ad hoc reviews and inconsistent financial support. There should also be provision for decommissioning core facilities, if that becomes appropriate for financial or strategic reasons.

RECOMMENDATION 4
Implements the strategy for consolidating, managing and investing in high-cost core research facilities and capabilities, including an IT platform to facilitate access and enhance research collaboration.

3.3 STAFFING FOR RESEARCH EXCELLENCE

The vision for health and medical research at Sydney requires disciplinary depth, critical mass in a few priority areas, participation in strong collaborative teams and partnerships across the community. At the core are excellent researchers at all stages of career – early-and mid-career researchers and established research leaders. How the University attracts, retains and develops these elite researchers is of central concern to the review.

3.3.1 CURRENT STAFF RECRUITMENT, RETENTION AND DEVELOPMENT AT SYDNEY

Following the White Paper and Strategic Plan in 2011, Sydney has sought to implement more comprehensive University-wide initiatives to better support researchers in developing capabilities appropriate to their career stage, including leadership capabilities for established researchers.
University training of the future health and medical research workforce begins with their undergraduate study. Many faculties at Sydney embed elements of research training and opportunities for participating in research projects in the undergraduate curriculum. The Talented Student Program in the Faculty of Science is just one example. This practice should be encouraged as a means not only to educate but to inspire the next generation of researchers.

Historically, developing the research capability of early-career researchers was principally the responsibility of the faculties, schools and institutes where the requirements of different kinds of research were understood and needs could be met. Now the University’s learning and development unit (Learning Solutions), in collaboration with the Research Portfolio, provides additional assistance through University-wide programs and support of individual faculty initiatives, including stronger and more uniform induction, orientation and mentoring programs to develop the full potential of emerging researchers. Particular examples are the early-career researcher development program in biomedicine; the Go8-sponsored Future Research Leaders Program, which targets researchers from all disciplines who are moving into the role of first-named chief investigator; training for new grant winners in their responsibilities; orientation and introduction for new staff; and the Industry Engagement Program.

In addition, the University has a number of schemes to support researchers facing challenges that can compromise their work and careers. For example, the Brown Fellowships support researchers re-establishing careers after significant caring responsibilities; Thompson Fellowships address the under-representation of women in senior academic positions; and Laffan Fellowships support researchers with disabilities. The University is also in the first stage of a comprehensive strategy to support Aboriginal and Torres Strait Islander researchers that will be launched over the next six months.

One group on whom there appears to have been only limited focus is mid-career researchers. Apart from centrally funded bridging support to enable near-miss ARC or NHMRC grant applicants to maintain research momentum for a subsequent application, and gap-year salary support for ARC- or NHMRC-funded fellows who miss out on a subsequent fellowship, there have been few initiatives targeting their needs. Recent examination of the research productivity data revealed that substantial numbers of level C and D researchers are outperforming those in higher ranks. This observation led to discussion with the SEG Research Committee to implement a new centrally funded program to identify and support outstanding mid-career researchers. The program will provide targeted development support over two years to give real impetus to the burgeoning research careers of our next generation of research leaders.

Notwithstanding the value of these initiatives for individual researchers and researcher cohorts, the University appears to be struggling to attract and retain early-to mid-career researchers critical to its ongoing performance (Figure 1.5). The worrying downward trend in the proportion of level B academics in health and medical research that started in about 2005 must be reversed.

An important indicator of the University’s performance in researcher development is success in NHMRC fellowship schemes. These are a major source of support for elite researchers at all stages of career. The fellowships are highly competitive and allow academics to focus on research. Sydney’s comparatively poor performance in these schemes (Figure 1.6) appears in part to be attributable to significantly lower application numbers in all schemes despite having higher total staff numbers, although in the mid-and established-career categories success rates are also down (Figures 3.4, 3.5, 3.6). It is imperative that the University take action to address this underperformance.
Figure 3.4  Go8 comparison of NHMRC fellowships awarded to early-career researchers (2008–12)

Source: NHMRC datasets

Figure 3.5  Go8 comparison of NHMRC fellowships awarded to mid-career researchers (2008–12)

Source: As figure 3.4

Figure 3.6  Go8 comparison of NHMRC fellowships awarded to established-career researchers (2008–12)

Source: As figure 3.4

3.3.2 FUTURE DIRECTIONS

As the University develops a renewed strategy for focusing its health and medical research, it is timely to place renewed emphasis on the development of support and training for its researchers. Programs for successfully developing, attracting and retaining researchers of the highest quality who are capable of working in collaborative, cross-disciplinary teams as well as conducting discipline-focused research are critical.

Provide training for University researchers that develops capability for both leadership and membership of collaborative research partnerships for University staff and its research partners.

The University should therefore develop a comprehensive suite of programs to support researcher development at all stages. Specific attention must be given to understanding and addressing the underlying reasons why the University’s early-career researcher cohort is declining in numbers, and to ensuring that the mid-career researcher cohort is not overlooked. Mid-career researchers face a unique set of challenges that come with increasing personal and professional responsibilities.

Further, programs for early- and mid-career researchers should be specifically designed to link them into organisational structures and systems that provide a conducive environment for intellectual cross-pollination and for identifying collaborators in other disciplines. This would help form cross-disciplinary teams among this group.

The review heard that early-career researchers are often able to bridge basic and clinical research because they can be more flexible and are open to understanding the two distinct cultures. Encouraging this would assist the goal of developing a vertically integrated translation pipeline from basic to clinical research and ultimately implementation (see 2.4.4 Translation pipeline).

In addition to offering further training and development for early- and mid-career researchers, the University should invest in attracting and retaining established researchers. In the NSW Review final report, universities are given partial responsibility for delivering on action 5.2.1, “Establish an elite researcher scheme to attract leading Australian and international researchers to NSW linked to hubs and NSW research priorities”. Since the global financial crisis has had a large impact on funding for health and medical research in many OECD countries, Australia’s reasonably strong economy may prove attractive, if reflected in research funding. The Advisory Committee strongly recommends joining forces with the NSW Ministry of Health to implement a program that specifically targets recruitment of established researchers. Such research leaders will strengthen the University’s nominated SPARCs and help build emerging ones.

Particular capabilities required of these more established researchers will be: experience with collaborative research partnerships; skills for leading cross-disciplinary and cross-organisational collaborations; skills in identifying and supporting the development needs of other, less senior researchers. For example, the Green Paper in 2010 identified the need for research leaders to have well-developed skills in relationship management and communication – in addition to traditional management skills and their core research skills and knowledge. The University’s success in building critical mass in the SPARCs will depend to a considerable extent on the quality of the academic leadership it is able to attract and retain.

RECOMMENDATION 5

Establish comprehensive recruitment, retention and development programs to:

- attract new researchers, especially within the SPARCs
- provide mentoring and skills development for researchers at all stages of career
- provide skills development opportunities to prepare researchers for membership and leadership of collaborative research partnerships.

---

The review is recommending that the University focus its health and medical research efforts strategically on priority areas that address health issues of major importance to society and that engage more effectively with the health system and health care providers (see Chapter 1). In order for this cross-disciplinary, cross-faculty and in many cases cross-organisational collaborative strategy to succeed, the SPARCs must be underpinned by supportive structures and good governance. Some of these structural and governance arrangements will be new, developed specifically to support the SPARCs. But the SPARCs are intended also to build on the University’s strengths in the disciplines, so the success of the strategy will depend in addition on optimising the structures and governance arrangements of the traditional organisational units that are home to key disciplines. It will depend also on clarifying the relationships between the SPARCs and these organisational units, in particular providing guidance on responsibilities, reporting arrangements and resourcing. And it will depend on optimising relationships with the University’s numerous internal and external centres, institutes and affiliated researchers.

The question of how to develop new structural and governance arrangements and optimise existing ones is addressed by Strategic objective 3 and discussed in this chapter.

4 REFORMING GOVERNANCE AND STRUCTURE

4.1 CONTEXT: INCREASING INTEGRATION BETWEEN THE RESEARCH AND HEALTH SECTORS

Governments across the world and in Australia are looking increasingly to university research to help address population-wide health issues and their associated social and economic consequences. The current view – as illustrated by recent government research funding decisions (for example CINSW Translational Research Centres, NHMRC Partnership Centres) – is that research benefits health outcomes most when researchers work together in cross-disciplinary teams and networks large enough to be integrated with wider social and economic systems.

This approach is evident in the Advanced Health Research Centres advocated by the NHMRC for some years, in the McKeon Review recommendation to form a limited number of Integrated Health Research Centres (IHRCs), and in the NSW Review recommendation to organise health and medical research around hubs based on geographic centres. These government initiatives for reform are intended to enable better integration of the many stakeholders involved, to encourage more effective diffusion of knowledge through the health delivery system, and ultimately to increase the impact of research on health and health care delivery at all levels.

At a time of funding pressures, the challenge faced by Sydney and other research-intensive universities is how to organise themselves to respond to these calls for greater integration. Success will depend partly on how well relationships can be managed with the proposed NSW Hubs and Commonwealth IHRCs, which in turn will depend on university governance arrangements with clear lines of authority and accountability. Universities whose research activities clearly target recognised health priorities will also be at an advantage.

How to optimise existing organisational structures and governance arrangements will be discussed later in this chapter. First we consider what structures and governance arrangements will best support greater cross-disciplinary and cross-faculty collaboration and cross-organisational partnership, as required for the SPARCs.

STRATEGIC OBJECTIVE 3

Establish strong, effective governance with clear lines of authority, accountability and responsibility to enhance overall research performance and enable greater integration with the health care provider network so that results can be translated into better health outcomes for individuals, communities and populations.

There are several ways in which we can create focus and build critical mass in areas that are prioritised. One is through structural reform that addresses the problems of the fragmentation of disciplines among the various faculties and creates appropriate governance arrangements for horizontal units.

University of Sydney Green Paper 2010, Chapter 3
4.2 GOVERNANCE AND STRUCTURE FOR THE SPARCs

4.2.1 INTRODUCTION

Sydney has already taken several steps – principally through the CPC, SyReNS, and networks such as the Cancer Research Network and the Sydney Health Policy Network – to promote greater cross-disciplinary, cross-faculty and cross-organisational research collaborations that also respond to the changing needs and expectations of government, funders and the wider community. In addition, the Deputy Vice-Chancellor, Research (DVCR) – who oversees strategies to support the quality of research across the University – has been conducting biannual discussions with each faculty about strategic investments in research that are aligned with University strategies and goals. In these ‘compact’ discussions, faculties have been encouraged to collaborate with each other on faculty-level research strategies.

However, feedback to the review indicated that there is some uncertainty about how these initiatives operate, how they are governed, how the external world interacts with them, how smaller networks could progress as they become successful, and how agreements are made and operational support is provided. In the context of the SPARCs, therefore, the review has considered how mechanisms for governing and managing cross-disciplinary, cross-faculty research networks can be strengthened and harmonised, as well as made flexible enough so that they can operate at whatever size produces the best results.

Each of the four SPARCs already has some form of governance arrangement in place. For obesity, diabetes and cardiovascular disease there is the CPC with its academic director and various committees including a Senior Executive Group (SEG) governing committee. Cancer has the Cancer Research Network with its newly formed Cancer Council. Mental health and neuroscience has the BMRI as an administrative unit within Medicine, and a governing committee consisting of the BMRI management, deans from stakeholder faculties, and the DVCR (chair). Infectious diseases has a faculty-supported virtual institute within Medicine and a broader, inter-faculty SyReNS-supported network. An important preliminary question therefore has been to determine how supportive of research these existing frameworks are. To do this, the review has examined the extent to which collaboration around the research themes of each SPARC is actually occurring.

4.2.2 ANALYSIS OF CURRENT LEVELS OF COLLABORATION IN THE SPARCs

Examining the various governance arrangements in the nominated SPARCs, the review asked: where is collaboration strong and where is it not; what are the scope and scale of research; and to what extent does it have coherence and focus? This required a different kind of analysis from that used to identify research strengths based on numbers of publications and citations and grant income (Chapter 1).

The review therefore commissioned an independent research strategist, Thomas Barlow, to produce cluster schematics (‘Barlow plots’) to visualise patterns of research collaboration, productivity, funding and commonality within existing networks of researchers in each SPARC (Figures 4.1, 4.2, 4.3 and 4.4 on the following pages). Appendix D provides examples of generic Barlow plots and explains how to interpret them. The plots are indicative only and have their limitations (see box: Reading the Barlow plots for SPARCs) but nonetheless reveal some fundamental patterns.

READING THE BARLOW PLOTS FOR PRIORITY RESEARCH AREAS

- These Barlow plots are for researchers doing research relevant to each of the four SPARCs. For each plot, the University provided a list determined on the basis of an FoR code analysis. FoR coding has its limitations in regard to accuracy and completeness of the coding, but as the analysis focuses on co-authorship the coding issues are mitigated.

- The analyses were completed at both the four- and six-digit levels to overcome the limitations of the large number of sub-disciplines captured in the Clinical Sciences 1103 code.

- A cut-off of at least two papers a year over a specified period was used, which, given the inherently multi-disciplinary nature of the research, will likely result in some relevant researchers not being included. Choosing researchers to include in any given cluster was also somewhat subjective, and due to the number of staff involved in some groupings actual pair-wise interactions are typically greater than shown. This is especially true for obesity, diabetes and cardiovascular disease.

- Staff are labelled by location or broad organisational structure. This means, for example, that staff at the Westmead Millennium Institute will have the same colour as staff at the Western Clinical School, and so on.

- Circle areas are proportional to number of outputs in the HERDC.

- Overlaps are proportional to approximate numbers of co-authorships.

- Letters in brackets show level of appointment (C = senior lecturer D = associate professor; E = professor; O = unknown).

- The value of external grants from 2009 to 2011 on which academics were chief investigators is indicated as follows:

  - ** ≥$10m; * = $1m–$10m; bold = $300k–$1m

  - (solid outline) = $100k–$300k

  - (dotted outline) = < $100k

  - (no outline) = no external grants

- Any external grant for which an individual is a co-chief investigator is counted. (Note that counts will be low for recently arrived staff.)
Figure 4.1 Obesity, diabetes and cardiovascular disease (Barlow plot)

Note: There is evidence of collaborative clustering in this plot; but for this SPARC the sheer scale of activity meant the analysis had to be focused. The subset chosen was the clinical schools, yet there is significant additional activity in the School of Public Health, the George Institute, and the faculties of Health Sciences and Pharmacy.

Figure 4.2 Cancer (Barlow plot)

Note: Cancer, not surprisingly, being the most mature and largest SPARC, shows the strongest collaborative clustering.
Figure 4.3  Mental health and neuroscience (Barlow plot)

Note: The plot reveals a lack of collaboration between researchers in psychiatry, the strongest cluster (within the brown dotted line), and in neurosciences, as well as a general lack of collaboration with psychology (to the left of the grey dotted line), a key potential collaborative partner. This was also observed in Chapter 2.

Figure 4.4  Infectious disease (Barlow plot)

Note: There is evidence of substantial collaborative clustering here. Indeed, the level of collaboration among key individuals in this cluster was greater than could be represented in two dimensions. The blue double-ended arrow was introduced to indicate that these two clusters have additional joint publications and should be considered connected.
4.2.2.1 Conclusions from the Barlow plots

Taking into account the limitations of the Barlow plots, some general conclusions can be drawn from the analysis:

– Researchers are collaborating across each of the SPARCs, although to varying extents.
– Geography and organisational unit affiliation would appear not to prevent collaboration among at least a subcategory of clinical researchers.
– The interactions between clinical researchers and basic scientists are weak in every SPARC, thus compromising vertical integration in the translation pipeline (see 2.4.1 Introduction).

Overall, the clustering in the SPARCs is encouraging, but to achieve pre-eminence more clustering and focus is needed, especially larger collaborative teams pursuing strategic goals. To achieve this, there would need to be more strategic coordination; a stronger capacity for collective planning and decision-making; more robust governance with clear lines of accountability; best-practice transparent processes for appointing leaders with clear roles and responsibilities; more support, including incentives, from the faculties and the central administration; and more effective tools to support collaboration (for example core research facilities, corporate systems and ICT infrastructure – as discussed in Chapters 3 and 5).

38 This conclusion is not readily deduced from the plots provided here as the researchers have been de-identified due to the sensitivity of the data. The complete plots have been provided to the relevant faculties for validation and for use in strategic planning.

4.2.3 MODUS OPERANDI: THE MATRIX APPROACH

Whatever structural, governance and support mechanisms are adopted to strengthen the SPARCs, they will need to be in harmony with the way collaborative research at Sydney already operates. Exclusively top-down impositions will not succeed, and bottom-up initiatives will need senior leadership recognition and support if they are to reach the scale required for them to be sustained. As it happens, a distinct approach to research (and education) at Sydney is already evolving, with recent efforts to develop cross-disciplinary networks and collaborations capitalising on a long history of disciplinary excellence. This synergistic, matrix-like integration of disciplinary excellence and cross-disciplinary engagement is in effect Sydney’s modus operandi.

Strong disciplines provide depth, peer review, rigour and structure to both the education and research functions of the University, as well as sustain and develop individual researchers. The stewards of the disciplines are the faculties: this principle underpins governance and management at Sydney and is reinforced in the University White Paper’s vision of engaged enquiry and research-led teaching. Sydney academics are first and foremost members of faculties.

Cross-disciplinary research must draw on and enhance the disciplinary excellence of the faculties, not compete with them nor deplete the critical resources needed to sustain discipline strength. In this respect Sydney does not seek to establish special-purpose institutes separate from the faculties. Rather, Sydney academics participate in collaborative cross-faculty initiatives, possibly multiple ones, from their home faculties.

Figure 4.5 The matrix approach: cross-disciplinary thematic research draws on the strengths of faculty-based disciplines
The matrix approach is therefore a way to manage the integration of cross-disciplinary thematic research and disciplinary excellence; in effect it offers a mechanism to ensure the SPARCs can work synergistically with the faculty structures to achieve agreed goals. Figure 4.5 offers a schematic illustration of this approach. The disciplines are represented in the vertical dimension; ‘real’, comparatively static, rooted in the University’s faculty structures. Cross-disciplinary thematic research (such as a SPARC) is represented in the horizontal: ‘virtual’, dynamic networks that draw expertise from relevant disciplines in the faculties.

4.2.3.1 Charles Perkins Centre: an illustration of the matrix approach

The Charles Perkins Centre (CPC) is a pan-University endeavour being developed according to the principles embodied in the White Paper which called for cross-disciplinary, cross-faculty collaboration to address pressing societal needs. But it does so without compromising faculty-based discipline excellence: staff and operational support from central services are kept to a minimum, and the centre leadership works with the faculties to develop research (and education) strategies, and is developing formal agreements to engage researchers in implementing them. The CPC thus operates according to the matrix approach – as a horizontal network – and is the University’s flagship for cross-disciplinary, cross-faculty and cross-organisational collaboration.

The idea for the CPC came from a small team of researchers in medicine, pharmacy and science who had analysed Sydney’s research strengths in diabetes and cardiovascular disease and saw that they could be matched to the community’s need to address the rising incidence of obesity, diabetes and cardiovascular disease. Non-health faculties represented in the horizontal: ‘virtual’, dynamic networks that draw expertise from relevant disciplines in the faculties.

4.2.3.2 SyReNS: a scheme to support new cross-disciplinary, cross-faculty collaborative networks

At the other end of the spectrum of cross-disciplinary collaboration are smaller, newly formed networks supported by the SyReNS. Through the DVCR, the SyReNS provides funding over a two-year period to assist productive, collaborative networks engaged in new, high-quality, cross-disciplinary research to develop scale and focus. Like the CPC, these networks create new capability to respond to opportunities and operate according to the matrix approach. They nominate academic directors and typically have a representative executive management group. The funding supports an administrative coordination position to enable the network to function and to assist with activities.

Six SyReNS-supported cross-disciplinary networks have initially been established. One of these is based on an existing network, the Sydney Emerging Infections and Biosecurity Institute (a ‘virtual’ institute). In this network the support of SyReNS facilitated the incorporation of additional nodes in the natural sciences and humanities with an interest in infectious disease. The Health and Work Research Network, to give another example, brings together researchers from the faculties of Business, Health Sciences and Medicine to develop integrated models of sustainable work that encompass both health and productivity.

As is evident from the examples of the CPC and the SyReNS-supported networks, the matrix approach is already becoming well established at Sydney. The review therefore recommends that it be recognised as the fundamental *modus operandi* of the SPARCs. We now turn to the question of governance.

4.2.4 GOVERNANCE: A SCALABLE FRAMEWORK

The CPC and the SyReNS-supported networks have many characteristics in common: they maintain research expertise in the faculties, building on it and enhancing it; they are largely comprised of virtual teams whose members undertake their research and practice in a variety of organisational locations and entities, often dispersed geographically; and to be successful they need strong, trusted academic leadership and robust mechanisms to agree on goals and objectives, and obligations and benefits of membership. The main point of difference between them is scale.

Scale can be a function of the outcomes sought: the more ambitious the objectives, the greater the scale likely to be needed to achieve them. Scale can also be a function of time: an initially small network may evolve with time into a larger and more formal network – a SyReNS-supported network, for example, could be the precursor to a large cross-disciplinary, cross-faculty, and ultimately cross-organisational network like the CPC. Not all networks will necessarily aspire to or achieve the scale of a CPC of course, but given that they are inherently dynamic and largely virtual, there are no reasons, physical or theoretical, to constrain artificially their potential for growth.

Current Sydney Research Networks Scheme (SyReNS) Projects

1. The Sydney Social Justice Project
2. The Sydney Network on Climate Change and Society
3. Sydney Infectious Diseases and Biosecurity Network
4. Learning, Technology & Knowledge in Action
5. Health and Work Research Network
Were a SyReNS-supported network to expand to the scale of the CPC in its vision, investment, level of engagement with the faculties and/or the health system, and so on, more formalised governance arrangements and mechanisms to document agreements and to monitor and report outcomes would become necessary. At the level of the CPC, for example, given the large initial infrastructure investment, the governing body for its start-up phase is a committee of the University’s Senior Executive Group (SEG), chaired by the Vice-Chancellor. Increases in scale must have attendant increases in the rigour and formality of governance and reporting.

For all these reasons, a governance framework for collaborative networks that span disciplines and faculties – which include but are not limited to the SPARCs – must be scalable (Figure 4.6).

**Figure 4.6** The framework for scalable governance of collaborative research networks

This scalable framework must define principles for good governance and transparent decision-making, with a level of formality appropriate to the scale of activity and to the required investment for establishment and ongoing operations. Operating at one end of the framework will be small-scale networks, such as those supported by the SyReNS. These should be recognised within faculty and division strategic plans but should have a low degree of formality and a small amount of seed funding. At the opposite end will be large-scale networks such as the CPC. These should be recognised and approved by the SEG, since significant University investment will be required to formalise and cement the collaborative network, and they should have an appropriately formal level of governance.

The existing governance arrangements of the four SPARCs will be required to comply with this framework. As indicated in the figure, they would sit (at least initially) at different levels of governance according to their current scales of activity.

This governance framework should in addition be recommended to other collaborative research networks that already exist at various levels, and it should be used to guide the development of new networks in order to support and encourage cross-disciplinary activity. Further, it should explicitly enable strong partnering with the wider health system and independent entities such as the medical research institutes by making it easier for them to engage with the University’s SPARCs.

4.2.4.1 Governance framework: indicative characteristics

Details of the scalable governance framework are still to be determined; and they will be informed by the work under way to finalise the governance and operation of the CPC, namely to articulate goals and strategies, roles, accountabilities and responsibilities, addressing strategic, tactical and operational issues. It may nonetheless be helpful to present an indication of the likely scale, likely levels of operational support and likely formality of governance for the largest (for example CPC) and smallest (for example SyReNS) networks.

(Feedback to the review indicated that, while some of the key elements of the CPC framework were understood at an intellectual level, there needed to be greater clarity in regard to detailed operations and how agreements are made.)
### Table 4.1  Indicative characteristics of the scalable governance framework

<table>
<thead>
<tr>
<th>LARGE-SCALE/MOST FORMALISED COLLABORATIVE NETWORKS (EG CPC)</th>
<th>SMALL-SCALE/LEAST FORMALISED COLLABORATIVE NETWORKS (EG SYRENS-SUPPORTED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic leadership appointed through an open competitive, transparent process.</td>
<td>Academic leadership nominated by network collaborators.</td>
</tr>
<tr>
<td>Demonstrates transparency and accountability in governance structure, which is aligned with University policies.</td>
<td>Demonstrates transparency and accountability, but without requiring formal recognition as a University network.</td>
</tr>
<tr>
<td>Has a mission and vision (research and education) agreed by the broad research community, and a strategy to achieve them.</td>
<td>Proposed research program must align with research strategy/ies of faculty/ies, and must specify goals.</td>
</tr>
<tr>
<td>Has signed collaboration agreements with all participants.</td>
<td>Not required</td>
</tr>
<tr>
<td>Has an executive committee of key researchers from within the participating faculties and entities.</td>
<td>Participating researchers may form an executive committee to represent research clusters in the network.</td>
</tr>
<tr>
<td>Has a research committee to support the executive committee in achieving the mission.</td>
<td>Not required</td>
</tr>
<tr>
<td>Has an advisory committee with independent contribution.</td>
<td>Not required</td>
</tr>
<tr>
<td>Has demonstrated scale and excellence in research output with strong existing collaborations throughout the network.</td>
<td>Has demonstrated excellence in research output and the potential to grow through collaboration.</td>
</tr>
<tr>
<td>Demonstrates critical mass and cross-disciplinary collaboration involving multiple groups of researchers.</td>
<td>Has core team of at least 10–20 active University researchers plus up to 10 external researchers; must be genuinely multi-disciplinary, involving researchers from at least two faculties; must have a plan to build critical mass.</td>
</tr>
<tr>
<td>Demonstrates substantial external collaboration nationally and internationally.</td>
<td>May have up to 10 researchers external to the University.</td>
</tr>
<tr>
<td>Demonstrates substantial groups strategically focused on agreed goals.</td>
<td>Core team must demonstrate some existing collaborative activity at time of application; and/or propose plans to establish genuine and broad collaboration within the proposed network.</td>
</tr>
<tr>
<td>Demonstrates potential for long-term financial sustainability.</td>
<td>Seed funding (up to $200,000 a year) over two years for network support.</td>
</tr>
<tr>
<td>Has been approved by SEG and obtained formal recognition as cross-disciplinary/cross-faculty University network.</td>
<td>Has been assessed and SyReNS support approved by SEG Research Committee.</td>
</tr>
</tbody>
</table>
4.2.4.2 Governance framework: principles, procedures, policy

Principles and procedures for the proposed framework must ensure strong governance and management of cross-disciplinary, cross-faculty networks, with clear mechanisms for agreeing from the outset what a network is to achieve, how it is to be led, managed and resourced, how newcomers can join, and how its performance will be monitored and measured. The effectiveness of a network at any level of formality will depend on the strength of its leadership and the clarity of the goals and objectives which guide its members. If a network expands to the point where the decisions of the leadership affect substantial resource allocations or opportunities for members, then the leadership must be appointed in an open, competitive manner with best-practice recruitment and selection procedures.

A key feature of larger, more formal networks will be a collaboration agreement. This will secure each researcher’s commitment and will document what they can expect from being a member of the network as well as what will be expected of them. It will clarify their role, as well as how to reconcile, where necessary, competing priorities from their home faculty or organisation, so that everyone knows to whom the members of the collaborative network are accountable and for what. The collaboration agreement will also set out the agreed levels of stakeholder funding and resourcing, responsibilities and obligations, revenue and costs, intellectual property, access to research facilities and support.

Because the CPC is currently the only University network of its scale and level of investment, its governing body is a committee of SEG, chaired in its start-up phase by the Vice-Chancellor, with a balance of SEG members and research leaders. While it should not be necessary once the CPC is operational for its governing body to continue as a committee of SEG, the arrangement allows the CPC leadership to act impartially in the best interests of the centre without being overshadowed by the needs of the faculties. Such impartiality is essential, and governance for the most formal of the envisioned collaborative networks should include arrangements to guarantee it, such as the following:

- the academic director reporting centrally (in the case of the CPC this is to the DVCR)
- an external advisory group to provide advice and guidance to the academic director on achieving the agreed outcomes for the centre
- an executive committee, responsible for the effective and efficient operation of the centre
- a research committee, including key research leaders in the centre, to support the executive committee for its research mission
- appropriate inclusion on committees of researchers from partner organisations
- a reporting line to the SEG through the SEG Research Committee.

Policy

In recognition of the importance of effective collaborative networks to Sydney’s research strategy, the University should develop a new Collaborative Research Networks Policy, not unlike the Centres Policy, to explicitly provide for those large-scale cross-disciplinary, cross-faculty networks such as the SPARCs. The SEG would decide whether a network were to gain formal recognition. The policy should include criteria that reflect the characteristics of large-scale, formalised collaborative networks identified in Table 4.1 including reporting requirements and performance reviews.

All large-scale, formally recognised networks should have the tools to and be required to provide not only standard reports on staffing and members of the collaboration, but also budgets, income from all sources and expenditures, annual reports on activities in relation to objectives and targets, details of research programs and financial performance. The level of detail in such reports must allow a network’s financial viability as well as research performance to be assessed. A formal review of the network’s performance against its goals and strategies should take place within two years of its establishment and thereafter at least every five years. Formal recognition of the network should lapse unless the performance review recommends its continuation.

Supportive corporate systems

To support the proposed governance framework, the University’s corporate systems will need to make it possible to monitor, report on and evaluate how effectively a collaborative network:

- establishes and builds collaborative, pan-University and external relationships
- produces high-quality and high-impact cross-disciplinary, cross-faculty research outputs and outcomes, including the establishment of new research programs and research fields
- secures research grants and funding for its activities
- generates transformative outcomes through translation and associated commercialisation
- achieves national and international recognition for its research.

These capabilities of the corporate systems are needed for large-scale, cross-faculty collaborative networks beyond health and medical research, where the governance framework also could usefully be applied. Chapter 5 discusses what must be done in order for the corporate systems to have these capabilities.
4.2.4.3 Governance framework: supporting engagement with the health system

It is envisaged that the governance framework will be the formal mechanism by which the SPARCS will engage with the health system and in particular with the research hubs proposed by the NSW Review (Figure 4.7). The purpose of these research hubs is to improve the translation of research outcomes by engendering collaborations between universities, medical research institutes, health services and other key stakeholder groups. They will therefore represent ideal opportunities for the SPARCs.

RECOMMENDATION 6

Align the governance of the SPARCs with the scalable governance framework for collaborative research networks, and formally recognise that the modus operandi of the SPARCs is the matrix approach which integrates faculty-based disciplinary excellence and cross-disciplinary engagement.

Figure 4.7 How SPARCs would connect to the proposed NSW research hubs
**4.2.5 STRENGTHENED SENIOR EXECUTIVE SUPPORT AND OVERSIGHT FOR LARGE-SCALE CROSS-FACULTY COLLABORATIVE EFFORTS**

The review considers that there is a need for better senior level oversight and support for research where cross-faculty and cross-division coordination is required and where external partnerships are integral to the enterprise. This is particularly true for health and medical research with its critically important relationships with the health system at large and a number of independent medical research institutes. Sydney and Melbourne have the largest university research portfolios in the nation. Sydney leads in the proportion of research income and research staff involved in health and medical research, and comes second to Melbourne in research outputs (Table 4.1).

**Table 4.1** Health and medical research share of total research effort

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>SHARE OF UNIVERSITY RESEARCH INCOME (%)</th>
<th>SHARE OF UNIVERSITY RESEARCH STAFF (%)</th>
<th>SHARE OF UNIVERSITY RESEARCH OUTPUTS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>64</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Melbourne</td>
<td>57</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Monash</td>
<td>49</td>
<td>37</td>
<td>36</td>
</tr>
<tr>
<td>UNSW</td>
<td>57</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>UQ</td>
<td>41</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>Adelaide</td>
<td>49</td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>UWA</td>
<td>42</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>ANU</td>
<td>23</td>
<td>17</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: ERA 2012 national report

Good governance and management are recognised as key ingredients for the success of an organisation and the realisation of strategy. Universities are unique in the tension they experience between their traditional collegial organisation and modern corporate models that demand greater accountability and transparency. Notwithstanding this uniqueness, the elements of good governance are as relevant to a university as to any other organisation. Central to good governance is leadership. When implemented, the new arrangements will have to be overseen and supported at a senior level in the University. This will take time and energy. The review is concerned that this important task should distract neither the senior executive from the already substantial work of leading and focusing the University research effort, nor the deans from leading their faculties.

Of the five universities with the largest total research income and the largest health and medical research enterprises, Sydney has the fewest Deputy Vice-Chancellors (DVCs) and Pro-Vice-Chancellors (PVCs) (Table 4.2).

**Table 4.2** Deputy Vice-Chancellors and Pro-Vice-Chancellors of the top five universities based on total research income

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>NUMBER OF DVCS</th>
<th>NUMBER OF PVCs</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Melbourne</td>
<td>4</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Monash</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>UNSW</td>
<td>2 (+3 VPs)*</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>UQ</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: University websites organisational structures

In a corporate environment of similar size, dynamism and complexity, a leadership group as small as Sydney’s would cause concern: can the organisation really function effectively with so few senior managers?

To ensure strong, coordinated and focused leadership of the reforms being recommended by the review, it is recommending therefore that the University establish a new Pro-Vice-Chancellor position, reporting to the Deputy Vice-Chancellor, Research, to oversee the coordination and support of the new collaborative arrangements for the SPARCs (Chapter 2) and collaborative research infrastructure (Chapter 3). The position should be supported by a unit in the Research Portfolio. The academic directors of the SPARCs should report to the new Pro-Vice-Chancellor, who should also review and monitor the performance of internal research centres.

**RECOMMENDATION 7**

Establish a new Pro-Vice-Chancellor, Research, position to oversee the implementation of the SPARCs and the necessary collaborative infrastructure, and to provide oversight and support for the performance and outcomes of the large-scale cross-faculty research collaborations and partnerships.

---


* Previously stated ‘5 DVCs’ in the original review
4.3 STRUCTURE AND GOVERNANCE OF EXISTING ORGANISATIONAL UNITS AND AFFILIATED ENTITIES

4.3.1 CURRENT ARRANGEMENTS
Much of the success of the SPARCs will depend on the strengths of the disciplines that underpin them, together with the University’s capacity for cross-disciplinary activity. These capabilities are strongly influenced by the structures and governance of the internal organisational units that are home to the disciplines – that is the faculties, as per the matrix approach (see 4.2.3)*, in which departments and schools set their own research and education agendas – as well as the numerous internal and external entities that contribute to them – the medical research institutes and centres owned by or affiliated with the University, and hospitals and community health settings. The researchers in these various entities are a mix of University staff and affiliates.

During the review consultation process, a consistent view of contributors both inside and outside the University was that the current organisation and governance of health and medical research at Sydney is complex and opaque, fragments disciplinary communities, and is not optimised for cross-disciplinary collaboration. A contrary view was also expressed, that the complexity is in fact evidence of strength, indicating the scope and reach of activity and the advantages of multiple relationships and levels of engagement between research entities and with the health system, and that researchers themselves navigate this complex terrain perfectly well. Nevertheless, the degree of complexity does not make it easy for industry, the health system or the wider community to recognise the University’s research strengths or pre-eminence in particular areas, nor for industry and the health system to engage as easily as they might with our research efforts.

This section describes the current structural and governance arrangements for the faculties and divisions, the institutes and centres, and the researchers affiliated with the University, as well as the extent to which these arrangements are conducive to the strategic objectives proposed in this review. It then recommends reforms to improve their alignment with the strategic objectives.

4.3.1.1 Faculties and divisions
There are five health and medical faculties: Medicine, Dentistry, Pharmacy, Nursing and Midwifery, and Health Sciences. Significant contributions to health and medical research also come from the faculties of Science, Agriculture and Environment, Veterinary Science, and Engineering and Information Technologies. In addition, most of the remaining faculties have some researchers whose work contributes to the University’s overall health and medical research effort.

The five health and medical faculties vary considerably in size and internal organisation (Table 4.3). Medicine is the largest, with more than 3000 full-time equivalent (FTE) employees (including affiliates) organised in four schools, seven clinical schools and 23 disciplines. There are an additional 24 University-owned health and medical research institutes and centres, as well as independent and hospital-owned institutes and centres (see 4.6.1.3). The next largest faculty is Health Sciences, which is organised around eight disciplines. Pharmacy, Dentistry, and Nursing and Midwifery are all organised around a small number of research units and teams.

The review heard that one of the difficulties facing the University in agreeing a strategic focus for health and medical research is the imbalance between the size of Medicine and the other health faculties; two of Medicine’s schools (Public Health and Medical Sciences) are larger than the faculties of Dentistry, Nursing and Midwifery, or Pharmacy (Table 4.3). This imbalance creates tensions both with the smaller faculties, especially those for which the research tradition in their disciplines is relatively new, and with smaller groups within Medicine that may feel marginalised (see also 1.3.2.3 Lack of clear, commonly agreed research priorities).

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>EMPLOYEE</th>
<th>AFFILIATES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Pharmacy</td>
<td>71</td>
<td>21</td>
<td>92</td>
</tr>
<tr>
<td>Faculty of Nursing &amp; Midwifery</td>
<td>64</td>
<td>58</td>
<td>122</td>
</tr>
<tr>
<td>Faculty of Health Sciences</td>
<td>341</td>
<td>35</td>
<td>376</td>
</tr>
<tr>
<td>School of Medical Sciences</td>
<td>201</td>
<td>85</td>
<td>286</td>
</tr>
<tr>
<td>School of Public Health</td>
<td>198</td>
<td>91</td>
<td>289</td>
</tr>
<tr>
<td>Faculty of Dentistry</td>
<td>66</td>
<td>92</td>
<td>158</td>
</tr>
<tr>
<td>Faculty of Medicine</td>
<td>1307</td>
<td>1759</td>
<td>3066</td>
</tr>
</tbody>
</table>

Source: Data from HR including affiliates.

* Previously stated ‘as per the matrix approach (see 4.1.3)’ in the original review
Much of the structural complexity and dynamism of the current arrangements has evolved historically from the locating of disciplines within faculties, from the professional training requirements for health and medical practitioners within the wider health system, and from the desire to provide clinicians, working in hospitals and contributing to clinical training, with research facilities. Further, the drive to maximise funding for research from all sources, including philanthropy, has contributed to the establishment of many independent or quasi-independent institutes and centres that have various informal or formal relationships with the University.

In 2010, staff and student surveys undertaken as part of the strategic planning process that led to the Green Paper identified Sydney’s traditional organisational structures as “high-walled, largely faculty-based, silos inhibiting cooperation and collaboration”. While this was a characterisation of the University as a whole, it is particularly apposite to the governance and organisational structure of health and medical research. Following the White Paper, governance reforms sought to address this silo effect of the traditional faculty and school structures. In health and medicine, two divisions were established to bring cognate disciplines together and to facilitate integrated academic and strategic planning: one division for Medicine, Dentistry, Nursing and Pharmacy; another for Health Sciences. Distance was a significant factor in determining Health Sciences’ status as a separate division; it was felt its location at Lidcombe Campus made separate administrative support necessary. The governing board of each division includes the deans of the participating faculties and is charged with detailed strategic planning, portfolio analysis and educational and research reform. The Division of Medicine, Dentistry, Nursing and Pharmacy is chaired by the Dean of Medicine, while Health Sciences has an independent chair (currently the Dean of Engineering and IT).

Despite the new divisional structure, to date there has been no agreed strategic plan for health and medical research for the five health faculties, let alone one that facilitates contribution from the non-health faculties. Notwithstanding some broad commonalities in research themes identified by each faculty, the review found little evidence of joined-up strategic planning and goal-setting or of investment for cross-faculty collaboration (see Introduction, especially Figure 1.9).

There was considerable feedback to the review on the question of whether these faculty and divisional arrangements need to be reformed. Some argued that change would be detrimental, on the basis that small-scale units are flexible and thus optimal as incubators of discovery, and that any consolidation or rationalisation of small units runs the risk of losing specific-purpose brands and their attendant capacity for fundraising.

“University structure has not changed to keep up with strategic direction. The strategy wants things the structure can’t deliver.”

Review interview

Others were in favour of creating greater clarity, arguing that the current arrangements make it difficult to determine: who has authority for making decisions and who is accountable for research, especially when it crosses faculty boundaries; what research is being done, by whom and in which entity; and how research is supported. The argument was also made that although much collaboration already occurs among researchers and research groups within and beyond the University, nevertheless individual and group decisions about what research is done and where, are not necessarily optimally aligned for success in what is a tough competitive environment with limited resources, and that the current organisational arrangements impede high-level strategic planning and goal-setting that could usefully guide investment and resourcing and enhance competitive positioning. Cognisant of the outcomes sought by the University’s White Paper, many people also commented that the reforms proposed in the document are not happening quickly enough and that opportunities to partner with industry and government are passed up because the University’s organisational structures and governance arrangements do not permit sufficiently rapid responses.
READING THE BARLOW PLOTS FOR ORGANISATIONAL UNITS

- Staff are categorised (roughly) according to FoR codes associated with their publications. FoR coding has its limitations, in regard to accuracy and completeness of the coding, but as the analysis focuses on co-authorship the coding issues are mitigated.
- The analyses were completed at both the four- and six-digit levels to overcome the limitations of the large number of subdisciplines captured in the Clinical Sciences 1103 code.
- Circle areas are proportional to number of outputs in the HERDC. For Figures 4.8 and 4.9, staff are included only if they published more than 10 outputs at the University from 2009 to 2011. For Figures 4.10 and 4.11, staff are included if they published more than six outputs over the same period.
- Overlaps are proportional to approximate levels of pairwise co-authorships.
- Arrows pointing to pink boxes show the existence of a co-author in another organisational unit.
- Letters in brackets show level of appointment (C = senior lecturer; D = associate professor; E = professor; O = unknown).
- The value of external grants from 2009 to 2011 on which academics were chief investigators is indicated as follows:
  - ** = ≥$10m; * = $1m–$10m; bold = $300k–$1m
  - (solid outline) = $100k–$300k
  - (dotted outline) = < $100k
  - (no outline) = no external grants
- Any external grant for which an individual is a co-chief investigator is counted. (Note that counts will be low for recently arrived staff.)

4.3.1.2 Analysis of research collaboration, focus and coherence

To consider how organisational units within or affiliated with the five health and medical faculties are influencing research collaboration, focus and coherence – attributes that will be central to the success of the SPARCs – Barlow plots were again employed. This time, however, rather than considering researchers’ outputs in the FoRs relating to the SPARCs, the Barlow analysis examined all research outputs and research income for groups of researchers within designated organisational units. The following subsections summarise the results of this analysis.

Faculty of Medicine

The Barlow plots have been shared with Medicine’s leadership. The feedback was that, noting the limitations (see box on this page, and Appendix D), “broadly speaking they do pass a sanity check and clearly have given us some purchase on a very complex body of data”.

In summary, for schools and entities within or affiliated with Medicine the plots indicate enormous variation in research collaboration, focus and coherence. Such variation is an unsurprising consequence of the many different factors that have driven the evolution of Medicine’s organisational structure, many of which have been responses to local circumstances. The following pages offer some examples of this variation.

Examples of units with exceptionally strong research collaboration, focus and cohesion include the School of Public Health (Figure 4.8), the independent but affiliated George Institute for Global Health (Figure 4.9) and the NHMRC Clinical Trials Centre (Figure 4.10). The Barlow plots for these units each highlight the fact that they have healthy levels of collaboration (as evidenced by co-authored papers), have good research focus and scale, are well funded, include several research leaders, and have few examples of junior researchers seemingly wholly dependent on a more senior researcher. These characteristics align well with the analysis and conclusions in Chapter 2 in regard to research disciplines where Sydney is pre-eminently strong. The evidence thus indicates that when organisational structures serve to bring researchers together in strong discipline-focused units, the result is high-performing, coherent research activity. This also supports the White Paper proposition that faculties, as stewards of disciplines around which strong communities of researchers cluster, are important incubators of the research strengths essential for cross-disciplinary excellence.
Figure 4.8  School of Public Health, Faculty of Medicine (Barlow plot)

Figure 4.9  George Institute for Global Health (Barlow plot)
Figure 4.10 NHMRC Clinical Trials Centre (Barlow plot)

Figure 4.11 Brain and Mind Research Institute (Barlow plot)
Evidence from other Barlow plots (provided to the faculty but not shown here) is that there are many units within Medicine that do not show this pattern of strong research focus and cohesion. Many units operate at low scale without a clear research focus. The clinical schools, in particular, contain large numbers of staff, some of whom, the evidence suggests, produce few research outputs and rarely collaborate. Linking staff with clinical schools may be important for administration and teaching, but it is arguably a hindrance to developing high-visibility, high-impact clusters of researchers. Shifting from geographic to discipline structures would be consistent with the faculty remit of ensuring excellence in the disciplines, and might serve to foster more cooperation within fields of research. In the FoRs of Neuroscience, and Oncology and Carcinogenesis, in particular, the University has significant capabilities, but the research is fragmented across numerous locations and organisational units, outputs per staff member are often low, and internal collaboration is weak. Finding ways to coalesce researchers in these fields would be particularly advantageous for the SPARCs.

Another key revelation of the Barlow analysis concerns the BMRI. In terms of the matrix approach (4.1.3 Modus operandi: the matrix approach), the BMRI is an unusual mix of discipline-focused ‘verticals’ and thematic ‘horizontals’: a faculty-like organisational unit in its own right, it aspires to an expansive cross-disciplinary vision. What is compromised in this arrangement is the typical faculty’s remit as a steward of disciplines. Supposing the BMRI were to form the basis of the proposed Mental Health and Neuroscience SPARC, it would need to be steward of the disciplines of neuroscience and clinical psychiatry, interacting strategically with research clusters in Medicine and beyond, and collaborate strongly with the discipline of psychology hosted by the Faculty of Science. The Barlow plot for the BMRI (Figure 4.11) does not show these characteristics. Rather, it reveals a strong, tight-knit group in clinical psychiatry that has excellent focus and very high co-authorship. However, in the neurosciences the levels of research activity, coherence and collaboration are comparatively low. And we have already seen that collaborations with the School of Psychology are minimal (see 2.3.3.2 Sydney’s track record in mental health and neuroscience research and Figure 4.3).
Using the Barlow plot methodology, a hypothetical expanded BMRI was considered by combining members of the existing BMRI with those of the School of Medical Sciences who are active in neuroscience research (as shown by collaboration around the FoR codes associated with their publications). The result (Figure 4.12) is a unit with two strong clusters, one focused on the FoRs of Psychiatry and Neurosciences Not Elsewhere Classified [nec] and the other focused on Central Nervous System. The first cluster is highly integrated and benefited from strong leadership, but lacks key collaborations (for example with psychology). The second cluster has scale and a number of high-performing individuals, but still lacks the kind of coherence and focus that is evident in the stronger discipline-focused units within Medicine.

It thus appears that the current BMRI as an organisational unit sitting administratively within Medicine is optimally structured neither to support the development of a coherent, discipline-focused neuroscience and mental health program, nor to lead a cross-disciplinary, cross-faculty program. This is in spite of its multi-faculty governing committee comprising the deans of Medicine, Health Sciences, Science, and Nursing and Midwifery, which is intended to facilitate the BMRI’s vision for cross-disciplinary and cross-faculty engagement. At the same time, the BMRI has strong brand recognition, is an excellent advocate for mental health research and services, has substantial investment in infrastructure, and focuses on research translation – it has an important partnership with Royal Prince Alfred Hospital where dedicated facilities for research are to be constructed in the new Missenden Mental Health Unit (supported by a $10 million University capital investment).

For these reasons, the review believes that, given the expansive vision implicit in ‘Brain and Mind Research Institute’, the name should be applied to the mental health and neuroscience SPARC. Consistent with the matrix approach, this BMRI SPARC would draw on the discipline excellence within the faculties to achieve its vision. Success therefore will depend upon Medicine structuring internally so as to foster a stronger and more focused neuroscience discipline in particular.

An additional point to be made about the Faculty of Medicine is that research in fundamental biomedical science can easily be neglected in a faculty otherwise focused on clinical activity. It is perhaps therefore not surprising that the School of Medical Sciences seems not to be organised strategically in this direction, and one could consider structuring to encourage coherence and greater interaction between researchers who share research interests in biomedical science. Another possible way to strengthen fundamental biomedical science research would be to increase joint strategic planning and recruitment between the School of Medical Sciences in Medicine and Molecular Bioscience in the Faculty of Science. Currently there is surprisingly low-level and only sporadic collaboration between these units.

Faculties of Dentistry, Nursing and Midwifery, and Pharmacy

Each of the faculties of Dentistry, Nursing and Midwifery, and Pharmacy is smaller in total numbers of staff than the Faculty of Health Sciences, and each hosts research at a scale smaller than that of Medicine’s larger schools (Public Health and Medical Sciences). Barlow plots have been provided to each of these faculties to aid in their strategic planning.

Pharmacy as a discipline, and as a faculty at the University, has a long history of research. The Barlow plot for Pharmacy indicates that researchers are focused around two FoRs (Clinical Pharmacy and Pharmacy Practice, and Pharmaceutical Sciences), which has led to coherence and strong collaboration within the faculty, but limited collaboration with other faculties. In general while productivity is high, quality is not necessarily always so. A review in 2012 evaluating the research undertaken within Pharmacy’s newly agreed research-theme structure concluded that this structure is yet to produce major theme-based successes. Due to a lack of comparative data, that review was unable to conclude whether research productivity (both in quantity and quality) was any better than under the previous discipline structure.

Dentistry, and Nursing and Midwifery each have stewardship of research traditions that are relatively new (globally as well as at Sydney) and both are therefore focusing on research and researcher development.

For its modest size, the Barlow plots reveal that Dentistry has some excellent researchers securing substantial grants. The members of the faculty are largely focused around two FoRs, which helps explain their coherence and strong internal collaboration. The dean of the faculty has nominated a research focus on healthy ageing, which fits well into the emphasis on ‘whole life span’ recommended in Chapter 2. The faculty is also actively supporting early-career researchers by providing funds to support research students working with new staff.

The number of active researchers in Nursing and Midwifery is very small and the faculty is in the very early stages of building a research culture, but it has had recent success in winning NHMRC funding and performed strongly in ERA 2012. The faculty’s strategy includes proactively supporting researcher development and hosting distinguished established visiting researchers to provide mentoring and to stimulate international collaborations. The Barlow plot for the faculty shows that its researchers are involved in a large number of FoRs, with a significant proportion co-publishing with researchers in Medicine or Health Sciences. Some of the strongest researchers appear to be the most collaborative in this respect. The SPARCs might give this faculty an opportunity to focus and build scale and critical mass in one or two areas.
Faculty of Health Sciences
Health Sciences has recently reorganised into a matrix with eight allied health discipline-focused units and five cross-disciplinary, faculty-wide research groupings. Included within the broad research groupings are five areas of research focus: disability, communication disorders/stuttering, exercise health and performance, arthritis and musculoskeletal, and imaging. Researchers collaborate beyond the faculty in most of these areas.

The Barlow plots for this faculty (based on 2011 information) show units of varying scale and focus. Some of the small-scale units were producing few research outputs and lacked coherence in their research programs. Some of the larger-scale units, on the other hand, produced excellent research according to traditional measures. The faculty has indicated that the Barlow analysis is useful and would like to consider additional analysis based on its recent restructure.

RECOMMENDATION 8
Require each of the faculties involved in health and medical research to individually and collectively consider how to configure their internal structures (schools, research groups) to optimise research disciplinary excellence as well as engagement with the SPARCs.

4.3.1.3 Centres and institutes
A multiplicity of independent and quasi-independent health and medical research centres and institutes is associated with the University: approximately 24 internal entities established to undertake research and teaching, and approximately 143 external associated or affiliated entities (Table 4.4). That these numbers can only be approximate illustrates an immediate problem: despite the existence of an official list of University-owned, related and affiliated research entities, and despite formal policies governing internal entities and the University’s relationships with external entities, information is incomplete and some entities are not on the list at all.

The official list is kept by the GSO in the Office of General Counsel. The GSO has been working to establish baseline data and legal structures for the entities but has found it difficult to obtain current and comprehensive information for all of them, including why they were established, how active they are, and who they employ.

UNIVERSITY POLICIES
The Centres Policy for Establishment, Management and Review (the Centres Policy) is intended to guide the establishment, management and ongoing assessment of internal centres.

The Associated and Affiliated Entities Policy (the Affiliated Entities Policy) is intended to guide the terms of association and affiliation with external entities.

The information available indicates that entities range from those that are formally incorporated in some way (in Australia or overseas) to those that are small, unincorporated associations of researchers operating in effect as small networks. External incorporated entities usually have University representation on their governing boards or as part of the voting membership, which presents potential conflicts of interest for individuals with executive appointments at the University. The review was advised that, apart from those internal entities established as a result of success in a competitive grant process, such as the NHMRC Centres of Research Excellence, a common reason for establishing both internal and external entities was for branding purposes – i.e. for public relations, promotion and marketing to attract funding through donations and gifts from industry and the public.

Internal centres and institutes
The 24 internal health and medical research entities on the GSO list (Table 4.4) cover a wide range of fields, are geographically spread, vary considerably in size and structure, and often have ambiguous relationships with their associated faculty, the University or an external entity. Many are long established and operate with their own administrative support. Some are simply networks of researchers within a faculty or school. Others are located in clinical settings and seem to be closely associated with similarly named incorporated entities. For the most part all tend to set their own research agenda. The review heard that for the external world, and even for those within the University, these arrangements contribute to a sense of confusion and a concern that the multiplicity of small, uncoordinated units leads to diffusion of effort, creates competition for scarce resources to address individual goals, and potentially inhibits the pursuit of a larger strategic agenda.
Table 4.4 Internal University health and medical research centres on the GSO list

<table>
<thead>
<tr>
<th>Faculty of Medicine</th>
<th>Faculty of Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre for Values, Ethics and the Law in Medicine</td>
<td>Centre for Medical Psychology and Evidence-based Decision-making</td>
</tr>
<tr>
<td>Australian Centre for Agricultural Health and Safety</td>
<td>Institute of Medical Physics</td>
</tr>
<tr>
<td>Boden Institute of Obesity, Nutrition, Exercise and Eating Disorders</td>
<td>Psycho-Oncology Co-operative Research Centre</td>
</tr>
<tr>
<td>Brain and Mind Research Institute</td>
<td></td>
</tr>
<tr>
<td>Centre for Education and Research on Ageing</td>
<td>Faculty of Law</td>
</tr>
<tr>
<td>Nepean Centre for Perinatal Care</td>
<td>Centre for Health Governance, Law and Ethics</td>
</tr>
<tr>
<td>NHMRC Clinical Trials Centre</td>
<td>Faculty of Health Science</td>
</tr>
<tr>
<td>Pain Management and Research Institute</td>
<td>Australian Stuttering Research Centre</td>
</tr>
<tr>
<td>Save Sight Institute</td>
<td>National Centre for Classification in Health (NCCH)</td>
</tr>
<tr>
<td>Sydney Emerging Infections and Biosecurity Institute</td>
<td>Centre for Disability Research and Policy (CDRP)</td>
</tr>
<tr>
<td>Poche Centre for Indigenous Health</td>
<td>Faculty of Veterinary Science</td>
</tr>
<tr>
<td>Sydney Cochlear Implant Centre</td>
<td>Wildlife Health and Conservation Centre</td>
</tr>
<tr>
<td>Family Medicine Research Centre</td>
<td>Faculty of Engineering and IT</td>
</tr>
<tr>
<td>DVC Research (as the University officer)</td>
<td>Institute of Biomedical Engineering and Technology</td>
</tr>
<tr>
<td>Centre for Integrated Research and Understanding of Sleep (CIRUS)</td>
<td></td>
</tr>
<tr>
<td>Centre for Research Excellence (CRE) in Critical Infectious Diseases</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.5 Financial information for University-affiliated MRIs

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Revenue</td>
<td>$8.7m</td>
<td>$19.5m</td>
<td>$53.0m</td>
<td>$21.7m</td>
<td>$9.6m</td>
<td>$17.1m</td>
<td>$12.3m*</td>
</tr>
<tr>
<td>Grants</td>
<td>N/A</td>
<td>$6.9m</td>
<td>$21.3m</td>
<td>$3.7m</td>
<td>$7.5m</td>
<td>N/A</td>
<td>$0.76m</td>
</tr>
<tr>
<td>Public Contributions</td>
<td>N/A</td>
<td>$6.5m</td>
<td>$29.7m</td>
<td>$17.6m</td>
<td>$0.154m</td>
<td>N/A</td>
<td>$1.6m</td>
</tr>
<tr>
<td>Expenses</td>
<td>$8.4m</td>
<td>$22.2m</td>
<td>$51.4m</td>
<td>$22.1m</td>
<td>$11.2m</td>
<td>N/A</td>
<td>$5.2m</td>
</tr>
<tr>
<td>Profit (loss)</td>
<td>($0.357m)</td>
<td>($2.5m)</td>
<td>($0.708m)</td>
<td>($0.462m)</td>
<td>($1.6m)</td>
<td>N/A</td>
<td>$7.1m</td>
</tr>
</tbody>
</table>

*The WMI was in transition from hospital ownership to fully independent institute during this period.
N/A = Not available

Note: The data are based on annual reports from ASIC returns. Dates shown are the dates information was submitted to ASIC.
While past practice enabled internal entities to be established without rigorous consideration of whether their goals could be pursued within existing organisational units, the review was advised that the Centres Policy is now operating effectively, in that due consideration is given to ensure an entity is necessary to achieve its stated purpose and is sustainable. Further, in an ongoing systematic review by the GSO, several inactive or dormant entities have recently been wound up, and more appropriate accountability arrangements are being sought or implemented for others.

The Centres Policy provides for ongoing assessment of designated centres’ performance and sustainability. For each entity an annual financial statement must be signed off by the ‘University Officer’ (usually the relevant dean), at which point additional information can be requested. And at two and five years the entity’s activities and financial status are formally reviewed, allowing the Provost and the relevant Deputy Vice-Chancellor to assess its continuing sustainability.

Notwithstanding the prescribed reporting and review processes, the small scale and lack of critical mass of many entities call into question their long-term viability. The current reporting requirements of the Centres Policy do not seem to provide assurance that the outcomes achieved by internal entities are sufficient to warrant the additional administrative, infrastructural and transactional costs that are generated, not to mention the complex relationship management often required. From the information available, it would appear that the research undertaken in many of these entities could readily be integrated into an existing research unit in a faculty or a larger research centre.

External affiliated entities
Apart from the government agencies and hospitals (which fall outside the remit of this review), the University’s main external affiliations and associations fall into two groups: independent medical research institutes (MRIs), and small-scale research groups.

Seven independent MRIs have a formal affiliation agreement with the University that identifies, at least at a high level, the relationship’s purpose and mutual obligations, and enables the MRIs to support University research and consequently access higher education research infrastructure block funding. Six of these seven institutes, by virtue of their independent governance arrangements, qualify for additional research infrastructure support from the NSW Ministry of Health.

A small number of other research institutes, such as the Kolling Institute at Royal North Shore Hospital and the Kids Research Institute at Westmead Children’s Hospital, are owned by a hospital and support University research conducted in their facilities.

INDEPENDENT MEDICAL RESEARCH INSTITUTES AFFILIATED WITH THE UNIVERSITY
– ANZAC Research Institute
– Centenary Institute of Cancer Medicine and Cell Biology
– Children’s Medical Research Institute
– George Institute for Global Health
– Westmead Millennium Institute for Medical Research (including the Centre for Infectious Diseases and Microbiology, and the Institute for Immunology and Allergy Research)
– Woolcock Institute for Medical Research
– Heart Research Institute

The total annual revenue of the seven independent Sydney-affiliated MRIs is close to $150 million and there is considerable variation in the scale of their operations: ANZAC is the smallest with $8.7 million annual revenue (2011), and the George Institute for Global Health the largest with $53 million annual revenue (2012) (Table 4.5); but note that the review was informed the data for the Westmead Millennium Institute are not meaningful because this formerly hospital-owned entity recently became independent. Nevertheless, it is evident that only in combination would these independent institutes be of a similar scale to the largest and most successful MRI in Australia, the Walter and Eliza Hall Institute. This institute, associated with the University of Melbourne, is a company limited by guarantee with reported net assets of $365 million, 650 staff and expenditure of approximately $90 million on research activities, according to its annual report for 2011–12. Other examples of large MRIs are the Florey Institute for Neuroscience and Mental Health (recently formed by the amalgamation of several smaller institutes in Victoria), which in 2011 reported an operating budget of $31 million, 416 staff and students, and which advertises itself as the “largest brain research group in the southern hemisphere”; and the Garvan Institute in NSW, which has 575 staff and an expenditure of approximately $51 million for 2011. Of the seven independent institutes affiliated with the University of Sydney, only the George Institute for Global Health is on the same scale financially as the Florey and Garvan Institutes.
Financial arrangements are sources of high tension in relations between the University and the affiliated, independent MRIs. All the MRIs depend on the University and the NSW Government for research infrastructure funding and some recurrent costs such as directors’ salaries; and at present they must also rely on philanthropy and even draw on capital reserves to support their operations. Yet these institutes are critically important to the University’s medical research, providing facilities for a large portion of that research – as much as 30 percent of Sydney’s reported NHMRC-funded research in 2012, steadily growing from 19 percent in 2008. Many staff on the University payroll conduct their research in the MRIs, and almost all researchers on the MRIs’ payrolls have University affiliations.

As a result of these long-standing arrangements of mutual benefit, there are strong loyalties among researchers both to the University and to the MRI where they conduct their research. These loyalties extend to the hospitals associated with the institutes, where clinical research and training occur. Amid the complexity of arrangements resulting from these many different affiliations, individual researchers naturally look after their own interests as best they can. The blurring of reporting lines and accountability that results make it almost impossible to know what research is attributable to which entity.

Though they must rely heavily on outside connections and resources to operate, the institutes fiercely defend their independence, both in strategic planning and operations. However, the resulting duplication of infrastructure must be costly, and it should be possible to achieve significant savings, which might be invested in research. It is interesting, too, that though the institutes often claim that their small size and flexibility enable them to respond quickly and be more innovative, they can be top-heavy; a board with 19 directors is excessive for even the largest of businesses.

It is also pertinent that while the institutes are regarded as independent according to NSW Government criteria for infrastructure funding, the University is liable for them legally. This is explicitly so in regard to obligations under funding agreements administered for the institutes by the University. In addition, case law has resolved that the University cannot distance itself from responsibility using the argument that an institute is an independently incorporated entity. Recently the University was held liable for the activities of an independent institute by virtue of the fact that the director was an employee of the University and there was no clear boundary between the institute and the University.

As the underfunding of research (particularly research infrastructure) has become chronic, financial sustainability has become an issue critical for all – and, in recent years, much of the focus of relations between the University and the independent institutes. The resulting tensions have inhibited dialogue between the two sides about research itself and how collectively establishing and sustaining pre-eminence might be achieved. Resolving these tensions has become urgent. Although it is appropriate that those negotiating specific issues do so in the interests of their respective corporate responsibilities and goals, at the same time the University and the independent institutes must find ways to be stronger strategic partners. A secure, strategic partnering between the University, the independent institutes and the hospital-owned institutes would provide a solid foundation for managing the relationships with the proposed NSW Hubs and Commonwealth’s Integrated Health Research Centres.

In addition to the MRIs, about 135 smaller research groups are affiliated or associated with the University under the Affiliated Entities Policy. Most have come into being through clinical appointments in hospitals, although some started life as research centres internal to the University before becoming separately incorporated. Notwithstanding the requirements of the University’s Affiliated Entities Policy, for most of these external affiliated and associated research entities the review found it difficult to identify a formal agreement setting out the nature of the relationship, including mutual obligations, responsibilities and accountabilities. This makes it difficult to manage the relationship, assess its ongoing value, and support meaningful engagement around agreed research strategies. The University should therefore continue the work of the GSO to document ongoing relationships and wind up those that are inactive or no longer relevant.

### 4.3.1.4 Academic affiliates

Just as there are many external research entities affiliated — at times ambiguously — with the University, there are also many affiliated individuals. These appear to fall into three main groups:

- those in externally funded positions where the University pays the salary and then claims full or partial reimbursement from the external body, usually the health system
- those in a university-funded external position where the University reimburses an external body for full or partial salary costs
- those designated volunteers who supervise students in clinical practice, support teaching programs and undertake research, but do not get paid.
The first group contains approximately 140 individuals, for whom the University was reimbursed $18.3 million in 2011. The second group is smaller; the review has not been able to get precise figures for the expenditure. The last group is large (about 2000 people); the sources of information for this number were the University’s statements for insurance purposes, HR data and affiliated staff numbers (Table 4.3).

Many affiliates are critical to the University’s health and medical teaching and training mission. However, the arrangements for these appointments are complex, and identifying their number accurately, as well as their quality and purpose, has proved challenging; for many, details are simply unavailable through central administration records. Administration and billing costs for externally funded individuals are significant. There is a long history of difficulties in making payments on time; and at any moment up to $8 million in debts may be outstanding.

While there may be a reason for arrangements of this kind, the inefficiencies involved in administering them absorb funds that would be better devoted directly to health and medical research. Moreover, researchers are frequently affiliated with more than one entity; and as there is no process for reporting what activities are undertaken in relation to which affiliation, it is generally impossible to reliably assess the research productivity attributable to many of these entities.

Consider a reconfiguration of health divisions and appoint a chair for the Division of Medicine, Dentistry, Nursing and Pharmacy from outside the five health and medical faculties.

When the CPC building is complete and staff move in from elsewhere, there will be an important opportunity to collocate cognate disciplines, and in particular to bring researchers in Nursing and Midwifery, and Health Sciences onto the Camperdown Campus.

**RECOMMENDATION 9**
Collocate the health faculties into a small number of precincts to minimise geographical isolation of particular groups and to maximise the opportunity for collaboration and the development of critical mass.

Configuration of divisions and faculties
With collocation there is an opportunity to consider a single health research entity to facilitate integrated strategic planning among the faculties of Medicine, Nursing, Dentistry, Pharmacy and Health Sciences. For a single entity to be successful, however, one concern often stated to the review would need to be addressed, namely that smaller faculties tend to feel marginalised in a division where one faculty is far larger than the rest. This imbalance might be addressed in several ways. An immediate step would be to appoint an independent chair for the current Medicine, Dentistry, Nursing and Pharmacy Division — as is the current practice for single-faculty divisions (for example Business, Engineering and Information Technologies, Health Sciences). Another step might be to combine the School of Public Health and the Clinical Trials Centre into their own faculty. Consolidating smaller faculties should also be considered, but the difficulty of ensuring they can continue effectively to serve the specific requirements of professional training and to maintain relationships with their distinct professional communities would have to be addressed.

“There are several ways in which we can create focus and build critical mass in areas that are prioritised. One is through structural reform that addresses the problems of the fragmentation of disciplines among the various faculties and creates appropriate governance arrangements for horizontal units.”

University of Sydney Green Paper 2010, Chapter 3

**UNIVERSITY POLICY**
The Associated and Affiliated entities Policy is intended to guide the appointment of affiliated staff.

**4.3.2 FUTURE DIRECTIONS**

**4.3.2.1 Possible reforms to strengthen disciplines**

Collocation and greater integration of cognate disciplines in Health Sciences, and Nursing and Midwifery

While the governance framework will provide a way to formally organise, recognise and support cross-faculty collaborations across the University and beyond, the data on research performance of key health and medical disciplines set out in Chapter 2 clearly suggest that in important areas there is insufficient organisational support for cross-disciplinary and cross-organisational collaboration when disciplines are fragmented by geography as well as organisational structures. Although we have seen that distance alone does not necessarily prevent researchers from collaborating, it can lead to intellectual isolation. This was noted in the University’s 2012 Review of Life Sciences, particularly for researchers in Health Sciences (currently the only faculty on the Lidcombe Campus) and Nursing and Midwifery (currently in sub-optimal facilities on Mallett Street).

“There are several ways in which we can create focus and build critical mass in areas that are prioritised. One is through structural reform that addresses the problems of the fragmentation of disciplines among the various faculties and creates appropriate governance arrangements for horizontal units.”

University of Sydney Green Paper 2010, Chapter 3
In the long term, it seems that much would be gained if Sydney had a single, cohesive Health entity with strong research and teaching units of more equal size. The review therefore urges the faculties to consider carefully and consult widely on a possible reconfiguration of the health divisions.

4.3.2.2 Reform of research institutes, centres and affiliated staff
The University’s extensive network of internal and external research institutes and centres should be one of its greatest strengths. Under the current arrangements, however, the practice of working with and through so many entities, including individual stand-alone research groups, along with various appointment arrangements for many individuals, dilutes and depletes resources. The multiplicity of arrangements also constrains Sydney’s capacity to develop coordinated and integrated strategies for health and medical research across its broad research community. While some entities are highly productive and the associations are of value to the University, many are too small, focus on relatively narrow interests and require a disproportionately high level of investment in managing the relationship relative to the outcomes achieved.

Reform of internal centres and institutes
The University, under the Centres Policy, is currently reviewing all internal research entities. This provides an opportunity to consider each entity’s longer-term sustainability and strategic positioning. But in addition to assessing an entity’s financial viability, specific attention should be paid to whether the entity enables the impact of the University’s research to be widened and deepened, either by providing access to cutting-edge infrastructure, facilities, equipment and resources, or by developing programs of research that are aligned with and extend the University’s health and medical research strategy. Options need to be explored for amalgamating existing centres and institutes to form larger, more viable and sustainable research entities or for reintegrating researchers into relevant schools.

A noteworthy example of what could be achieved through amalgamation is the Bosch Institute – at one point an independent incorporated entity but recently unincorporated due to financial considerations. The purpose of the Bosch is, as its website states, to bring together “basic and clinical research scientists to tackle major unsolved questions about the human body in health and in illness” – surely the purpose in large part of the Faculty of Medicine. What sets the Bosch apart in pursuing its purpose, however, is its fundraising effort to support shared research equipment. In this respect the Bosch is widely recognised and appreciated for solving a significant problem for many medical researchers. But a much broader group of researchers than the Bosch Institute currently has the capacity to serve needs similar support for shared and collaborative research infrastructure. There would be great merit, then, in considering how to align the Bosch’s efforts with the project now underway to manage research infrastructure centrally (see 3.2). The Bosch Institute need not lose its identity in such a step; rather, it could be part of a larger effort and achieve efficiencies by leveraging administration, processes and IT platforms for shared research infrastructure. The larger project would benefit from the experience and expert knowledge of the health and medical disciplines within the Bosch Institute.

External affiliated entities
The review has considered the views it heard about the University’s current relationships with the independent MRIs and what mechanisms might better foster future collaborations between researchers working in them, particularly vis-à-vis the proposed SPARCs. This is especially important given the quality of the research done by both University researchers and affiliates in the institutes and their close relationships with researchers in the University’s clinical schools. Moreover, success in the future Integrated Health Research Centres and in the geographical Research Hubs heralded by the McKeon Review and NSW Review respectively, will depend in part on the extent to which the University and the institutes can demonstrate that researchers in both settings are part of and committed to strong and high-impact collaborative research networks.

Develop options for integrating existing centres to form larger, more viable and sustainable research entities or for reintegrating researchers into relevant schools.

The data on research performance and collaborations between researchers in the institutes and those in the University’s faculties and schools clearly suggest that there are already important synergies around the SPARCs. For example, the research focus of the Heart Research Institute, as well as significant activities in the George Institute for Global Health and the Woolcock Institute, are already well
matched to the research programs being developed in the CPC; and researchers from these institutes have already been strongly engaged in developing and implementing the CPC’s research strategy, with plans to move some of their members to the CPC research and education hub. Similarly the Centenary Institute and Westmead Millennium Institute each has substantial research strengths in the priority areas of cancer and infectious diseases, and their researchers are already members of these University networks. The Kolling Institute’s focus on pregnancy and childbirth and on diseases of the bones and joints (conditions of ageing), the obvious focus on childhood of the Children’s Medical Research Institute and the Kids Research Institute at Westmead, and the ANZAC Institute’s research strength in diseases of ageing, all demonstrate the commitment to whole of life span research proposed in this review. Finally, the George Institute is active in research relating to Aboriginal and Torres Strait Islander health. This list is not exhaustive, but illustrates some common research interests. Furthermore, the proposed governance framework explicitly recognises that researchers in external affiliated and associated entities (hospitals and institutes) should take part in both formulating and implementing research strategies.

**RECOMMENDATION 11**

Actively seek strategic engagement with medical research institutes, health care providers and industry and support their participation in and benefit from the SPARCs.

It is clear that financial sustainability for at least some of the institutes will remain a challenge for the foreseeable future, and that this may have implications for the University’s relations with them, especially where there are University nominees on boards and where CEOs are University employees. The periodic reviews required as part of the Affiliated Entities Policy should provide the opportunity for the University to monitor and better understand the emerging or critical issues or risks that may have a material impact on an external entity’s performance so that the University can take action when appropriate.

For those smaller research groups associated with the University that do not have a documented relationship, the GSO should continue its review with the aim of formalising the relationship and ensuring appropriate accountability. Also, the University’s Affiliated Entities Policy should be amended to enable the value of the association or affiliation to be specifically assessed in terms of the extent to which it aligns with and enhances the University’s health and medical strategy.

**Affiliated staff**

The University’s policy for appointing affiliates should be reviewed to make clear the type of employment arrangements that are acceptable for affiliated staff and to require ongoing, regular and documented assessment of the affiliation and its value. The aims here would be to ensure that appointment arrangements do not confuse matters of responsibility and accountability for research productivity and outcomes, and are not costly to administer.

**4.4 CONCLUSION**

In this chapter the review has argued the importance of supportive governance and structures for the success of the University’s health and medical research strategy. The continuing stewardship of the disciplines by the faculties will be critical to maintaining, or in some cases attaining, pre-eminence, and to this end there may be opportunities to consolidate and strengthen some disciplines by optimising how the faculties and the organisational units within them are configured.

Spanning the faculties horizontally, and drawing upon their disciplinary strengths, will be the virtual, collaborative networks of the four SPARCs. To manage the SPARCs a new governance framework will be required; one that is scalable – both to encompass differences in the various networks’ sizes, objectives, and levels of formality, and to accommodate growth. This framework will also enable greater integration with the health-provider network including the proposed NSW Research Hubs. Together with the matrix *modus operandi* – integrating discipline-focused faculties and cross-disciplinary, cross-faculty networks – the new governance framework will be put forward as a model of structure and governance that other research networks might wish to emulate.

Finally, the University’s complicated relationships with internal centres, MRIs and other external entities, as well as with more than 2000 affiliates, will need to be simplified and managed more transparently, in some cases through stronger engagement and formalisation of relationships, in others through consolidation to reduce unnecessary and costly complexity.

Overall, the proposed structural and governance reforms should enhance the University’s research performance in health and medicine, facilitate better integration with health care providers, and ultimately translate into better health outcomes for individuals, communities and the population.
A constant theme heard by the review in consultations with stakeholders and in submissions was the need to invest in and align key business processes and information and communications technology (ICT) systems to support excellent health and medical research across the University and its extended networks. This has led to the review’s fourth strategic objective, discussed in this chapter.

**STRATEGIC OBJECTIVE 4**
Develop business processes and ICT systems to facilitate cross-disciplinary, cross-faculty and cross-organisational health and medical research.

5.1 CONTEXT: EFFECTIVE ICT RELIES ON STRATEGIC BUSINESS PROCESSES

Many contributors to the review focused on what they saw as the limitations of the University’s ICT systems, both for health and medical research itself and for the administrative and reporting requirements associated with it. In particular, researchers working across multiple institutions remarked on the difficulties of dealing with ICT networks and systems that are not adequately linked; and administrative staff in the faculties and central portfolios expressed their frustrations with inconsistent and often inaccurate data about staff, finances and other resources, due largely to a lack of integration between corporate systems.

This focus on ICT is understandable. Researchers in all fields rely increasingly on high-quality, well-functioning ICT to conduct their research, to access support (for example for the management of grants and contracts) and to complete administrative tasks. And researchers in the fields of health and medicine are arguably more reliant on ICT than most. First, their work tends to be highly collaborative. Second, it tends to extend across multiple locations – campuses, research centres and institutes, and hospitals. Third, these multiple locations are typically a mix of internal (that is, University) workplaces and external workplaces (for example hospitals, community health settings) all of which have their own ICT networks and systems that may not easily ‘talk’ to one other. For administrative staff, similarly, the inability of the University’s corporate systems to ‘talk’ to each other tends to be seen as a flaw in the technology.

Yet while it is technology that bears the brunt of people’s dissatisfaction, technology per se is rarely the only, or even the primary, problem. Developing and implementing more effective ICT systems is possible only when the underlying business processes are understood and clearly defined – where and how research is done and supported, what data is collected and analysed, and how it is used. In other words, there needs to be holistic consideration of business processes across and beyond the University before ICT systems can be made fit for purpose.

5.2 CURRENT STATE OF AFFAIRS AT SYDNEY

This section discusses the limitations of the University’s ICT capabilities as experienced by researchers and administrative staff and reported to the review. It also describes work that is already being undertaken to improve these capabilities, largely proceeding from recommendations made in the University’s Green and White Papers.

5.2.1 INFRASTRUCTURE

Researchers often reported inconsistent wireless connectivity, slow-wired connections, and a lack of easily accessible audio-visual conferencing equipment. They complained of losing valuable research time as a consequence of having to compensate for these shortcomings by travelling between the various University campuses and research sites.

Over the past couple of years, however, there have been coordinated investments in the underlying data network, and integrated planning for capital expenditure to upgrade buildings and networks simultaneously. This has led to substantial improvements for researchers, particularly on the Camperdown/Darlington Campus, including a new wireless network and increasing access to high performance computing, tools and data storage, as well as expanded ICT service delivery and support.

Nevertheless, the review heard frequently that more needs to be done. Additional investment is needed to accelerate the upgrade program in order to meet not only current research requirements but to prepare for the increased collaborative focus for health and medical research proposed by this review. This will require, for example, capabilities to transfer large data sets and electronic files as well as...
to interface with newer equipment and machinery, and — simpler but nonetheless very important — the installation of audio-visual conferencing equipment at more rooms within all collaborating sites.

5.2.2 INTERCONNECTIVITY BETWEEN NETWORKS — THE ‘FIREWALL’ ISSUE
Researchers frequently experienced difficulties in working across multiple institutions, each of which has its own ICT network (for example the University and a hospital). This was sometimes referred to as the ‘firewall’ issue. In the words of one submission:

“It is crucial to improve electronic communication capacity across the University and hospitals. The Tyranny of Distance is sometimes dwarfed by the Tyranny of Firewalls.”

This was in fact the most commonly cited impediment to collaboration, greatly restricting the flow of information and data, and causing endless frustration. Importantly, it not only impedes interactions with others; it impedes the self-same researcher’s ability to work in multiple settings, forcing the researcher into a kind of technological split personality. The review heard, for example, of researchers who use a separate computer for each organisation they work with.

Nevertheless, the challenge in achieving seamless interconnectivity between organisations is not primarily technical. The main obstacle was not having agreements in place between organisations to address concerns of privacy and confidentiality, risk management and escalation procedures, and investment and maintenance. Encouragingly, discussions have already begun with some hospitals and LHDs on how best to manage this. But further work is required to establish an agreed framework for the roles and responsibilities necessary for ongoing governance and operational management.

5.2.3 DATA-SHARING
Researchers working with clinical data sets, especially in affiliated hospitals, frequently reported difficulties in saving, moving and exchanging data electronically, especially large data sets for which relatively high-cost technology is needed.

Associated with this issue is the location and maintenance of the host machines. Hospitals claim that the provision and ongoing maintenance of such research infrastructure requires more specialized support than that needed for their general business operations, and so should be undertaken by the University.

5.2.4 ACCESS CREDENTIALS
It is common for health and medical researchers to have more than one place of work and to use many applications and tools, for example multiple email applications (University, faculty, LHD, MRI, personal), word-processing and spreadsheet applications, statistical packages, library research tools, clinical and ethics systems, various data storage systems, and financial systems. Many of these require a unique login and password. The review heard that having to manage so many login/password combinations was a cause of irritation, and at times meant researchers were unable to access an application or share information.

In recent years, the UniKey login and password has extended access to many more applications across the University. However, further work is required to minimise the number of sign-ins required, especially for those researchers working in locations away from a University campus.

Ultimately the problem of access credentials is also part of the broader issue of identity management (see 5.2.7 Identity management)*.

5.2.5 ACADEMIC PROFILE SYSTEM
Many researchers expressed the need for a simple system to help them find potential collaborators in associated or relevant disciplines. Currently this is largely done by word of mouth, and as such is not always effective or efficient.

A fledgling academic profile system is being implemented University-wide and is already used by several faculties. It enables a researcher to search for collaborators or identify who is working in related fields. The system does, however, have limitations. Again, these are due to the broader issue of identity management (see 5.2.7 Identity management)*.

5.2.6 SHARING DATA BETWEEN CORPORATE SYSTEMS
Academic leaders, researchers and administrative staff in the faculties and central portfolios all informed the review of the many difficulties they encounter in tracking down and aggregating comprehensive and coherent data about staffing, finances and research performance for planning and implementing research strategies, accessing and providing support (for example grant management), and internal and external (for example ERA) reporting requirements.

The principal problem is that data cannot be easily shared or linked between the University’s corporate systems because they do not have consistent data definitions or system architectures. Functional units such as Human Resources and Finance upgrade their systems, change internal processes and hold data rules independently of one another; consequently the systems cannot ‘talk’ to each other, and staff have to curate or move data between applications manually. For example, this makes it difficult to identify funding income and expenditure for any given researcher. The review team itself experienced the difficulties of inconsistent data when seeking to validate claims and conclusions about research and researchers using the HR and Corporate Finance systems. Substantial work was required to ensure there were no duplications or omissions in the data.

* Previously stated ‘(see 5.1.7 identity management)’ in the original review
This situation leads to the so-called ‘stove-pipe’ mode of operating (Figure 5.1), which cannot be resolved by technical ‘fixes’ to the individual systems alone. Instead it reflects a lack of integration between University-wide business processes and a lack of agreement on standardised architecture.

Figure 5.1 The ‘stove-pipe’ mode of University corporate systems

This is a schematic representation of the processes and management of the University’s corporate systems. Each functional unit has its own system or systems. The business processes associated with most units are designed internally by the unit, without input from any other. The data held within a unit’s system or systems are collected as specified by that unit, without necessary consideration for any other data collection systems or mechanisms. The people symbols represent the manual workarounds required to bridge the various gaps.

Work to redress the problem of inconsistent corporate data is under way in the Strategic Information and Business Intelligence program (SIBI). SIBI is seeking to provide an institution-wide solution that overcomes the limitations of the ‘stove-pipe’ structure. SIBI’s master data management tool is intended to reconcile data in the various corporate systems that are inconsistent and to reduce duplication in order to produce a single, reliable source of information.

Currently SIBI is a work in progress, with manual workarounds still likely to be required into the future to supplement its key strategic reports. Ultimately, though, SIBI is designed to compensate for inconsistent data, not to create consistent data in the first place; and it cannot support the more sophisticated analysis and reporting requirements that are becoming necessary. To achieve the complete integration of corporate systems will require strategic decisions across the University as a whole (see 5.3.2 Integration of corporate systems)*.

While SIBI does enable the extraction of more consistent and reliable data, the corporate systems were not designed with the new collaborative research model in mind. For example, the review was advised that the corporate finance systems are constructed on models designed to deliver funding to faculties and central units on an annual basis, so it is difficult to reconcile data about researchers working across different centres, institutes, schools and faculties, or to allocate and track funding to cross-disciplinary, cross-faculty and/or cross-organisational research teams and to report on their performance. However, work is under way in the context of the CPC initiative to address the requirements of cross-disciplinary and cross-faculty collaborations. In particular, Corporate Finance and HR are looking at how effectively their respective systems support and enhance organisational structures as well as large-scale collaborations and access to centralised infrastructure services and facilities. Improvements will require changes to underlying data models and systems such as the University Economic Model (UEM). The UEM was developed to reflect research income and expenditures on the basis that researchers work in faculties, not in the multiple organisational settings in which health and medical researchers are working increasingly.

5.2.7 IDENTITY MANAGEMENT

Related to the problem of achieving consistent, reliable data is that of identity management. Definitive information about many University staff, students and affiliates – such as who they are, whether they are paid and by whom, whether they are an affiliate, visitor or contractor, or if they have left the University – is not available. (The review was advised of one instance where failure to identify when a researcher had left the University had significant repercussions for ARC funding for the other researchers on a continuing grant.)

For the purposes of this review the team requested information from the HR system about staff in health and medical faculties and the functions they performed. The available data indicated that of the 4934 staff listed, 2569 (52 percent) had no function recorded. The review team was unable to tell if they were research-only staff, teaching-only staff, teaching and research staff, or honorary appointments. The HR system holds data by position, not person, as mentioned above. Hence a researcher who belongs to a school may also hold a position elsewhere, causing a loss of linkage back to the school. This issue is especially manifest in health and medical research given many researchers’ relationships with hospitals, health systems, medical research institutes and special purpose entities; some researchers are...

* Previously stated “(see 5.1.9 Integration of corporate systems)” in the original review
associated with as many as six different entities. While there are manual workarounds to keep staff aligned with their organisational units, the underlying data should be structured to accommodate all the different ways it is used, including managing information on multiple affiliations.

As it is, no one corporate system holds a complete list of staff, students, affiliates and contractors and their links to other institutions. Nor are consistent business processes being followed when staff or affiliates are recorded, leading to everything from simple spelling mistakes when a person is first entered into a system, to critical information being missing. In the words of one submission to the review: “The quality of data is poor. The University should improve the data it collects and apply standardised guidelines around recording people against position linked with entities.”

Poor identity management also has ramifications for the ‘firewall’ issue. Agreements with partner organisations are unlikely until the University is able to uniquely identify its students, staff and affiliates and their currency of appointment.

5.3 FUTURE DIRECTIONS

The concerns expressed to the review about ICT capabilities for health and medical research and the underlying business processes echoed the conclusions in the Green and White Papers, which identified the need to significantly upgrade IT infrastructure, as well as to streamline and better coordinate administrative services.

Since then, investment in both hardware and systems has produced some notable improvements in ICT capabilities. However, the investment needed to begin to substantially address all the issues drawn to the review’s attention is considerable, and it requires a balance between capital and ongoing operations requirements. There is little definitive data readily available to indicate how Sydney’s investment in ICT compares nationally, nor how effectively Sydney is managing the balance between capital and operational investment. The CAUDIT Annual Benchmarking Report on IT spending across Australian universities indicates that Sydney’s annual expenditure as a percentage of total institutional revenue is in the lower range. The median spend is 7.3 percent; Sydney’s is 5.2 percent, putting it in sixth lowest position. These figures can, however, be misleading: some universities report capital as well as operational costs, whereas Sydney reports only operational costs. Sydney also has in place an effective strategy to drive operational costs down to enable greater capital investment.

Notwithstanding the significant achievements in ICT systems and technologies over the past couple of years, as well as the work currently being undertaken to deliver further improvements, there are three particular matters the review is nominating for greater attention and investment.

5.3.1 INFRASTRUCTURE UPGRADE

First, it is crucial that investment in the current upgrade to the network across the University is accelerated to ensure there is adequate bandwidth for research purposes. For health and medical researchers a reliable, high-speed, large-bandwidth network is now critically important.

5.3.2 INTEGRATION OF CORPORATE SYSTEMS

Second, deficiencies in the data collected by the core corporate systems, as well as the systems’ inability to share or link data, must be addressed. And as large-scale collaborative, cross-disciplinary research networks are set to multiply, the University cannot afford more costly manual processes and bespoke solutions for every new system, structure, temporary grouping or application implemented.

Overall, the review found that Sydney has the capacity and the desire to resolve the lack of integration between its main corporate systems. But this will require mapping business processes and information from a University-wide perspective rather than from a functional-unit perspective. It will also require establishing an essential foundation: a single version of the University’s organisational hierarchy together with unique identifiers for personnel to structure data, integrate business processes and guide future systems development. Each stand-alone corporate system currently has its own idiosyncratic version of the organisational hierarchy, so there is no single ‘source of truth’. A single organisational hierarchy, with appropriate governance, will enable systems to link together and will ensure transparent, streamlined operational management.

The review therefore supports the implementation of a master organisational hierarchy with which all downstream and core systems should align, keeping all naming and underlying codes consistent for information management and reporting purposes. The cost of this is likely to be high in both time and money, but the work must be scoped, planned and implemented properly. It is possible that some systems may not be able to accommodate a master organisational hierarchy, so it may be necessary to consider replacing them.
5.3.3 INTER-INSTITUTIONAL AGREEMENTS
Third, there is the need to reach agreement with partner organisations on how best to enable communication, connectivity and data-sharing across the multiple health and medical networks where research is conducted, especially to support the increased emphasis on the large-scale collaborations being recommended. Input to the review from representatives of the LHDs and the NSW Ministry of Health has supported this strongly.

It will be critical to reach common agreement with all institutional partners. Given the disparate structures of organisations in which health and medical research is undertaken in NSW, such an agreement may need to be made with the Ministry of Health rather than with individual LHDs or hospitals. The agreement should cover requirements for connectivity, identity management, data-sharing, system and data architecture, privacy and confidentiality, risk management, and infrastructure investment and maintenance. While the review recognises that this set of issues presents significant difficulties, the work must be undertaken with the determination to seek resolution.

5.3.4 UNIVERSITY-WIDE GOVERNANCE
Many of the matters discussed in this chapter require technical solutions. But without business processes that are coherent across the University, and without the necessary governance to support these processes, such solutions will remain local, ad hoc, possibly even tactical, but they will not be part of an agreed strategy and there will be no commitment to implement them.

For example, the limitations of the main corporate systems can only be addressed by developing an end-to-end view of what researchers and research managers need, and by developing applications that then align with those requirements.

The review has concluded that the benefit of further investments in technology will not be optimised unless there are changes to the way the underlying business processes are developed and governed. The review is therefore recommending that senior executive-level governance be implemented to oversee and coordinate the development of a University-wide strategy to deliver integrated and cohesive processes and systems (Figure 5.2). As well as focusing on internal University processes and systems, these governance arrangements will need to consider external partners’ processes and systems, in order to achieve greater interconnectivity between organisations’ networks and facilities.
Achieving the strategy proposed in this report will take several years; there are few quick fixes when grappling with the complexities of maximising outcomes from health and medical research. Even to realise the review’s vision within the next decade, namely for Sydney to attain national pre-eminence and greater international recognition in important areas of health and medical research, will require sustained leadership and political commitment.

The Australian community invests $4 billion in health and medical research every year. The need to justify this investment will come increasingly to dominate the national research agenda, and is likely to demand a greater balance between investigator-initiated research and priority-driven research.

The recommendations in this report are designed to position the University to play a leading role in this national agenda and to succeed in a research landscape that continues to change. These recommendations, like research itself, will not produce immediate results but will provide a solid foundation to strengthen and energise health and medical research at Sydney.

6.1 DELIVERING ON THE TERMS OF REFERENCE

The review’s Terms of Reference (Appendix A) comprise five goals and additional matters for consideration that collectively encompass three broad areas:

- **Maximising research impact** (ToR goals 1, 2)
- **Developing effective organisational and governance frameworks to position the University to effectively participate in proposed state and national research hubs** (ToR goals 2, 3, 4)
- **Enhancing research collaboration** (ToR goal 5).

As the review progressed through the consultations and data analysis, four strategic objectives emerged to address these broad areas.

Strategic objective 1 – **Identify and support strategic priority areas for research focus that leverage research excellence, align with our researchers’ values, and deliver significant benefits for society** – will deliver on **maximising research impact** through its proposal that the University focus its efforts on four strategic priority areas for research collaboration (SPARCs). As well as representing areas of research strength in their own right, the SPARCs are thematic, integrated and networked, allowing them the capability and flexibility to connect with the health system and with industry to maximise impact through effective partnerships (as emphasised in the next strategic objective).

**Maximising research impact** is therefore also addressed by Strategic objective 2 – **Facilitate research excellence and impact by making Sydney’s strengths in the SPARCs highly visible to health care providers and industry, to expedite partnerships and opportunities for translation and commercialisation, and by making outstanding staff supported by state-of-the-art research facilities the hallmarks of research excellence at Sydney.** The SPARCs, individually and collectively, will provide high-profile and formal points of connectivity for internal and external collaborations, to overcome consistent feedback to the review that the lack of clarity about who to deal with at the University was a barrier to collaboration. In addition, the emphasis this strategic objective places on outstanding staff and state-of-the-art research facilities is critical to maximising research impact sustainably over the long-term.

Strategic objective 3 – **Establish strong, effective governance with clear lines of authority, accountability and responsibility to enhance overall research performance and enable greater integration with the health care provider network to increase translation into better health outcomes for individuals, communities and populations** – will deliver on **developing effective organisational and governance frameworks to position the University to effectively participate in proposed state and national research hubs.** The Terms of Reference directed the review
IMPLEMENTATION

6.1 IMPLEMENTING THE RECOMMENDATIONS
Implementing the recommendations will require considerable work, sustained focus and adequate resources. To ensure success and to maintain it, there must be a well-planned approach to encourage University-wide engagement to refine concepts and approaches.

It is critical that the University respond to the report and commit to its recommendations. Once this is done, planning how to implement these recommendations will require senior leadership and support as well as strong grass-roots buy-in. To ensure the University health and medical research strategy is appropriately integrated with and supports the NSW health delivery system, the Executive Steering Committee should include a senior representative of the NSW Ministry of Health. Additionally, senior members of the University executive should be appointed to the executive steering committee to ensure the University’s commitment to integrated education and research is reflected in implementation of the health and medical research strategy; and the University’s business processes and systems support the strategy.

6.1.1 RESOURCES FOR IMPLEMENTATION

Resources to support implementation of the research strategy are required for two purposes. Firstly, they are needed to support the recommendations relating to the SPARCs – both as the new, collaborative matrix approach develops and as it becomes an established way for Sydney to organise and support priority areas of research. Secondly, resources are needed to support the Executive Steering Committee as it develops and initiates the implementation plan.

Key to long-term resourcing of the SPARCs is the work being done to revise the UEM to enable effective support of cross-disciplinary, cross-faculty and cross-organisational collaborative networks. The collaborative approach to research proposed in this review goes beyond health and medical research and is relevant across the full breadth of research – as well as education – at Sydney. As the UEM was not originally designed to support large-scale collaborative ventures of this kind, prioritising completion of the UEM revision will be critical to effective implementation of the review’s recommendations and will ensure there is a sustainable and transparent mechanism to support multi-disciplinary, multi-faculty and multi-organisational entities.

In addition, specific initiatives in the report will be supported through existing programs and targeted applications for external funding. Research excellence will continue to be supported broadly through the DVCR programs and its research support team. The existing investment pools for some of the SPARCs will continue.

For the CPC SPARC there is, in addition to the substantial investment in infrastructure, $1 million per annum to seed the research program. The Cancer SPARC will have funds dedicated to it from the Cancer Research Fund, which delivers an annual budget of $1–1.5 million. The Infectious Diseases SPARC will continue to be supported by the SyReNS scheme. There is also a SyReNS-level allocation in the DVCR compact budget with Medicine to support the Mental Health and Neuroscience SPARC.

Finally, set aside in the DVCR program budget is $1 million to support implementation of the review’s recommendations. The Executive Steering Committee is being tasked with the responsibility to determine how this funding is best allocated in order to initiate activities and support transitional arrangements necessary to long-term successful implementation.

RECOMMENDATION 13
Establish an Executive Steering Committee reporting to the Vice-Chancellor to plan and oversee implementation of the recommendations. Establish an independent chair for the committee, to be appointed by the Vice-Chancellor.
Changes required to processes, systems and structures within central portfolios should be managed within existing arrangements.

Support for the Executive Steering Committee should be provided through the position of the Pro-Vice-Chancellor, Research (PVCR). The PVCR will be chair of a working group (the Health and Medical Research Strategic Working Group) representing all key organisational units within the University and supported by a small team established within the Research Portfolio. This team will initially support the working group but will have a longer-term remit to support the SPARC leadership group and to be a point of contact for both internal and external stakeholders in their SPARCs.

### 6.1.3 EXECUTIVE STEERING COMMITTEE

#### MEMBERSHIP

**Background**

This report of the Health and Medical Research Strategic Review was presented to the Vice-Chancellor in June 2013.

**Membership of the Executive Steering Committee**

- Independent chair (appointed by the Vice-Chancellor)
- Deputy Vice-Chancellor, Research
- Deputy Vice-Chancellor, Education
- Deputy Vice-Chancellor, Strategic Management
- Representative of NSW Ministry of Health

#### 6.1.4 TERMS OF REFERENCE FOR THE EXECUTIVE STEERING COMMITTEE

A. Create a clear implementation plan that reflects the priorities of the recommendations and includes a timetable for delivery.

B. Identify and assign responsibility for implementation of each recommendation and action.

C. Recommend allocation of strategic implementation funding.

D. Set clear, measurable KPIs for each recommendation and action.

E. Oversee and report quarterly on implementation of the plan to the Vice-Chancellor through SEG.

F. Provide advice to the Vice-Chancellor on any other measure the committee determines is likely to advance the University’s health and medical research strategy.

**Meetings**

The Executive Steering Committee will meet quarterly and report to the Vice-Chancellor following each meeting.

**Operational support**

The Executive Steering Committee will be supported by a ‘Health and Medical Strategic Working Group’ comprising:

- PVCR (chair)
- five deans of health and medical faculties (or nominees)
- one dean of a non-health and medical faculty (or nominee)
- academic directors/leaders of SPARCs
- 1 x DVCR nominee
- Chief Financial Officer
- Director, Human Resources
- Chief Information Officer
- General Counsel (or nominee).

The Working Group will take responsibility for implementing the tasks and activities identified by the Executive Steering Committee, including providing support through the central portfolios and faculties for:

A. the development of the SPARCs

B. the review by each faculty of its internal structures in order to optimise disciplinary excellence and engagement with the SPARCs

C. an ‘end-to-end’ review of business processes and ICT systems to enable effective functioning of cross-disciplinary, cross-faculty and cross-organisation collaborations

D. a review of the Centres Policy to determine whether to incorporate into it regulations pertaining to the proposed SPARCs and future large-scale collaborative networks, or whether to develop a new policy framework for them.
APPENDICES

E-appendices referred to in this document are located at sydney.edu.au/strategy/research

APPENDIX A
TERMS OF REFERENCE

TERMS OF REFERENCE
The Health and Medical Research Strategic Review will focus on how the University can optimise the comprehensive resources of its health and medical research entities over the next 10 years.

The review will:

1. Maximise the impact of research and education in response to the NSW state and federal Reviews of health and medical research.

2. Prepare the University for its application to the forthcoming NHMRC’s Integrated Health Research Centre’s initiative.

3. Develop an organisational framework for all of the University’s affiliated entities including medical research institutes, hospitals, primary health and rural health networks, and the internal health related divisions.

4. Assess the effectiveness of the current governance framework and affiliation agreements across all health and medical research entities.

5. Make recommendations on how the University could create mechanisms to enhance research collaboration at all levels.

In addressing its Terms of Reference the review will also give consideration to:

- Benchmarking the University’s current health and medical research performance data against other Australian universities and relevant international comparisons.

- In response to the NSW Health and Medical Research Strategic Review, how the University will assist in developing planning for the University affiliated Research Hubs, with the aim to foster translation, innovation and build research capacity.

- How to structure more efficient, coordinated and productive outcomes from within the University’s health and medical research entities.

- Examine the present and potential links to industry in developing and commercialising health and medical research discoveries.

- Develop a structure to actively recruit, develop and retain high quality research staff and students.

- Develop an implementation plan to action the review recommendations.
APPENDIX B
INDIVIDUALS AND GROUPS WHO HAVE PARTICIPATED IN THIS REVIEW

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>SUBMITTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PROFESSIONAL</td>
</tr>
<tr>
<td>Affiliated hospital entity</td>
<td>12</td>
</tr>
<tr>
<td>Commonwealth government</td>
<td>1</td>
</tr>
<tr>
<td>Faculty of Medicine</td>
<td>28</td>
</tr>
<tr>
<td>Other university</td>
<td>0</td>
</tr>
<tr>
<td>State government</td>
<td>1</td>
</tr>
<tr>
<td>Sydney cross-faculty entity</td>
<td>2</td>
</tr>
<tr>
<td>University central services</td>
<td>3</td>
</tr>
<tr>
<td>University health and medical faculty</td>
<td>3</td>
</tr>
<tr>
<td>University non-health and medical faculty</td>
<td>2</td>
</tr>
<tr>
<td>Independent Medical Research Institutes</td>
<td>4</td>
</tr>
<tr>
<td>Submitters not listed elsewhere</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>56</td>
</tr>
</tbody>
</table>

LIST OF INDIVIDUAL CONTRIBUTORS

Ms Helene Abouyanni  Dr Roger Bourne
Dr Mark Ainsworth    Professor Ann Brewer
Dr Teresa Anderson   Associate Professor Helena Britt
Professor Carol Armour Professor Warwick Britton
Dr Chris Armstrong   Associate Professor Anthony Brown
Dr Clive Aspin       Professor Phyllis Butow
Professor Dale Bailey Dr Herma Buttner
Professor Bernard Balaine Ms Hilary Byrne
Ms Louise Bannerman  Ms Paula Caffrey
Associate Professor Vanessa Barrs Mr David Cater-Cameron
Professor Louise Baur Professor Ian Caterson
Associate Professor Julia Beatty Professor David Celermajer
Professor Thomas Becker Professor Hak-Kim Chan
Ms Anne Bell          Dr Kerry Chant
Dr Andrew Black       Professor Macdonald Christie
Ms Merrill Bouckley   Mr Ian Clarke
Professor Chris Murphy
Ms Audrey no surname provided
Ms Lauren no surname provided
Ms Sasha no surname provided
Professor Robyn Norton
Professor Mary O’Kane
Dr Lauri Olivier
Ms Grainne O’Loughlin
Dr Nick Pearce
Professor Chris Peck
Professor Michael Peek
Dr Tony Penna
Professor Vlado Perkovic
Ms Kathrine Petersen
Mr Vijayasarathi Ramanathan
Professor Iqbal Ramzan
Dr Gopi Rangan
Professor Roger Reddel
Mr Tim Regan
Mr Greg Robinson
Dr Pat Ruell
Professor Janice Russell
Associate Professor Amanda Sainsbury-Salis
Professor Glenn Salkeld
Ms Emily Saurman
Ms Kate Sawkins
Associate Professor Toni Schofield
Dr Devanshi Seth
Ms Milly Sidhu
Professor John Simes
Ms Milena Simic
Professor Stephen Simpson
Ms Yamini Sindoba Sandiran
Dr Lorraine Smith
Dr Jennifer Smith-Merry
Professor Tania Sorrell
Professor Jonathan Stone
Dr Nanthakumar Subramaniam
Ms Vicki Taylor
Professor John Thompson
Professor Mike Thompson
Dr Angela Todd
Professor Leanne Togher
Associate Professor Lyndal Trevena
Ms Helen Triantafyllou
Professor Mathew Vadas
Mr Philip Vita
Ms Samantha Warhurst
Dr Julia Warning
Associate Professor Donna Waters
Dr Olaf Werder
Ms Gabrielle Whelan
Dr Julie Wheway
Professor Jill White
Mr Boyd Williams
Mr Andrew Wilson
Dr Kam Wong
Dr Paul Wrigley
Mr Tong Zhang

APPENDICES
## APPENDIX C

### FIELD OF RESEARCH CODES FOR HEALTH AND MEDICAL RESEARCH AT SIX-DIGIT LEVEL

<table>
<thead>
<tr>
<th>060000</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>060501</td>
<td>Bacteriology</td>
</tr>
<tr>
<td>060502</td>
<td>Infectious Agents</td>
</tr>
<tr>
<td>060503</td>
<td>Microbial Genetics</td>
</tr>
<tr>
<td>060504</td>
<td>Microbial Ecology</td>
</tr>
<tr>
<td>060505</td>
<td>Mycology</td>
</tr>
<tr>
<td>060506</td>
<td>Virology</td>
</tr>
<tr>
<td>060599</td>
<td>Microbiology (not elsewhere classified)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>080000</th>
<th>Information and Computing Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>080000</td>
<td>Information and Computing Sciences</td>
</tr>
<tr>
<td>080702</td>
<td>Health Informatics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>090000</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>090303</td>
<td>Biomedical Instrumentation</td>
</tr>
<tr>
<td>090304</td>
<td>Medical Devices</td>
</tr>
<tr>
<td>090399</td>
<td>Biomedical Engineering (not elsewhere classified)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>100000</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>100401</td>
<td>Gene and Molecular Therapy</td>
</tr>
<tr>
<td>100402</td>
<td>Medical Biotechnology Diagnostics (incl. Biosensors)</td>
</tr>
<tr>
<td>100403</td>
<td>Medical Molecular Engineering of Nucleic Acids and Proteins</td>
</tr>
<tr>
<td>100404</td>
<td>Regenerative Medicine (incl. Stem Cells and Tissue Engineering)</td>
</tr>
<tr>
<td>100499</td>
<td>Medical Biotechnology (not elsewhere classified)</td>
</tr>
<tr>
<td>100403</td>
<td>Medical Molecular Engineering of Nucleic Acids and Proteins</td>
</tr>
<tr>
<td>100404</td>
<td>Regenerative Medicine (incl. Stem Cells and Tissue Engineering)</td>
</tr>
<tr>
<td>100499</td>
<td>Medical Biotechnology (not elsewhere classified)</td>
</tr>
<tr>
<td>110303</td>
<td>Clinical Microbiology</td>
</tr>
<tr>
<td>110304</td>
<td>Dermatology</td>
</tr>
<tr>
<td>110305</td>
<td>Emergency Medicine</td>
</tr>
<tr>
<td>110306</td>
<td>Endocrinology</td>
</tr>
<tr>
<td>110307</td>
<td>Gastroenterology and Hepatology</td>
</tr>
<tr>
<td>110308</td>
<td>Geriatrics and Gerontology</td>
</tr>
<tr>
<td>110309</td>
<td>Infectious Diseases</td>
</tr>
<tr>
<td>110310</td>
<td>Intensive Care</td>
</tr>
<tr>
<td>110311</td>
<td>Medical Genetics (excl. Cancer Genetics)</td>
</tr>
<tr>
<td>110312</td>
<td>Nephrology and Urology</td>
</tr>
<tr>
<td>110313</td>
<td>Nuclear Medicine</td>
</tr>
<tr>
<td>110314</td>
<td>Orthopaedics</td>
</tr>
<tr>
<td>110315</td>
<td>Otorhinolaryngology</td>
</tr>
<tr>
<td>code</td>
<td>description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>110316</td>
<td>Pathology (excl. Oral Pathology)</td>
</tr>
<tr>
<td>110317</td>
<td>Physiotherapy</td>
</tr>
<tr>
<td>110318</td>
<td>Podiatry</td>
</tr>
<tr>
<td>110319</td>
<td>Psychiatry (incl. Psychotherapy)</td>
</tr>
<tr>
<td>110320</td>
<td>Radiology and Organ Imaging</td>
</tr>
<tr>
<td>110321</td>
<td>Rehabilitation and Therapy (excl. Physiotherapy)</td>
</tr>
<tr>
<td>110322</td>
<td>Rheumatology and Arthritis</td>
</tr>
<tr>
<td>110323</td>
<td>Surgery</td>
</tr>
<tr>
<td>110324</td>
<td>Venereology</td>
</tr>
<tr>
<td>110399</td>
<td>Clinical Sciences (not elsewhere classified)</td>
</tr>
<tr>
<td>110401</td>
<td>Chiropractic</td>
</tr>
<tr>
<td>110402</td>
<td>Naturopathy</td>
</tr>
<tr>
<td>110403</td>
<td>Traditional Aboriginal and Torres Strait Islander Medicine and Treatments</td>
</tr>
<tr>
<td>110404</td>
<td>Traditional Chinese Medicine and Treatments</td>
</tr>
<tr>
<td>110405</td>
<td>Traditional Maori Medicine and Treatments</td>
</tr>
<tr>
<td>110499</td>
<td>Complementary and Alternative Medicine not elsewhere classified</td>
</tr>
<tr>
<td>110501</td>
<td>Dental Materials and Equipment</td>
</tr>
<tr>
<td>110502</td>
<td>Dental Therapeutics, Pharmacology and Toxicology</td>
</tr>
<tr>
<td>110503</td>
<td>Endodontology</td>
</tr>
<tr>
<td>110504</td>
<td>Oral and Maxillofacial Surgery</td>
</tr>
<tr>
<td>110505</td>
<td>Oral Medicine and Pathology</td>
</tr>
<tr>
<td>110506</td>
<td>Orthodontics and Dento facial Orthopaedics</td>
</tr>
<tr>
<td>110507</td>
<td>Paedodentics</td>
</tr>
<tr>
<td>110508</td>
<td>Periodontics</td>
</tr>
<tr>
<td>110509</td>
<td>Special Needs Dentistry</td>
</tr>
<tr>
<td>110599</td>
<td>Dentistry (not elsewhere classified)</td>
</tr>
<tr>
<td>110601</td>
<td>Biomechanics</td>
</tr>
<tr>
<td>110602</td>
<td>Exercise Physiology</td>
</tr>
<tr>
<td>110603</td>
<td>Motor Control</td>
</tr>
<tr>
<td>110604</td>
<td>Sports Medicine</td>
</tr>
<tr>
<td>110699</td>
<td>Human Movement and Sports Science (not elsewhere classified)</td>
</tr>
<tr>
<td>110701</td>
<td>Allergy</td>
</tr>
<tr>
<td>110702</td>
<td>Applied Immunology (incl. Antibody Engineering, Xenotransplantation and T-cell Therapies)</td>
</tr>
<tr>
<td>110703</td>
<td>Autoimmunity</td>
</tr>
<tr>
<td>110704</td>
<td>Cellular Immunology</td>
</tr>
<tr>
<td>110705</td>
<td>Humoural Immunology and Immunochemistry</td>
</tr>
<tr>
<td>110706</td>
<td>Immunogenetics (incl. Genetic Immunology)</td>
</tr>
<tr>
<td>110707</td>
<td>Innate Immunity</td>
</tr>
<tr>
<td>110708</td>
<td>Transplantation Immunology</td>
</tr>
<tr>
<td>110709</td>
<td>Tumour Immunology</td>
</tr>
<tr>
<td>110799</td>
<td>Immunology (not elsewhere classified)</td>
</tr>
<tr>
<td>110801</td>
<td>Medical Bacteriology</td>
</tr>
<tr>
<td>110802</td>
<td>Medical Infection Agents (incl. Prions)</td>
</tr>
<tr>
<td>110803</td>
<td>Medical Parasitology</td>
</tr>
<tr>
<td>110804</td>
<td>Medical Virology</td>
</tr>
<tr>
<td>110899</td>
<td>Medical Microbiology (not elsewhere classified)</td>
</tr>
<tr>
<td>110901</td>
<td>Autonomic Nervous System</td>
</tr>
<tr>
<td>110902</td>
<td>Cellular Nervous System</td>
</tr>
<tr>
<td>110903</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>110904</td>
<td>Neurology and Neuromuscular Diseases</td>
</tr>
<tr>
<td>110905</td>
<td>Peripheral Nervous System</td>
</tr>
<tr>
<td>110906</td>
<td>Sensory Systems</td>
</tr>
<tr>
<td>110999</td>
<td>Neurosciences (not elsewhere classified)</td>
</tr>
<tr>
<td>111001</td>
<td>Aged Care Nursing</td>
</tr>
<tr>
<td>111002</td>
<td>Clinical Nursing: Primary (Preventative)</td>
</tr>
<tr>
<td>111003</td>
<td>Clinical Nursing: Secondary (Acute Care)</td>
</tr>
<tr>
<td>111004</td>
<td>Clinical Nursing: Tertiary (Rehabilitative)</td>
</tr>
<tr>
<td>111005</td>
<td>Mental Health Nursing</td>
</tr>
<tr>
<td>111006</td>
<td>Midwifery</td>
</tr>
<tr>
<td>111099</td>
<td>Nursing (not elsewhere classified)</td>
</tr>
<tr>
<td>111101</td>
<td>Clinical and Sports Nutrition</td>
</tr>
<tr>
<td>111102</td>
<td>Dietetics and Nutrigenomics</td>
</tr>
<tr>
<td>111103</td>
<td>Nutritional Physiology</td>
</tr>
<tr>
<td>111104</td>
<td>Public Nutrition Intervention</td>
</tr>
<tr>
<td>111199</td>
<td>Nutrition and Dietetics (not elsewhere classified)</td>
</tr>
<tr>
<td>111201</td>
<td>Cancer Cell Biology</td>
</tr>
<tr>
<td>111202</td>
<td>Cancer Diagnosis</td>
</tr>
<tr>
<td>111203</td>
<td>Cancer Genetics</td>
</tr>
<tr>
<td>111204</td>
<td>Cancer Therapy (excl. Chemotherapy and Radiation Therapy)</td>
</tr>
<tr>
<td>111205</td>
<td>Chemotherapy</td>
</tr>
<tr>
<td>111206</td>
<td>Haematological Tumours</td>
</tr>
<tr>
<td>111207</td>
<td>Molecular Targets</td>
</tr>
<tr>
<td>111208</td>
<td>Radiation Therapy</td>
</tr>
<tr>
<td>111209</td>
<td>Solid Tumours</td>
</tr>
<tr>
<td>111299</td>
<td>Oncology and Carcinogenesis (not elsewhere classified)</td>
</tr>
<tr>
<td>111301</td>
<td>Ophthalmology</td>
</tr>
<tr>
<td>111302</td>
<td>Optical Technology</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>111303</td>
<td>Vision Science</td>
</tr>
<tr>
<td>111399</td>
<td>Ophthalmology and Optometry (not elsewhere classified)</td>
</tr>
<tr>
<td>111401</td>
<td>Foetal Development and Medicine</td>
</tr>
<tr>
<td>111402</td>
<td>Obstetrics and Gynaecology</td>
</tr>
<tr>
<td>111403</td>
<td>Paediatrics</td>
</tr>
<tr>
<td>111404</td>
<td>Reproduction</td>
</tr>
<tr>
<td>111499</td>
<td>Paediatrics and Reproductive Medicine (not elsewhere classified)</td>
</tr>
<tr>
<td>111501</td>
<td>Basic Pharmacology</td>
</tr>
<tr>
<td>111502</td>
<td>Clinical Pharmacology and Therapeutics</td>
</tr>
<tr>
<td>111503</td>
<td>Clinical Pharmacy and Pharmacy Practice</td>
</tr>
<tr>
<td>111504</td>
<td>Pharmaceutical Sciences</td>
</tr>
<tr>
<td>111505</td>
<td>Pharmacogenomics</td>
</tr>
<tr>
<td>111506</td>
<td>Toxicology (incl. Clinical Toxicology)</td>
</tr>
<tr>
<td>111599</td>
<td>Pharmacology and Pharmaceutical Sciences (not elsewhere classified)</td>
</tr>
<tr>
<td>111601</td>
<td>Cell Physiology</td>
</tr>
<tr>
<td>111602</td>
<td>Human Biophysics</td>
</tr>
<tr>
<td>111603</td>
<td>Systems Physiology</td>
</tr>
<tr>
<td>111699</td>
<td>Medical Physiology (not elsewhere classified)</td>
</tr>
<tr>
<td>111701</td>
<td>Aboriginal and Torres Strait Islander Health</td>
</tr>
<tr>
<td>111702</td>
<td>Aged Health Care</td>
</tr>
<tr>
<td>111703</td>
<td>Care for Disabled</td>
</tr>
<tr>
<td>111704</td>
<td>Community Child Health</td>
</tr>
<tr>
<td>111705</td>
<td>Environmental and Occupational Health and Safety</td>
</tr>
<tr>
<td>111706</td>
<td>Epidemiology</td>
</tr>
<tr>
<td>111707</td>
<td>Family Care</td>
</tr>
<tr>
<td>111708</td>
<td>Health and Community Services</td>
</tr>
<tr>
<td>111709</td>
<td>Health Care Administration</td>
</tr>
<tr>
<td>111710</td>
<td>Health Counselling</td>
</tr>
<tr>
<td>111711</td>
<td>Health Information Systems (incl. Surveillance)</td>
</tr>
<tr>
<td>111712</td>
<td>Health Promotion</td>
</tr>
<tr>
<td>111713</td>
<td>Maori Health</td>
</tr>
<tr>
<td>111714</td>
<td>Mental Health</td>
</tr>
<tr>
<td>111715</td>
<td>Pacific Peoples Health</td>
</tr>
<tr>
<td>111716</td>
<td>Preventive Medicine</td>
</tr>
<tr>
<td>111717</td>
<td>Primary Health Care</td>
</tr>
<tr>
<td>111718</td>
<td>Residential Client Care</td>
</tr>
<tr>
<td>111799</td>
<td>Public Health and Health Services (not elsewhere classified)</td>
</tr>
<tr>
<td>119999</td>
<td>Medical and Health Sciences (not elsewhere classified)</td>
</tr>
<tr>
<td>130000</td>
<td>Education</td>
</tr>
<tr>
<td>130209</td>
<td>Medicine, Nursing and Health Curriculum and Pedagogy</td>
</tr>
<tr>
<td>160000</td>
<td>Studies in Human Society</td>
</tr>
<tr>
<td>160302</td>
<td>Fertility</td>
</tr>
<tr>
<td>160504</td>
<td>Mortality</td>
</tr>
<tr>
<td>160608</td>
<td>Health Policy</td>
</tr>
<tr>
<td>170000</td>
<td>Psychology and Cognitive Sciences</td>
</tr>
<tr>
<td>170101</td>
<td>Biological Psychology (Neuropsychology, Psychopharmacology, Physiological Psychology)</td>
</tr>
<tr>
<td>170102</td>
<td>Developmental Psychology and Ageng</td>
</tr>
<tr>
<td>170104</td>
<td>Forensic Psychology</td>
</tr>
<tr>
<td>170106</td>
<td>Health, Clinical and Counselling Psychology</td>
</tr>
<tr>
<td>220000</td>
<td>Philosophy and Religious Studies</td>
</tr>
<tr>
<td>220106</td>
<td>Medical Ethics</td>
</tr>
<tr>
<td>220205</td>
<td>History and Philosophy of Medicine</td>
</tr>
</tbody>
</table>
The figure shows a Barlow plot for the research-active staff in a typical generic mid-sized school or department. Staff in this department can be categorised into six fields of research. However, as the commentary in the figure indicates, some of these groups are clearly much more coherent and successful than others. The commentary in this figure suggests how one can interpret some of the features in this diagram.

- (solid outline) = $100k–$300k
- (dotted outline) = < $100k
- (no outline) = no external grants

Note: Circles indicate publication output for each academic, and overlaps show pair-wise collaboration. Staff promotion levels are indicated within brackets. Only staff members whose outputs exceed a basic threshold are shown, so level B and C staff members especially are omitted.
FIGURE D2 – BARLOW PLOT FOR A MORE SUCCESSFUL GENERIC MID-SIZED SCHOOL OR DEPARTMENT

This figure shows a Barlow plot for a generic school that is focused around a similar number of fields as in Figure D1, but where staff members are clustered in more productive ways. This school benefits from having a large number of productive staff with independent profiles, but it has also been able to create an international profile in distinct areas, because staff members have chosen to cluster synergistically around common themes. The commentary in this figure provides a sense of what these groups are like and how they are resourced.

**Note:** Circles indicate publication output for each academic, and overlaps show pair-wise collaboration. Staff promotion levels are indicated within brackets. Only staff members whose outputs exceed a basic threshold are shown, and level Bs are omitted in this case. Red colouring indicates staff involved in hosting an ARC Centre of Excellence.
## APPENDIX E

### STAFF INFORMATION FOR FIGURE 1.7

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>ASSORTED RELATED CAMPUSES</th>
<th>HEADCOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AFFILIATE</td>
</tr>
<tr>
<td>Camperdown</td>
<td>BIDNE Boden Institute Obesity Nutrition &amp; Exercise</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Centenary Institute Cancer Medicine &amp; Cell Biology</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Central Clinical School</td>
<td>508</td>
</tr>
<tr>
<td></td>
<td>Faculty of Pharmacy</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>School of Medical Sciences</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>School of Molecular Bioscience</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>School of Public Health</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>The George Institute for Global Health</td>
<td>39</td>
</tr>
<tr>
<td>Concord</td>
<td>ANZAC Research Institute</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Concord Clinical School</td>
<td>95</td>
</tr>
<tr>
<td>Glebe</td>
<td>Woolcock Institute of Medical Research</td>
<td>22</td>
</tr>
<tr>
<td>Lidcombe</td>
<td>Lidcombe</td>
<td>105</td>
</tr>
<tr>
<td>Mallett St, Camperdown</td>
<td>Brain &amp; Mind Research Institute</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Sydney Nursing School</td>
<td>54</td>
</tr>
<tr>
<td>Penrith</td>
<td>Nepean Clinical School</td>
<td>104</td>
</tr>
<tr>
<td>St Leonards</td>
<td>Kolling Institute of Medical Research</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Northern Clinical School</td>
<td>291</td>
</tr>
<tr>
<td>Westmead</td>
<td>Children's Hospital Westmead</td>
<td>258</td>
</tr>
<tr>
<td></td>
<td>Children's Medical Research Institute</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Faculty of Dentistry</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>Westmead Clinical School</td>
<td>310</td>
</tr>
<tr>
<td></td>
<td>Westmead Millennium Institute</td>
<td>39</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td><strong>2,440</strong></td>
</tr>
</tbody>
</table>

* The data was extracted from the RIMS HR Feed for staff & affiliates for year duration 2011. This data uses total headcount for each individual and not FTE.
GLOSSARY

AIDS  Acquired Immunodeficiency Syndrome
AIHW  Australian Institute of Health and Welfare
AMMRF  Australian Microscopy and Microanalysis Research Facility
ANU  Australian National University
ANZAC  Australian and New Zealand Army Corps
ARC  Australian Research Council
ARWU  Academic Ranking of World Universities
ASIC  Australian Securities and Investment Commission
BIONE  Boden Institute of Obesity, Nutrition and Exercise and Eating Disorders
BMRI  Brain and Mind Research Institute
CAUDIT  Council of Australian University Directors of Information Technology
CDIP  Commercial Development and Industry Partnerships
CDRP  Centre for Disability Research and Policy
CEC  Clinical Excellence Commission
CI  Chief investigator
CIHR  Canadian Institutes of Health Research
CINSW  Cancer Institute New South Wales
CIRUS  Centre for Integrated Research and Understanding of Sleep
CMRI  Children’s Medical Research Institute
COAG  Council Of Australian Governments
CPC  Charles Perkins Centre
CRE  Centre for Research Excellence
CRIS  Collaborative Research Infrastructure Strategy
CRN  Cancer Research Network
CSIRO  Commonwealth Scientific and Industrial Research Organisation
DALY  Disability-Adjusted Life Years
DEEWR  Department of Education, Employment and Workplace Relations
DVC  Deputy Vice-Chancellor
DVCissing  Deputy Vice-Chancellor, Indigenous Strategy and Services
DVCR  Deputy Vice-Chancellor, Research
EIF  Education Infrastructure Fund
ERA  Excellence in Research for Australia
FoR  Field of Research
FTE  Full-time equivalent
Go8  Group of Eight
GSO  Group Secretarial Office
HBV  Hepatitis B virus
HCV  Hepatitis C virus
HEO  Higher education officer
HERDC  Higher Education Research Data Collection
HIV  Human Immunodeficiency Virus
H&MR  Health and medical research
HPV  Human Papillomavirus
HR  Human Resources
HRI  Heart Research Institute
ICT  Information and Communication Technology
ID  Identity
IHRC  Integrated Health Research Centre
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP</td>
<td>Intellectual property</td>
</tr>
<tr>
<td>IRMA</td>
<td>Integrated Research Management Application</td>
</tr>
<tr>
<td>IT</td>
<td>Information technology</td>
</tr>
<tr>
<td>KRI</td>
<td>Kids’ Research Institute</td>
</tr>
<tr>
<td>LHD</td>
<td>Local Health District</td>
</tr>
<tr>
<td>MIA</td>
<td>Melanoma Institute Australia</td>
</tr>
<tr>
<td>MH&amp;N</td>
<td>Mental health and neuroscience</td>
</tr>
<tr>
<td>MRI</td>
<td>Medical Research Institute</td>
</tr>
<tr>
<td>NCCH</td>
<td>National Centre for Classification in Health</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-government organisation</td>
</tr>
<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
</tr>
<tr>
<td>NHPA</td>
<td>National Health Priority Area</td>
</tr>
<tr>
<td>NICTA</td>
<td>National Information and Communication Technology Australia</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PCPC</td>
<td>Peak Community Participation Council</td>
</tr>
<tr>
<td>PhD</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>PIO</td>
<td>Planning and Information Office</td>
</tr>
<tr>
<td>PVC</td>
<td>Pro-Vice-Chancellor</td>
</tr>
<tr>
<td>PVCR</td>
<td>Pro-Vice-Chancellor, Research</td>
</tr>
<tr>
<td>QS</td>
<td>Quacquarelli Symonds</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and development</td>
</tr>
<tr>
<td>RADS</td>
<td>Research reporting, analysis, data and systems</td>
</tr>
<tr>
<td>RC</td>
<td>Responsibility Code</td>
</tr>
<tr>
<td>RDSI</td>
<td>Research Data Storage Infrastructure</td>
</tr>
<tr>
<td>RIBG</td>
<td>Research Infrastructure Block Grants</td>
</tr>
<tr>
<td>RIMS</td>
<td>Research Information Management System</td>
</tr>
<tr>
<td>RNS</td>
<td>Royal North Shore (hospital)</td>
</tr>
<tr>
<td>RPA</td>
<td>Royal Prince Alfred (hospital)</td>
</tr>
<tr>
<td>SEG</td>
<td>Senior Executive Group</td>
</tr>
<tr>
<td>SEIB</td>
<td>Sydney Emerging Infections and Biosecurity Network</td>
</tr>
<tr>
<td>SIBI</td>
<td>Strategic Information and Business Intelligence</td>
</tr>
<tr>
<td>SiBRN</td>
<td>Sydney Infectious Diseases and Biosecurity Research Network</td>
</tr>
<tr>
<td>SMM</td>
<td>Sydney Microscopy and Microanalysis</td>
</tr>
<tr>
<td>SPARC</td>
<td>Strategic Priority Areas for Research Collaboration</td>
</tr>
<tr>
<td>SyReNS</td>
<td>Sydney Research Networks Scheme</td>
</tr>
<tr>
<td>Sydney</td>
<td>University of Sydney</td>
</tr>
<tr>
<td>THE</td>
<td>Times Higher Education</td>
</tr>
<tr>
<td>TRIP</td>
<td>Translating Research Into Practice (fellowship)</td>
</tr>
<tr>
<td>UEM</td>
<td>University Economic Model</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNSW</td>
<td>University of New South Wales</td>
</tr>
<tr>
<td>UQ</td>
<td>University of Queensland</td>
</tr>
<tr>
<td>VELIM</td>
<td>Centre for Values, Ethics and Law in Medicine</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WMI</td>
<td>Westmead Millennium Institute</td>
</tr>
</tbody>
</table>