

# 12. Health

## **STRATEGIC OBJECTIVE Plan and deliver world-class health infrastructure that supports a 21st century health system and improved health outcomes for the people of NSW**

### **SNAPSHOT**

- NSW Health is responsible for the delivery of healthcare services to 7.7 million NSW residents across an area of over 800,000 km<sup>2</sup>.
- Recurrent expenditure on health is 26.6 per cent of the NSW Government's total recurrent spend. Without changes to how the health system operates, this will rise to 36 per cent over the next 40 years.
- In the next 20 years, the demand for healthcare will grow by over 50 per cent, compared to population growth of 28 per cent. The highest rates of growth are expected to occur in the next five years, mainly due to the increase in 70 to 84-year-olds who are the highest users of health services.
- There is a need for disruptive innovation in healthcare to manage increasing demand and deliver more affordable and sustainable long-term solutions. This includes more investment in technology-enabled out-of-hospital healthcare models.
- NSW Health's facilities are valued at approximately \$22 billion, including over 230 public hospitals and 226 ambulance stations. Approximately 40 per cent of this infrastructure is over 50 years old and will struggle to accommodate newer models of care and technologies. Investment in the continued upgrading of hospital facilities must be accompanied by investment in infrastructure that supports new ways of coping with demand outside hospitals, including community, home-based and virtual care.
- Developing and refurbishing health assets to deliver new models of care will require sustained investment, as well as changes to land use planning policies. A new 20-year Health Infrastructure Strategy should be prepared to support the future delivery of health services across the State, including a focus on enabling more complex and higher volumes of services to be delivered in the community, where this is safe and appropriate.
- Technological innovation is set to change the way healthcare is delivered over the next 20 years. Cognitive technologies, telehealth, robotic surgery, mobile applications and other technology-enabled health solutions will require investment in new types of health infrastructure, including data storage and digital connectivity. Building on the foundations of the current eHealth Strategy 2016-2026, the NSW Government needs to continue to invest in technology-enabled healthcare.
- Innovative partnership and procurement models, and contestable approaches to funding and service delivery, will also be needed to realise the significant potential health and economic benefits from new healthcare models, integrated regional health services and cutting-edge health and education precincts.
- Environments that promote health are a key component in keeping people healthy and out of hospital. The planning, design and development of places and neighbourhoods should be geared to improving health outcomes through the provision of walking, cycling and active recreation opportunities.

RESPONSE	Summary of key recommendations
<b>Conduct a detailed assessment of future infrastructure needs</b>	<ul style="list-style-type: none"> <li>• Develop a 20-year Health Infrastructure Strategy that incorporates flexibility, enables system integration, innovation and technology, to inform investment in future-focused infrastructure.</li> <li>• Assess ageing health assets to determine whether they are fit-for-purpose, explore the potential to develop greenfield sites and consider divesting assets that are not fit-for-purpose for future care models.</li> <li>• Consider investment in infrastructure for health benefits as part of an integrated health and town planning strategy, such as walking and cycling infrastructure and parks and recreation facilities.</li> </ul>
<b>Invest in eHealth and technology</b>	<ul style="list-style-type: none"> <li>• Deliver the current <i>eHealth Strategy 2016-2026</i>.</li> <li>• Periodically refresh the eHealth Strategy to support an ongoing investment in technology-enabled health care including: mobile health; cognitive technologies; and virtual healthcare delivery.</li> </ul>
<b>Improve health asset management</b>	<ul style="list-style-type: none"> <li>• Include an assessment of strategic assets and asset management as part of the Health Infrastructure Strategy.</li> </ul>
<b>Access markets to improve health system efficiency</b>	<ul style="list-style-type: none"> <li>• Consider public private partnerships to finance health infrastructure and clinical care delivery, where they deliver value and improved clinical outcomes for the community.</li> </ul>

## 12.1 Recent progress

Since 2012, the NSW Government has invested heavily in health infrastructure, delivering more than 50 new and upgraded health facilities across rural, regional and metropolitan NSW. The 2017-18 Budget provided a significant short-term investment boost of \$2.8 billion investment over four years into health infrastructure.<sup>238</sup>

This ongoing investment supports the implementation and delivery of the current Health Strategy, the *NSW Health State Plan: Towards 2021* and related plans including the *eHealth Strategy for NSW Health 2016 – 2026*.

Since 2012, the NSW Government has continued the development of the Northern Beaches Hospital, via a Public Private Partnership (PPP). The Government has committed nearly \$1 billion to the Westmead Hospitals Redevelopment and has undertaken integrated cross-agency collaboration to support Westmead's development as a leading health and education precinct.

Over the last decade, the Government has committed more than \$45 million of capital funds to develop HealthOne sites across NSW where general practice, community health services and other health services can be co-located. As at November 2017, there were 27 operational HealthOne sites in NSW extending across 11 Local Health Districts (LHDs). In 2014, the

NSW Government reserved \$100 million to accelerate the delivery of Integrated Care, which is being carried out under the *HealthOne Strategy*.

The *HealthOne Strategy* comprises 20 sites identified in the *State Infrastructure Strategy Update 2014* for investment through development, redevelopment or refurbishment. Priority was given to areas with an ageing population and an increased demand for integrated community health services, including mental health and drug and alcohol services. Each HealthOne service will be configured to meet the needs of the local community and will vary from site to site.

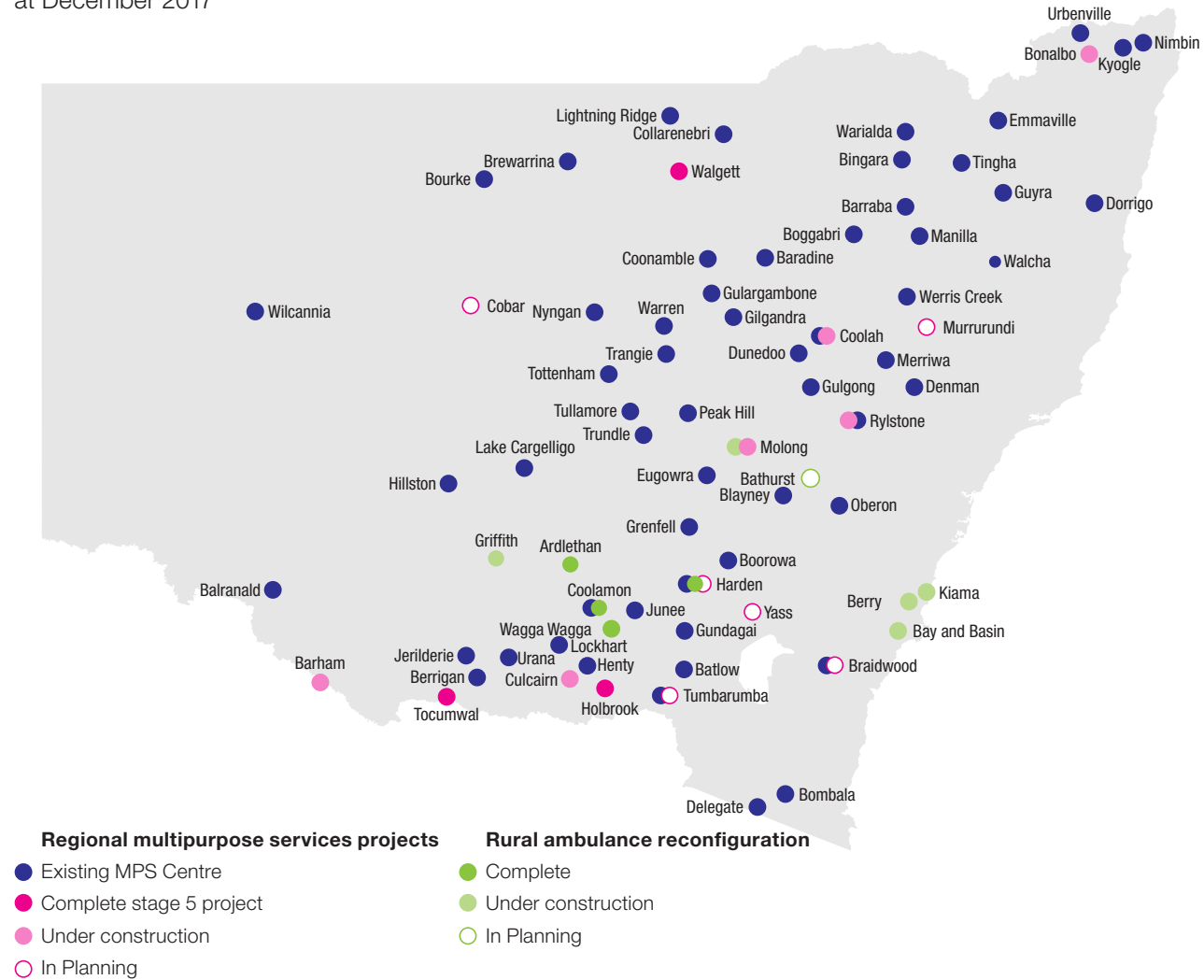
<sup>238</sup> NSW Treasury 2017

The NSW Government is also investing in multipurpose services (MPSs) to better integrate health and aged care services. MPSs include a range of services to meet the unique needs of each community. Services such as inpatient care, respite, palliative care, residential aged care, emergency care, allied health, oral health, GPs and community health services may be included.

The Multipurpose Services Strategy (MPS Strategy) Stage 5 is a further \$300 million investment to provide health and aged care services for small and remote rural communities. Sites at Walgett, Tocumwal and Holbrook are complete and operational. Construction has begun or will commence in 2017-18 at Barham, Bonalbo, Molong, Coolah, Culcairn, Rylstone and Tumbarumba. Planning continues for facilities at Cobar, Harden, Braidwood, Yass and Murrurundi (see Figure 47).

Delivery of the Regional Ambulance Infrastructure Reconfiguration Program is also ongoing. This \$122 million program will reconfigure rural and regional ambulance infrastructure to respond to service demand. A total of 22 new, rebuilt and updated NSW Ambulance Stations have been announced by the NSW Government. Construction is complete at Wagga Wagga, Ardlethan, Coolamon and Harden. Construction has commenced for facilities at Griffith, Molong, Kiama, Bay and Basin, Berry, Toukley, Wyong, and Wauchope (see Figure 49). Planning is underway for the facility at Bathurst.

**Figure 47 – Rural ambulance infrastructure reconfiguration and Regional Multipurpose Services and projects, as at December 2017**



Source: NSW Health 2017

## 12.2 Challenges and opportunities

The healthcare system needs to evolve to meet future needs and trends, including population growth, an ageing population that uses services more frequently, the shift in disease burden to chronic and complex conditions, and new and more accessible services made available by advances in technology.

### 12.2.1 A growing and ageing population

The uneven nature of population growth in NSW will influence demand for health services and place considerable pressure on the health system in high growth areas. Western Sydney and South Western Sydney are the two largest Local Health Districts (LHD), representing 25 per cent of the State population in 2016, and are projected to be the fastest growing districts in the next 20 years (see Figure 48). The population of the Western Sydney LHD is projected to grow by half a million people, or 56 per cent, and the population for the South Western Sydney LHD is projected to grow by 436,000 people, or 45 per cent, by 2036.

The significant forecast growth in the aged population will increase the demand for health services and change the types of services required and how they are delivered. People over 70 years of age consume more care than any other section of the population and are less able to make a financial contribution to their care. Across all OECD countries, the ratio will shift from four working-age people for every person aged

over 65 to roughly two working-age people for every person aged over 65 by 2040.<sup>239</sup>

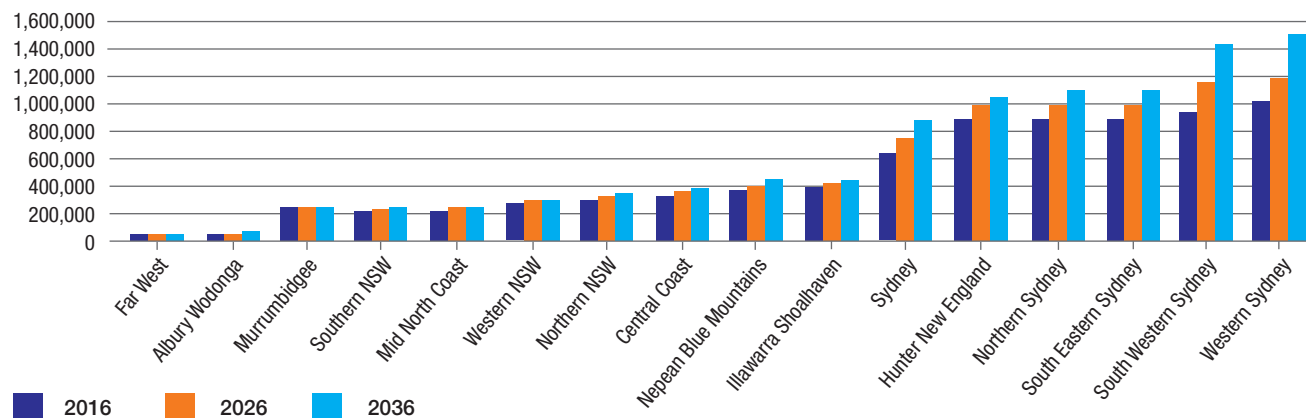
In NSW, the population over 70 years old is expected to grow from 853,000 in 2016 to over 1.55 million by 2036, an increase of 85 per cent (see Figure 49). The Hunter New England LHD currently has the highest number of people aged 70 and over, accounting for 13 per cent of the State's total. This is estimated to increase from 120,350 in 2016 to 205,070 in 2036, an increase of 70 per cent. The Western Sydney, South Western Sydney and Nepean Blue Mountains LHDs are estimated to have the most significant growth in the local population aged over 70, with increases over the next 20 years of 128 per cent, 124 per cent and 116 per cent respectively.

Over the next 20 years, the demand for in-patient health services is forecast to grow by over 50 per cent, compared to population growth of just 28 per cent, due in large measure to the ageing population (see Figure 50).

### 12.2.2 The increasing cost of healthcare

The NSW Intergenerational Report (2016) identified health spending as a key pressure for the NSW Government. If 'business as usual' practices continue, health expenses will increase from around 29 per cent of NSW Government expenses in 2014-15 to 36 per cent by 2055-56. Health services represent the largest share of State expenditure and have the fastest projected growth rate. Estimates in the NSW Intergenerational Report indicated that health costs in NSW are expected to grow by about six per cent a

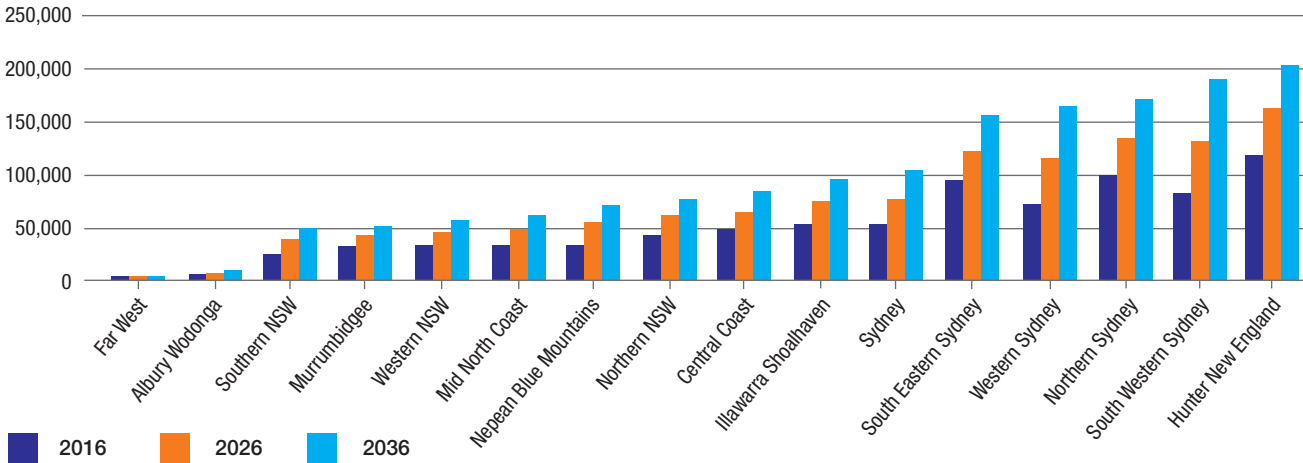
Figure 48 – Population projections for NSW Local Health Districts, 2016 – 2036



Source: NSW Department of Planning and Environment 2016

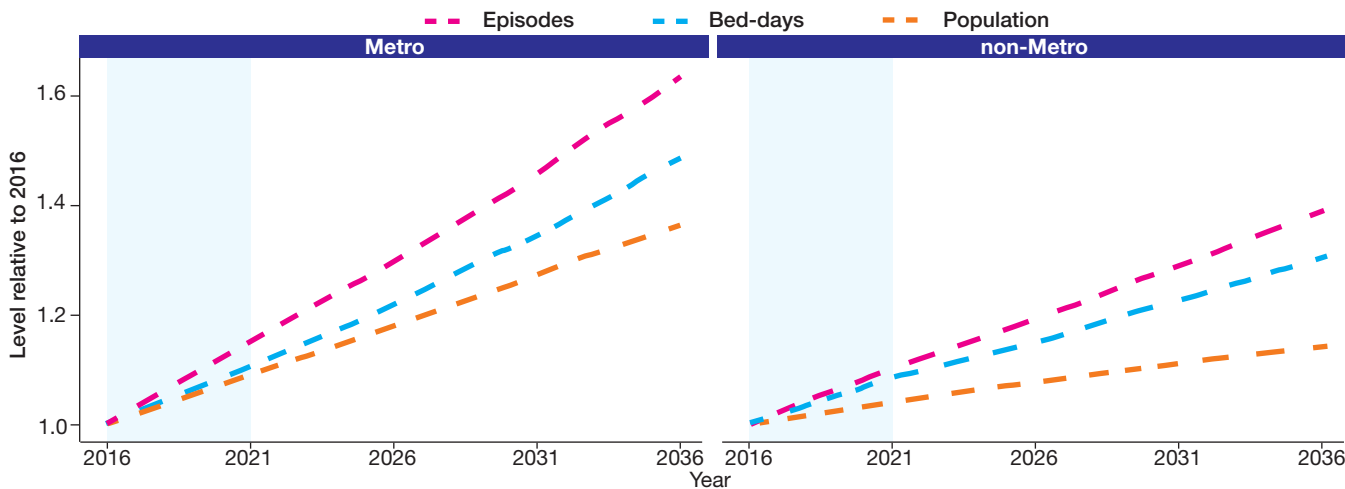
239 Business Council of Australia 2015, p. 10 (citing OECD statistics)

**Figure 49** – NSW population projections, population aged 70 years and older, 2016 – 2036



Source: NSW Department of Planning and Environment 2016

**Figure 50** – NSW Health public hospital activity growth against population growth, 2016 – 2036



Sources: NSW Health 2017; NSW Department of Planning and Environment 2016

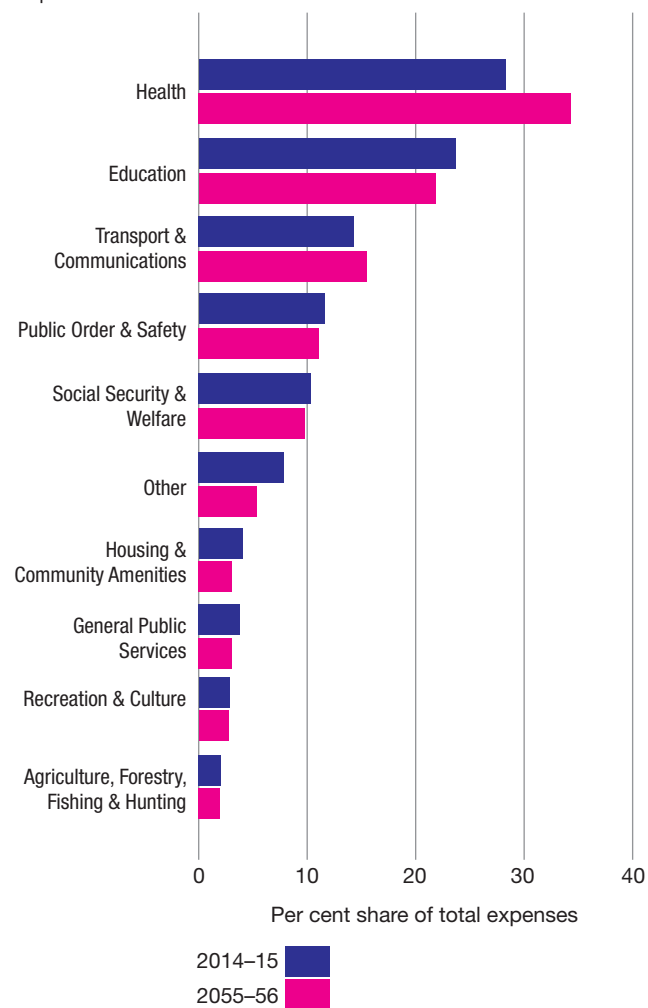
year over the next decade and beyond, with most of the costs growth occurring in the hospital system.<sup>240</sup>

This growth rate in spending assumes that NSW Health continues to plan for and deliver health services in the same way that it does today. Existing projections based on traditional models suggest that up to 10,000 new hospital beds may be required by 2030 to meet demographic demands. However, these projections do not account for the rapidly changing nature of healthcare delivery. The number of hospital beds per thousand people has been dropping steadily in Australia since the early 1970s and is likely to continue to drop as care is delivered increasingly in people’s homes and their communities, or even virtually. In the future, hospital care will be required only for the most acute surgical interventions and severe medical conditions allowing more people to remain in their homes and to receive care than previously required hospitalisation.

NSW Health is adopting new ways of delivering services as part of a program to manage the rising costs of healthcare. These include preventative strategies to reduce demand and alternative models of care that can replace high-cost hospital-based treatments. Health partnerships (using the not-for-profit and private sectors), reducing duplication and clinical variations to deliver better value care, developing workforce capabilities and investing in infrastructure to drive future efficiencies are also being explored.

<sup>240</sup> NSW Treasury 2017, p. 10

**Figure 51** – Share of total NSW Government expenditure 2014-15 to 2055-56



Source: NSW Treasury 2016, *Intergenerational Report 2016*

### 12.2.3 A complex operating environment

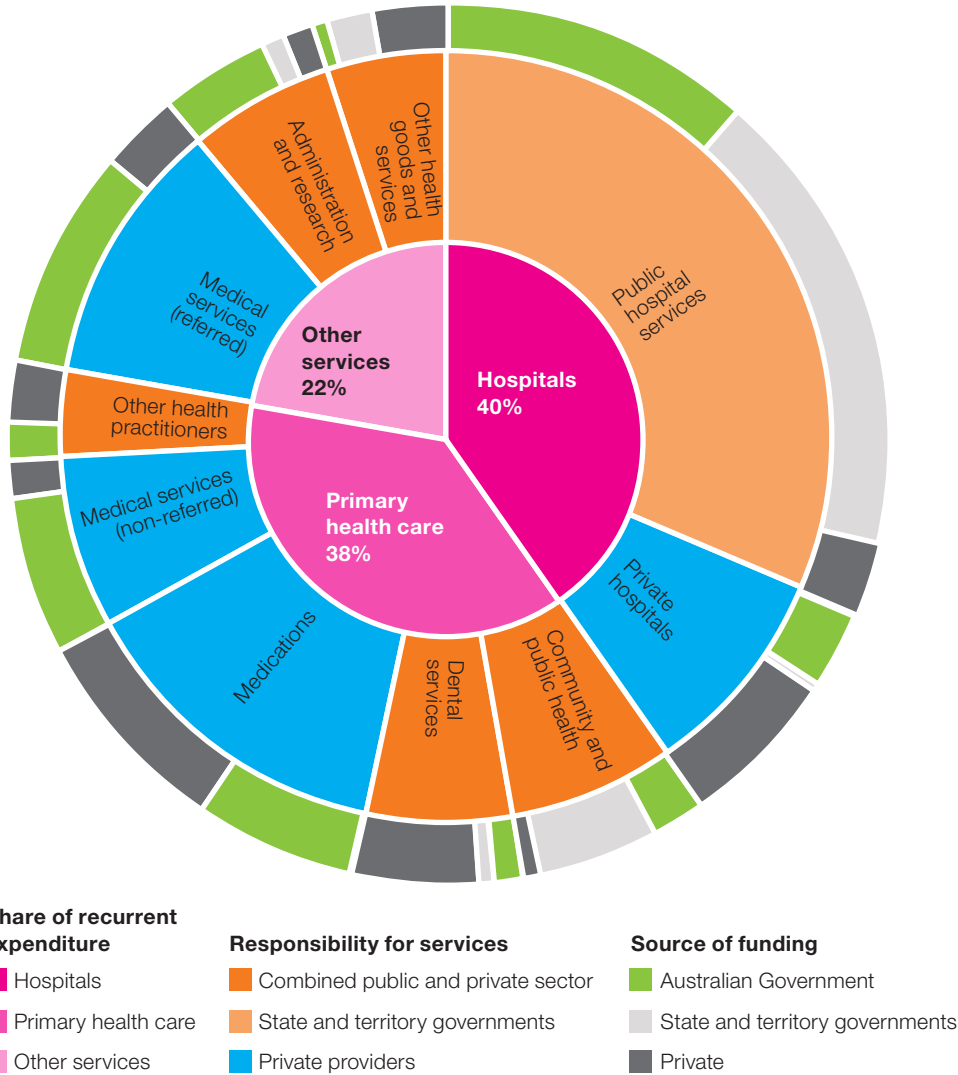
In NSW, healthcare is provided through a comprehensive network of services ranging from large principal referral hospitals providing highly complex emergency and planned services, through to community health centres and care in people's homes. The health care system includes ambulance services, population health and preventative services, mental health, primary care (including general practice), allied health services, pharmacy, dental and residential aged care. A diverse range of services is delivered by different levels of government as well as by the private and not-for-profit sectors.

The Productivity Commission has described the health system as large, fragmented and complex with significant interdependencies between public and non-government providers as well as Commonwealth and state governments.<sup>241</sup> The nature of the system means that cost pressures, policy decisions and infrastructure investments need to be managed as part of a system-wide approach.

The hospital system on its own cannot meet the changing needs of a community where people are living longer, often with chronic and complex healthcare needs, including mental illnesses. New models of care will be needed – including partnerships across the health sector, flexible funding streams, new workforce models and eHealth solutions – to create the connected and integrated healthcare system required to meet growing and changing healthcare needs across NSW.

<sup>241</sup> Productivity Commission 2015, pp. 9-10

Figure 52 – Australia’s health system overview



Source: Australian Institute of Health and Welfare 2016, Australia’s Health

Figure 53 – Health sector roles and responsibilities

	Funding and financing	Service delivery	Policy and regulation
Hospitals	Australian Government	NSW Government	Australian Government
	NSW Government	Non-Government	NSW Government
	Non-Government		
Primary health care	Australian Government	NSW Government	Australian Government
	NSW Government	Non-Government	NSW Government
	Non-Government		
Other (e.g. referred services)	Australian Government	NSW Government	Australian Government
	NSW Government	Non-Government	NSW Government
	Non-Government		

Source: Productivity Commission 2015

### 12.2.4 Ageing health infrastructure

Approximately 40 per cent of NSW Health's built infrastructure is over 50 years old. This necessitates ongoing investment in maintenance and upgrades to meet current needs. An integrated approach is imperative to ensure that the use and condition of these key assets are aligned to clinical needs and that they deliver value for money across government. This is a significant challenge due to the age and condition of some older property assets, the difference scope and sizes of each LHD's assets base and required improvements in the tracking and analysis of maintenance expenditure.<sup>242</sup> Many sites need to be retro-fitted with digital connectivity infrastructure and power supply.

### 12.2.5 Technology and disruption

Healthcare is an industry that is expected to experience significant disruption over the next decade. Most of this disruption is likely to be driven by the advent of cognitive technologies, artificial intelligence (AI), personalised medicine and virtual healthcare that enables service delivery outside of hospitals. Technology disruption in other industries has shown that organisations are exposed to risk when they:

- deny the existence of disruption rather than confront the uncertainty
- fail to act because innovation could potentially render existing assets and investments obsolete
- become constrained by the idea that the future will mirror the past.

## Delivering new and upgraded health infrastructure

The 2017-18 Budget provided a significant short-term investment boost for health infrastructure, committing an additional \$2.8 billion over four years to 2020-21, bringing the total investment over that period to a record \$7.7 billion. This ongoing investment will support the implementation and delivery of the current Health Strategy, the *NSW Health State Plan: Towards 2021* and related plans including the eHealth Strategy. It will enable NSW Health to deliver new facilities, upgrades and redevelopments across NSW.

Major works commencing in 2017-18 include:

- the reconfiguration and expansion of Randwick Hospital Campus (estimated total cost \$720 million)
- Campbelltown Hospital Stage 2, comprising mental health and South West paediatric services (estimated total cost \$632 million)
- the Nepean Hospital and integrated ambulatory services redevelopment and hospital car park (estimated total cost \$576 million)
- a new Tweed Hospital on a greenfield site (estimated total cost \$534.1 million)
- the Concord Hospital upgrade (estimated total cost \$341.2 million).

There will be ongoing investment in major strategies such as the *Multipurpose Services Strategy*, Rural Ambulance Infrastructure Reconfiguration and *HealthOne Strategy* (estimated total cost \$522 million). Other health infrastructure projects that received capital investment in the 2017-18 Budget include:

- redevelopment of hospitals at Albury, Coffs Harbour, Cooma, Goulburn, Inverell, Lismore, Shellharbour, Wagga Wagga and Wyong (nearly \$48 million)
- new hospitals at Macksville, Maitland, and Mudgee (\$36 million)
- stage 2 of the Hornsby Hospital redevelopment (\$24 million including \$4 million for the car park)
- car parks at Campbelltown, Shoalhaven and St George hospitals (\$13.7 million)
- phase 2 of the Medical Research Infrastructure Initiatives (\$10 million)
- planning for a statewide mental health capital works program and future capital works at Rouse Hill, Griffith, Tumut, Liverpool and St George Hospitals (\$15 million).



The health sector has significant structural barriers to adopting new behaviours and solutions. The Committee for Economic Development of Australia (CEDA) has argued that business systems in the health sector have failed to keep pace with technological improvements and that the sector is not oriented around the needs of patients, but is instead overwhelmingly an arrangement of producer interests.<sup>243</sup> Likewise, the Business Council of Australia has observed that existing supply models have been unable to match the efficiency gains made in the rest of the economy.<sup>244</sup>

Over the past decade, NSW has invested more significantly in eHealth than any other state in the country and has built the foundations of an electronic health system that can cater for future technology advances. The eHealth strategy for NSW encompasses programs that support new models of care. These include telehealth, electronic medications management, statewide access to digital imaging and the use of voice recognition software as part of the second phase of the electronic medical records program. eHealth is being used to improve patient care by making patient information being readily available to clinicians across the State, engaging clinicians and other health workers to implement statewide systems in their local facilities and setting performance standards to ensure information systems meet the needs of clinicians and patients.

243 CEDA 2017, p. 30

244 Business Council of Australia 2015, p. 1

## eHealth Strategy for NSW Health 2016 – 2026

At June 2016, more than 73 per cent of health employees were using electronic medical records across the NSW Health facilities to provide care. During 2015-16, electronic charts were opened more than 12 million times – a 30 per cent increase over the previous year.

The 2017-18 State Budget provided an additional \$536 million for enhanced eHealth information technology projects to deliver improved digital infrastructure for patients and staff across NSW.

## 12.3 Response

NSW Health is currently delivering the *NSW State Health Plan: Towards 2021*, which is based on three directions:

- keeping people healthy
- providing world-class clinical care
- delivering truly integrated care.

These directions are supported by four strategies:

- supporting and developing the workforce
- supporting and harnessing research and innovation
- enabling eHealth
- designing and building future focused infrastructure.<sup>245</sup>

The Health Plan's directions and strategies underpin the current investment in health services and provide

245 NSW Health 2014, p. 164

a strong direction for the short term. NSW Health develops an annual asset strategy, with a 10-year outlook, that outlines its strategic directions, the drivers for infrastructure investment and approaches to managing and maintaining its asset portfolio.

### 12.3.1 Planning for the longer term

Health has benefited from significant capital investment in new and modernised hospitals over the past six years. Beyond the \$7.7 billion currently committed for new infrastructure to 2020-21, the opportunity exists to develop a long-term strategy that will support and enable new models of care within the health system and allow it to cope with the challenges of long-term population growth, settlement patterns as well as increasing and changing demand.

A longer term strategy will enable NSW Health to consider the impact of mobile and virtual health care delivered in people's homes and communities rather than in traditional hospital beds, and to ensure that the future health infrastructure system is designed to support an ongoing focus on demand management for acute care.

The journey the health system will take over the next 20 years is comparable to changes in the banking system. Banking has moved from a reliance on services delivered in branches, to ready access to services via automated teller machines, mobile and virtual banking – where most services are available at any time of day, anywhere in the world, via mobile phones. Similarly, the healthcare of the future will be delivered to patients via virtual and mobile technologies – at home, in the community or, if they have complex and severe needs, in the hospital. This shift to mobile healthcare requires careful planning of the electronic, digital, analytic and

mobile infrastructure needs of a future healthcare system. That planning needs to commence now.

## Value based care – moving from volume to value

Capital investment represents just seven per cent of total NSW health expenditure in 2017-18. NSW Health is examining and implementing non-asset strategies to manage rising healthcare costs. These strategies include:

- alternatives to hospital based models of care
- improved system integration
- reduced variation in care
- preventative health measures.

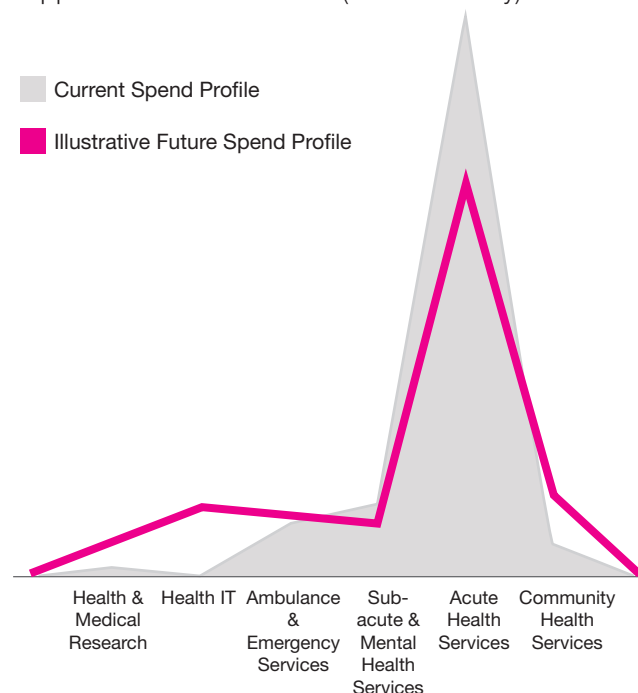
Like many health systems around the world, NSW is progressing along a long-term transformational journey from volume to value. This puts the patient at the centre of care and focuses on the experience and outcomes of patients and clinicians.

*“Value based healthcare means that we continually measure the experience and health outcomes of patients. . .with the aim of constantly improving the patient reported and medical quality. . .thereby receive the largest amount of value for our patients per spend...”<sup>246</sup>*

NSW Health is investing in the *Leading Better Value Care Program* to improve the efficiency, effectiveness and integration of care across the health system to reduce rates of growth in health costs.

246 Definition of Value-based Healthcare at Sahlgrenska University Hospital (SU), Koff, E 2016

**Figure 54** – Change in capital expenditure profile to support future of healthcare (Indicative Only)



Source: Deloitte Analysis 2017

In delivering the vision for the future of health, there will inevitably be changes to the allocation of investment across healthcare programs. New models of care and technological innovation will require a rebalancing of capital expenditure, away from conventional hospitals and towards community-based care and technology-enabled facilities.

This re-profiling will need to be supported with care strategies that reduce rates of hospital admissions in NSW for clinical conditions that can be treated effectively outside of a hospital.

Future investment decisions should commit to investment in infrastructure that will improve integration between hospital and primary care, and help prevent unnecessary hospital readmissions and attendances at Emergency Departments. Further investment in new non-hospital based infrastructure or re-purposing of existing assets will be required to support the future care strategies.

### 12.3.2 Development of a 20-year Health Infrastructure Strategy

Infrastructure NSW recommends the development of a robust 20-year Health Infrastructure Strategy to achieve a coordinated and integrated response across government, non-government and private sector providers of health services. The Strategy should focus on delivering new models of care, investing in fit-for-purpose health infrastructure and accessing the benefits of technology for future services. A longer-term commitment to the principles contained in the *NSW State Health Plan: Towards 2021* will also create opportunities for dialogue about the future of healthcare in NSW with the non-government and private sector, and with the Commonwealth Government.

This Strategy should consider all the elements of the health system, including integrated care, ambulance services and cross-government policies (such as planning instruments), that are required to support future infrastructure needs. More facilities, community health assets and other health services are likely to be needed in new and high growth areas. The role and function of some existing assets should be reviewed to ensure they are fit-for-purpose in the longer term. NSW Health should plan for investment in future-focused infrastructure that incorporates flexibility, innovation, eHealth and mobile technologies and that will support improved efficiency and effectiveness in health service delivery.

## Guiding principles for the 20-year Health Infrastructure Strategy

- Provide infrastructure that supports the delivery of world-class health care services
- Develop fit-for-purpose infrastructure that is planned to align with forecast population growth and demographics
- Identify and protect strategic areas for future health infrastructure needs at early stages of land use planning
- Support improved health outcomes for people and the community
- Support access to quality health services and facilities across the whole of NSW, either through physical access or access to eHealth and telemedicine
- Deliver services more efficiently to contribute to managing the forecast increases in costs of providing health services through service improvements and ongoing contestability of service provision (where appropriate) for health infrastructure
- Support increasing the flexible use of system capacity and capability to meet the needs of people using and employed by the system at every stage
- Continue to seek opportunities to further develop eHealth systems and to encourage patients to access eHealth services where appropriate
- Develop and maintain a sound (digital) information system on asset management condition and capacity
- Achieve strengthened long-term planning to support the provision of service delivery priorities

### 12.3.3 Developing facilities that support new models of care

In assessing capital needs for new health facilities, Infrastructure NSW supports shifting the focus from being primarily on large hospitals and acute inpatient beds to a more holistic response requiring new forms of health infrastructure that can support cost-effective and patient-centric healthcare delivery in the community. This is consistent with the direction being followed in health systems around the world.

In the future, a higher volume and complexity of healthcare services will be delivered in homes, GP surgeries and community care centres. In addition to existing care settings, new types of facilities may be required, such as rapid response units or day care facilities for elderly people (this will require partnerships with the Commonwealth Government). Innovative models will help to manage the demand generated by the growing and ageing population, changing settlement patterns, and the management of chronic disease.

The role of health infrastructure will need to be reimagined to include next generation communications networks, physical robots, data storage, cybersecurity, connected home devices, virtual care centres and more.

As well as investigating future requirements for facilities, the NSW Government needs to continue to deliver new health care facilities. Over the next 20 years, the Government should continue to invest in hospital upgrades, redevelopments and new

construction to ensure health services are being delivered to align with population and settlement patterns. This investment should be coupled with an increasing focus on demand management for acute care services, where appropriate, and this demand management focus should inform investment decisions.

Planning and development of the projects that have been identified by NSW Health through their forward planning processes should continue, with programming and funding decisions to be made to align with the Health Infrastructure Strategy, and supported by business cases.

### 12.3.4 Integrated land use through precincts and campuses

Over the past 20 years, the footprint of hospitals and health facilities has become increasingly integrated with other related and supporting land uses. Hospitals have become health campuses or precincts that incorporate integrated education and medical research facilities and firms, related health services and worker housing. The NSW Government needs to plan for future health precincts beyond the metropolitan boundary to meet the needs of rural and regional communities.

### Integrated planning for rural and regional areas

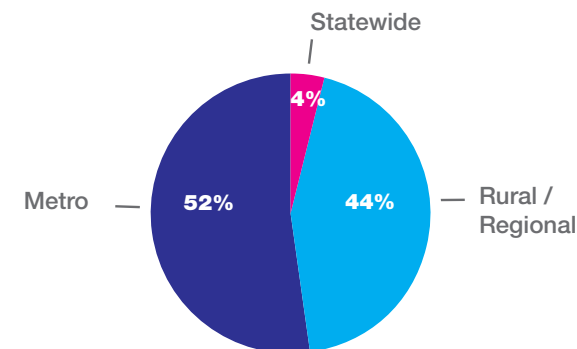
The delivery of health services in proximity to remote and regional communities is a challenge because of the size of NSW. The advent of better remote monitoring capabilities, virtual healthcare and mobile healthcare apps will support improved delivery of healthcare for rural and remote patients via the application of a ‘hub and spoke’ approach to health service delivery in regional areas.

Economic modelling highlights the significant contribution that investment in health infrastructure has on local economies through the creation of jobs, flow-on effects from the purchasing of goods and services, and further business investment. In many places, the LHD and other health services are major employers in the communities they serve. Figure 54 shows the proportion of new capital works announced since 2011 compared to the proportion of population growth and acute activity between metropolitan, rural/regional and statewide projects. Given its levels of population and activity growth, the rural sector has received a large share of capital investment to upgrade ageing infrastructure and in recognition of the economic and social benefits that health infrastructure brings to communities.

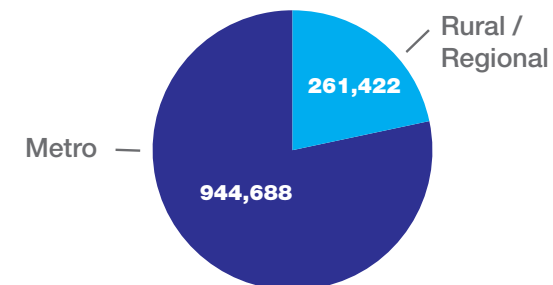
New integrated healthcare delivery models will support and complement the economic contribution made by existing hospital and health care services and will need ongoing investment to support their rollout across the State.

Figure 55 – Rural and regional health facts

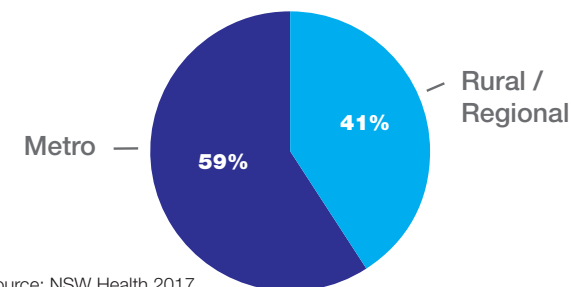
### New Capital Works announced since 2011



### Population Growth 2015-2026



### Proportion of Acute Activity: Metro v Regional



Source: NSW Health 2017

### Health and education precincts

Quality health services have partnerships with academia and the provision of training at their core. Partnerships with medical research institutes and with medical and other health-related faculties at universities lead to high quality research outcomes, medical breakthroughs and improved patient care and treatment. These collaborations often involve multiple hospitals and universities, as well as private firms. The commercialisation of research generated by these precincts can make a significant contribution to NSW's international competitiveness.

Twelve established and emerging health and education precincts have been identified in the draft Greater Sydney Commission District Plans (shown in Figure 56), which also outline steps to maximise the economic and employment potential of these precincts.

A NSW Government benchmarking study<sup>247</sup> has found that the evolution of health education precincts follows a 'maturity pathway': as health precincts evolve, the economic productivity of the precinct increases substantially. This evolution sees precincts develop into progressively more complex models, including clusters, precincts and innovation districts. The eleven health and education precincts in Sydney are at different points along the 'maturity pathway'. While not all precincts will be able to develop into internationally competitive innovation districts, ongoing investment in their development is recommended.

<sup>247</sup> Greater Sydney Commission 2017, p. 99

### Design living spaces to accommodate care in the home

The draft *Greater Sydney Region Plan* notes that accessible, well-designed places and homes can allow people to stay in their neighbourhoods as they age. Strategies that promote more healthy ageing will help to offset the significant forecast growth in demand in health services. Some cities around the world are investing in housing and infrastructure strategies that encourage a more active lifestyle to combat the onset of obesity and chronic disease. NSW Health should work with other agencies to optimise health promotion and disease prevention measures within NSW's built environment.

The need for acute care in the home, as an alternative to care in a hospital, is being driven by advances in medicine, increased pressure on the healthcare system and evidence of improved health outcomes for patients who spend less time in hospital.

NSW Health is currently using technology to support the healthcare system as it changes and evolves, embedding eHealth into everyday models of care that help link patients, service providers and communities with a smarter healthcare system. eHealth and other technologies will enable a stronger approach to delivery of care in the home, leading to different approaches to accessing and delivering health care. Approaches to out-of-hospital care need further development and work will need to be undertaken with the Commonwealth Government to ensure funding mechanisms for health services keep pace with advances in healthcare service delivery.

### 12.3.5 A strategic review of existing assets

Locating the right assets in the right places to provide readily accessible services to a growing and ageing population will be an ongoing challenge as Sydney grows and regional NSW population increasingly move into towns and cities. The proposed 20-year Health Infrastructure Strategy should consider where assets should be located and whether rebuilding and renewing existing assets would provide better service outcomes than building new, fit-for-purpose infrastructure precincts and divesting legacy assets.

NSW Health's assets are valued at over \$22 billion across land, buildings, plant and equipment.<sup>248</sup> The Strategy should consider how NSW Health can achieve consistency in asset management, the supply of power and digital connectivity needed at all sites, and the need for further improvements in the performance and utilisation of assets.

NSW Health should continue to run programs like the Asset Refurbishment and Replacement Program (ARRP), which funds backlog remedial maintenance works at public hospitals. This 10-year, \$500 million program funds projects to restore existing systems and assets to a capability where they will reliably support health services, as well as extending the life of building assets.<sup>249</sup>

<sup>248</sup> NSW Health 2016, pp. 6-7

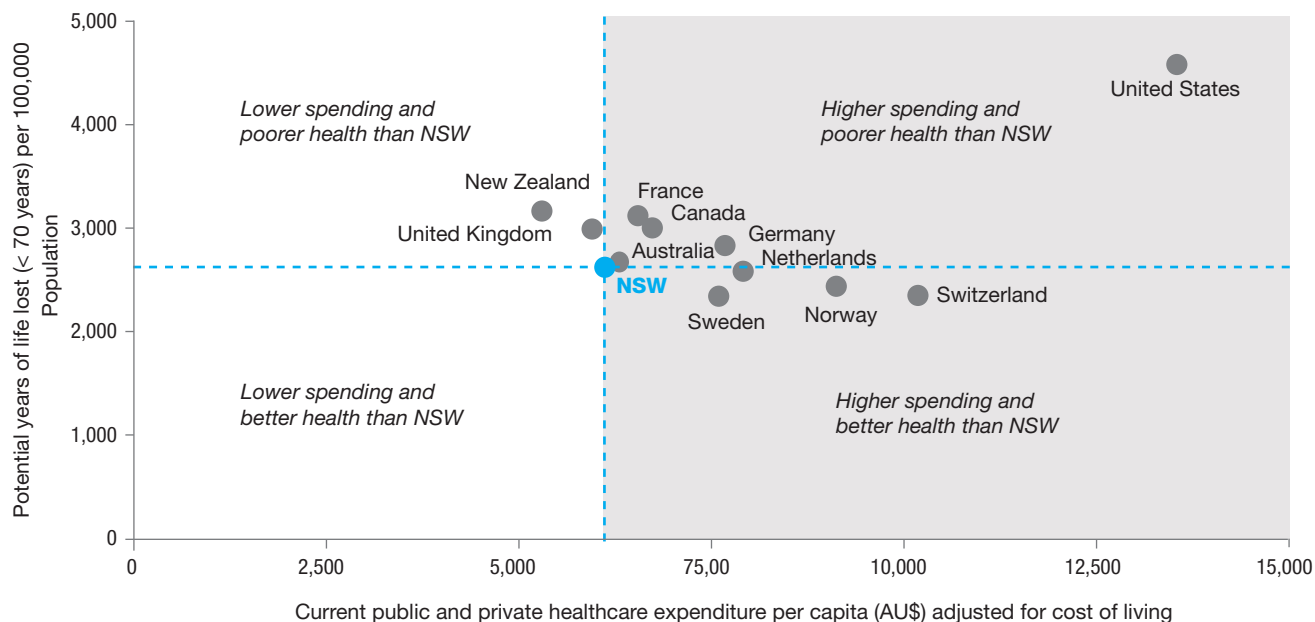
<sup>249</sup> Health Infrastructure 2015, [http://www.hinfra.health.nsw.gov.au/our-projects/project-search/projects/asset\\_refurbishment\\_and\\_replacement\\_program](http://www.hinfra.health.nsw.gov.au/our-projects/project-search/projects/asset_refurbishment_and_replacement_program)

Figure 56 – Health and Education Precincts – Sydney



Source: NSW Health 2017

**Figure 57** – Total current public and private healthcare spending per person adjusted for cost of living, by potential years of life lost, NSW and comparator countries, 2014 (or nearest year)



Source: Bureau of Health Information 2017, *Healthcare in Focus 2016*

### 12.3.6 Partnering with non-government providers in NSW

The NSW Government should continue to access opportunities to increase non-government participation in health. Using partnerships with the private and not-for-profit sectors should form part of this approach.

The extent of these opportunities will depend on the Government’s willingness to enable markets and create incentives for innovation and improvement in service delivery. Incentivised partnerships with non-

government and private health providers will enhance co-design, co-location, community engagement and management.<sup>250</sup>

### Recommendation 95

Infrastructure NSW recommends that the NSW Government continue the high level of investment in fit-for-purpose health infrastructure over the 10-year period from 2018 to 2028.

<sup>250</sup> NSW Government 2016, p. 10

### Recommendation 96

Infrastructure NSW recommends that NSW Health develop a 20-year Health Infrastructure Strategy by early 2019 that supports the future delivery of health services and includes:

- a future-focused analysis of emerging healthcare and non-healthcare technological disruptors and the likely impact on infrastructure required over the next 20 years
- an assessment of the suitability of existing facilities to support future care requirements and enable a higher volume and complexity of services to be delivered in the community
- investigating sites for future health facilities where new development is expected such as North Bringelly and Leppington
- a 20-year strategy for asset management and renewal
- an examination of the role of NSW Health in the delivery of future models of care; for example, identifying and securing land for additional integrated community care facilities, health and medical research hubs and research centres, remote monitoring facilities and rapid response units
- further investment in ambulatory rehabilitation and mental health clinics and investment in assets to house vehicle fleets and mobile medical equipment
- consideration of options for innovative procurement models and increased private and non-government sector delivery of health infrastructure and services.

### 12.3.7 Ongoing investment in technology transformation

The benefits of eHealth solutions extend well beyond the electronic capture and recording of patient information. The future of healthcare innovation is moving rapidly towards the everyday use of software ‘bots’, mobile technologies, bioinformatics, artificial intelligence diagnostic systems and other technology-enabled tools that allow clinicians to deliver healthcare in faster, more mobile and more integrated ways.

Over the next 20 years, the impact of technology-enabled health care is likely to be significant, dramatic and disruptive. The NSW eHealth strategy needs to be refreshed to look beyond electronic information systems and consider ways to support the delivery of healthcare enabled by the latest technological advances. Building on the foundations laid by the current eHealth Strategy, the NSW Government should continue its high levels of investment in the next generation of eHealth and technology-enabled healthcare.

Beyond the implementation of the current eHealth strategy, the NSW Government should continue to embrace technology in the delivery of health services, including.

- seeking to make more data available to support research and innovation that improves service delivery and system efficiency
- continuing to develop connectivity and digital tools that support improved health outcomes
- investing in new technology that improves service delivery and health outcomes.

The advent of personalised precision medicine that allows more tailored treatments for individuals based on genetic, metabolic and microbiological analysis will support more effective out-of-hospital care. These developments will need to be supported by investment in data storage and analytic capacity, remote monitoring centres, biobanks and research data platforms.

#### Data storage, information and availability of data

Information is central to an efficient and effective health system and an essential component of performance reporting, patient information and sharing of records.<sup>251</sup> Data gathered and held in the health sector is a valuable resource for improving service delivery and supporting research, development and innovation in the health sector. The NSW Government should make more data available in the health sector to support ongoing improvements in service delivery and patient-centred models of care. Data release may also provide economic benefits: in the United States, an open source health data initiative led to large increases in patient- and provider-focused applications and in venture capital investment.<sup>252</sup>

Emerging digital technologies are creating new ways to monitor patients in hospitals. These technologies generate masses of data that can be integrated and aggregated to create a holistic view of a patient or an operational unit’s activity and real-time status. Programs such as the UK National Health Service’s *Getting It Right First Time* highlight the importance of streamlined and accessible data to improve the health system.<sup>253</sup> Not only do the interactions between outcomes of care

<sup>251</sup> Productivity Commission 2015, p. 73

<sup>252</sup> Business Council of Australia 2015, p. 18

<sup>253</sup> NHS, <http://gettingitrightfirsttime.co.uk/what-we-do/>

### Clinical Command Centre, Cleveland, Ohio

The Clinical Command Centre at Cleveland Clinic’s eHospital facilitates problem identification and swift intervention by physicians and nurses. The eHospital’s ‘bunker’ – a clinical command centre on the hospital’s main campus – was initiated in 2014. Physicians, critical care nurses and technical staff monitor patient data on a digital wall in the bunker in real time across six intensive care units (ICUs) located in Cleveland Clinic’s four hospitals: the main campus and Fairview, Medina and South Pointe hospitals.

Each patient has a tile on the screen on the wall with their name, age, hospital location and vital signs trend line. The risk status, instead of complicated numbers, is a simple dot – green for low risk and red for high risk – that beeps intermittently. The team monitors red dots closely and alerts ICU ground staff about possible interventions.<sup>254</sup>

With multidimensional data, the team uses analytical algorithms to stratify patients based on risk and demographic profiles. The team also uses data from electronic health records to provide advanced alerts for patients who portray higher risk levels. In the first half of 2015, the bunker team reviewed data on more than 37,800 ICU patients.

<sup>254</sup> Ibid.



and input costs become more transparent, such initiatives also provide, in one easily accessible place, a comprehensive clinical, performance and financial picture for each unit. None of this is possible without a solid foundation of capturing, storing, securing and analysing data within a system-wide digital infrastructure.

### Connectivity and digital tools that support improved outcomes

Providing access to health services online, as well as resources that help people self-select care options and manage their own health, should form part of the future health system. Education campaigns that help build users' digital literacy and knowledge of the healthcare options available to them will help reduce the demand for in-hospital care and treatment and support health in the home.

The future of in-home care includes mass monitoring of patients at home by doctors or nurses, in a virtual care centre setting. Smart devices and algorithms are enabling quality care and disease management to take place within the home, and adverse events detected by these devices can trigger alerts to families, care teams or emergency services.

A wide range of digital and web-based health technologies are currently available to patients within the NSW Health system, including remote telemonitoring of patients at home and the secure use of applications on personal devices such as mobile phones and tablets. The next generation of telehealth will see:

- patients recording their own blood pressure, glucose levels and medication
- in-home sensors and accelerometers detecting falls

- patients wearing scannable wristbands to improve continuity of care in the hospital setting
- smart health assistants providing medical advice and reminders
- Electronic Medical Records (eMR) connected to in-home monitoring devices
- electronic referrals and virtual appointment scheduling.

The increasing adoption of telehealth services globally reflects a shift in demand in the health system from the acute to the primary sector, providing effective delivery of care at a lower cost and changing the infrastructure mix required for the future health system. Telehealth services improve the ability and willingness of patients to better manage their own conditions, leading to a gradual constraint in the growth of demand.<sup>255</sup>

Telehealth offers benefits for patients, carers and healthcare workers through improved access, availability and efficiency. Patient-centred, clinician-led telehealth provides an efficient and effective model of care that complements face-to-face consultation. Telehealth has been particularly important in rural and remote areas, where it has had a positive impact on patients and clinicians through reduced travel times and improved access to specialists and advice. For clinicians, it also improves access to continuing education and professional development.

Integrated ICT is an essential building block for all health strategies.<sup>256</sup> Technologies such as the Internet of Things, wearables, in-home sensors, cognitive computing and next generation communication networks are some of the technologies required to facilitate in-home care.

<sup>255</sup> Altman, L et al 2014, p. 3  
<sup>256</sup> Nicholson, C et al 2014

## Patient Reported Outcome Measures, NSW

Systematic collection and real-time availability of patient reported measures, including outcomes and experience, across multiple care settings present significant challenges as the enabling eHealth technology is not widely available or connected and integrated into other existing corporate and clinical information systems. Patient-Reported Outcome Measures (PROMs) ask patients to assess elements of their own health, quality of life and functioning. The resulting data can be used to show how healthcare interventions and treatments affect these aspects of a person's day-to-day life.<sup>257</sup>

At present, PROMs are being used to evaluate healthcare effectiveness at different levels of the health system, from the individual to the service and system levels. Their use during clinical consultations and in multidisciplinary team discussions is thought to contribute to shared clinical decision-making and patient-centred care. PROM data that is collected during the patient-clinician encounter can be aggregated to support comparative effectiveness research, performance measurement, population surveillance and an understanding of the cost-effectiveness of healthcare.

The routine integration of PROM information into evaluation and decision-making activities beyond the clinical consultation is attracting international interest. This has potential advantages for increasing the relevance of the data collected, building large-scale or national datasets and ultimately improving patient care.

<sup>257</sup> Williams, K et al 2016, p. 3

### Vision for telehealth in NSW

Telehealth enables access to integrated, high quality, patient-centred and safe clinical care through remote delivery between a health professional and patient, or between health professionals. The vision for telehealth in NSW includes:

- funding arrangements to better support telehealth usage
- effective change management to ensure a health workforce that is accepting and capable of using telehealth
- effective collaboration across the public, private and non-government sectors to support integrated telehealth use
- basic technology and physical infrastructure to support the effective operation of telehealth
- widespread use of a variety of telehealth technologies across all healthcare facilities and health specialties
- effective scheduling and booking system to operate across NSW, supported by a global contact list
- innovation in telehealth-enabled models of care
- evaluation and continuous improvement of telehealth services.<sup>258</sup>

<sup>258</sup> Nous Group 2015

### Artificial intelligence and robotics

Internationally, artificial intelligence (AI) has received much interest for its potential applications in healthcare. AI can help to review patient records, doctors' notes, discharge summaries, prescriptions, pathology and radiology results, and external data sources (such as weather and other seasonal trends) to augment patient care and clinical operations. It can assist with repetitive jobs, such as analysing digital images, lab results and electronic health records to detect problems quickly and reliably. It can mine the data in medical records to provide better and faster health services and assist in the design of treatment plans and medication management.<sup>259</sup> Recent advances mean that AI is also demonstrating potential in assisting in the diagnosis of some diseases and it may also have application in online medical consultations.<sup>260</sup>

The automation of clinical processes is not about replacing the health system as it exists today, but rather about improving the efficiency, accuracy and experience of care, while minimising the variations and risks caused by human error or misjudgement. Automation and AI do not fundamentally change models of care, but they can make them better.

Similarly, the automation of hospital ancillary and back-office services with physical robots can generate considerable cost and time efficiencies, and improve reliability. By simply touching a screen, nurses and other medical staff can summon robots for specific tasks. Hospitals that incorporate robotics into their operations will require overhead space or will need to be reconfigured to allow the robotic and human workforce to work seamlessly together.

<sup>259</sup> Medical Futurist 2017  
<sup>260</sup> Ibid.

The new Royal Adelaide Hospital has deployed several types of robots to assist with hospital operations, including:

- automated guided vehicles for moving linen, waste, meals and pharmacy supplies through the hospital
- automated pharmacy cabinets for tracking the use and dispensing of pharmaceuticals
- microbiology automation for complete automation of specimen processing.

There are opportunities to achieve substantial efficiencies using robotics – both physical robots and intelligent algorithms. Deloitte analysis shows that 54 per cent of jobs in the UK Health and Social Services have a medium or high likelihood of being automated in the next two decades.<sup>261</sup> Even if just a portion of the predicted savings are realised, it would allow a significant amount of operational expenditure to be redirected to further health innovation and to improving patient outcomes.

### Robotic surgery

Robotic surgery is the latest evolution of minimally invasive surgical procedures. During surgery, three or four robotic arms are inserted into the patient through small incisions in the abdomen. One arm is a camera, two arms act as the surgeon's hands and a fourth arm may be used to move obstructions out of the way. The patient is surrounded by a complete surgical team, while the surgeon is seated at a nearby console. The surgeon uses a viewfinder, which provides a three-dimensional image of the surgical field, and the surgeon's hands are placed in special devices that direct the instruments. The robotic arms mitigate

<sup>261</sup> Deloitte 2017

tremors in the physician's hands and increase the physician's range of motion. This enhanced precision is helpful during especially delicate procedures.

Robotic surgery provides significant benefits over traditional procedures, including shorter hospital stays, less blood loss and pain, fewer complications (including less risk of infection) and a faster return to normal activities.

### Robotic surgery in NSW

Robotic surgery is performed in some NSW public hospitals, including Nepean, Liverpool and Royal Prince Alfred (RPA) hospitals. An increasing number of private hospitals in the State are also undertaking robotic surgery. In April 2017, the Surgical and Robotics Training Institute was opened at RPA. The Institute is the first in the Southern Hemisphere and has the capacity to train 400 surgeons a year and offer more public patients access to less invasive procedures. Most Australian surgeons have previously had to travel to California to develop their robotic skills.

### Recommendation 97

Infrastructure NSW recommends that NSW Health continue to deliver the *NSW eHealth Strategy 2016-2026*, including full delivery of eHealth Integrated Digital Patient Records and the eHealth whole of system digital platform.

### Recommendation 98

Infrastructure NSW recommends that NSW Health periodically refresh the eHealth strategy to:

- assess IT infrastructure requirements in acute care facilities to enable digital innovation such as clinical command centres and artificial intelligence, including data storage, communications networks and technology, as well as digital platforms
- investigate the implications of integrating a robotic workforce into existing acute care facilities, including space allocation for robot command centres and robot pathways through hospital corridors, redevelopment of pathology labs and pharmacy, and ward, theatre and room configurations
- assess the availability of ICT infrastructure to facilitate in-home monitoring and response, including data storage, access to next generation communications networks and digital platforms
- assess the ability for existing research infrastructure to support ongoing health technology research.

### 12.3.8 Investment in infrastructure to improve health outcomes

Preventative action in health, including infrastructure that supports physical activity and safe environments, should form part of the 20-year Health Infrastructure Strategy. Infrastructure NSW recommends that the NSW Government support investment in walking and cycling infrastructure, parks and open space to support these health benefits, guided by existing land use strategies and transport plans. This investment needs to be supported by information campaigns that target communities with at-risk populations and proximity to this infrastructure.

The Productivity Commission has argued that Australia needs to invest more in preventative health to reduce the disease burden, improve health outcomes and get better value from expenditure. Preventative health – taking steps to avoid illness and reduce its impacts – relies on individuals to look after themselves through either exercise or medical check-ups, such as cancer screening. Australia's expenditure on preventative health is low compared to other OECD countries, at around 1.5 per cent of total health expenditure.<sup>262</sup>

Investment in preventative services will need to increase as the population ages and as the consequential value from avoiding disease and illness increases over time. In Australia, some estimates are that one-third of the total disease burden is attributable to modifiable risk factors.<sup>263</sup>

<sup>262</sup> Productivity Commission 2015, p. 40

<sup>263</sup> Ibid, p. 42 (citing NPHT 2009)

## Healthy Living Master Plan, Singapore

The Singapore Government is investing in infrastructure to encourage healthy lifestyles to reduce the burden of chronic disease and obesity on the health system. The Healthy Living Master Plan Taskforce – a whole-of-government and whole-of-society assembly – was formed in September 2012 to investigate ways of making healthy living accessible, natural, and effortless for all Singaporeans. Key infrastructure initiatives include:

- improving access to parks and fitness corners and ensuring that these facilities complement each other, and encouraging activities that improve their utility
- continuing urban development such that 90 per cent of residents live within 400 metres of a park and have access to green spaces
- developing off-road cycling networks and sheltered walkways connecting public transport and popular destinations
- implementing Active Design principles and guidelines for residential infrastructure. Examples include features that support stair climbing, such as well-designed and well-ventilated stairwells, and outdoor spaces for walking and cycling
- providing eateries and vending machines to provide healthier options in parks, schools, workplaces, and other settings
- the program encourages citizens to make simple lifestyle changes to combat chronic disease and aims to reduce the obesity rate to 10 per cent or less by 2020.<sup>264</sup>

## Recommendation 99

Infrastructure NSW recommends that the NSW Government increase investment in walking and cycling infrastructure and parks and open spaces as part of the ongoing integration of health into land use planning and transport strategies.

<sup>264</sup> Medical Futurist 2017