

People, Place and Prosperity

**Big data diagnostics in health and
education precinct design**



Hassell



People, Place and Prosperity

Contents

Acknowledgment of Country

We acknowledge and respect Traditional Owners across Australia as the original custodians of our land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past, present and emerging whose knowledge and wisdom has, and will, ensure the continuation of cultures and traditional practices.



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1.	People, place and prosperity	4
2.	The precincts	6
3.	Comparing growth	10
4.	Big data diagnostics	12
5.	Conclusion	28

PEOPLE, PLACE AND PROSPERITY

Hospital precincts are important because they're economic anchors as well as fundamental public infrastructure.

The best precincts create value for their host cities through high quality care, translational research and product development via clinical, academic and business knowledge transfer. They also act as catalysts for employment, population growth, and residential and commercial development.

In 2013, the Gold Coast University Hospital (GCUH) opened in Southport, Queensland, adjacent to the Griffith University campus. This was followed in 2014 by Fiona Stanley Hospital (FSH) in Perth, Western Australia, located beside the Murdoch University campus. Hassell was involved in the design of both hospitals

The Fiona Stanley Design Collaboration consisted of architects Hames Sharley, Hassell and Silver Thomas Hanley and was the catalyst project for the Murdoch Specialised Activity Centre (abbreviated to 'the Murdoch precinct' in this document), while the GCUH forms part of the Gold Coast Health and Knowledge Precinct ('the Gold Coast precinct') and was designed by Silver Thomas Hanley, PTD and Hassell.

These projects had remarkable similarities in their original briefs. Both aimed to contribute to the establishment of a suburban activity centre beside an existing university campus, with a new public hospital, a private hospital and research, residential, commercial and retail developments.



1. Gold Coast University Hospital, Southport, Australia
Photography by Christopher Frederick Jones
2. Fiona Stanley Hospital, Perth, Australia
Photography by Peter Bennetts

A RESEARCH OPPORTUNITY

The similarities between the precincts in size, timing and design aspiration present a unique opportunity to compare the progress of development and patterns of activity, and to evaluate what the designs have delivered for their clients and communities.

The briefs for the precincts centred on themes of People, Place and Prosperity. Hassell teamed up with our research partners Place Intelligence to explore how these themes have played out over the first decade of use:

People

→ Are there high quality services and amenities for those who live, work, or learn in the precinct?

Place

→ Is the precinct a comfortable, safe, and distinctive experience for all users?

Prosperity

→ Does the site deliver positive environmental, economic, social and health outcomes?

BIG DATA AND PRIVACY

Some of the data we analysed is publicly available (aerial photography and Australian Bureau of Statistics publications), but the detailed analysis of precinct activity comes from purchased mobile phone data. Place Intelligence measured people movement over time using a proprietary big data set of fully de-identified GDPR (General Data Protections Regulation) compliant mobile device signals.

The signals span a three year period at the two sites between 2019 and 2021. Unique device identities ensure anonymised tracking with spatial accuracy of between five and 15 metres.

The number of mobile devices detected in our data set represents between 25 and 40 per cent of the number of people on site at any given time. This variation occurs because signals can only be detected if phone users have their location services turned on.

Therefore the data depicted in this study does not give an accurate number of users, but **a proportional representation** of people movement on site.

WHAT WE FOUND

From extensive data sets, we analysed site activity, site journeys, dwell times, user types and visitor origins (see definitions below).

Our analysis uncovers many similarities in how people use and move around the precincts, most notably in predictable peak times of travel to and from the sites (early morning, late afternoon) and mid-morning to mid-afternoon peaks in activity. But there are also some interesting differences in development progress and movement that highlight local contextual factors such as transport access, institutional focus and economic conditions.

PEOPLE

People are drawn to both precincts from across their cities and regions, and, in the case of the hospitals, from well outside the expected health services catchment areas.

This indicates that the precincts provide high quality, convenient services and amenities that people are willing to travel long distances to for work, care and education. Some patients are travelling past other hospitals to get to their emergency department of choice.

The Gold Coast precinct exhibits strong links between health, education, residential and retail uses, while connections between the hospital and university institutions at the Murdoch precinct are more limited.

PLACE

The hospital sites are more populated than the university campuses, and both precincts support significant activity on any given day. However, movement patterns reflect a stark 9-5 weekday economy, highlighting the potential for more activities to lift space utilisation, commercial return and safety.

Activity in precincts is centred, predictably, in and around the major buildings - namely the hospitals and main university buildings (libraries and student centres) but also at transport infrastructure — car parks and the

public transit nodes for rail, light rail and buses.

Outdoor space use is heavily skewed toward staff and regular precinct visitors, which may be staff, students or regular contractors. In both precincts, around two thirds of all public realm users fall into this category.

The Murdoch precinct provides more extensive public realm and open space for people to connect with nature in a suburban bushland setting. This is an important consideration flagged in the original design brief, and linked to two indicators beyond the scope of this research — health outcomes for patients, and staff attraction and retention. Given the large proportion of staff using the public spaces, this design decision appears to be justified.

Landscape is a significant 'place' factor in the Murdoch precinct's distinctive identity, while at the Gold Coast, a more dense, urbanised and integrated mixed-use community is emerging.

PROSPERITY

The suburbs around the precincts have experienced above average population and employment growth, supporting infrastructure and building investment decisions made more than a decade ago. As the precincts develop further (particularly at Murdoch) more commercial, economic and social uplift is likely.

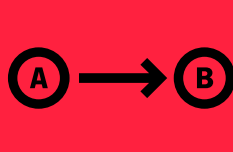
The Gold Coast precinct is developing at a faster rate than Murdoch, due to various economic and commercial factors. Crucially, the residential component of the Gold Coast precinct is well advanced compared to the Murdoch precinct.

Residential development is a catalyst for retail outlets. The food and beverage offerings (including supermarkets) are significant attractors of activity on both sites, and provide important focal points during the day. At the Gold Coast, this can also occur beyond business hours because of the major supermarket and food outlets, providing activity in the evenings that helps bolster night time safety. This is likely to develop in the Murdoch precinct in the future as residential development is delivered.



Site activity

The spatial distribution of activity on a heat map that highlights areas of high footfall or vehicle activity.



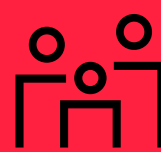
Site journeys

Mapping journeys from any location on the precinct to the next destination within the site boundary



Dwell time

Measuring how long devices spend in any location.



User types

Precinct worker or visitor status estimated by measuring regular and one-off site visitation.



Visitor origin

Precinct visitor origins by suburb revealing where and how far people travel to the site.

THE PRECINCTS

Gold Coast Health and Knowledge Precinct

Southport, Gold Coast, Queensland, Australia

Population

Gold Coast City: 540,000

Southport North Local Government Area:
16,715

Precinct size

85 hectares/210 acres

Public hospital beds

700

Private hospital beds

314

The Gold Coast City Council and Queensland State Government are pursuing the diversification of the Gold Coast economy, which has previously been heavily reliant on tourism. Built on suburban land that contained a variety of community and government facilities, the Gold Coast University Hospital is the centrepiece of the designated Gold Coast Health and Knowledge Precinct.

The precinct includes Griffith University, two hospitals and a mixed-use development. The main activity centre of this precinct provided accommodation for athletes at the 2018 Commonwealth Games, and is now converting gradually to the residential, commercial and retail component of the precinct.

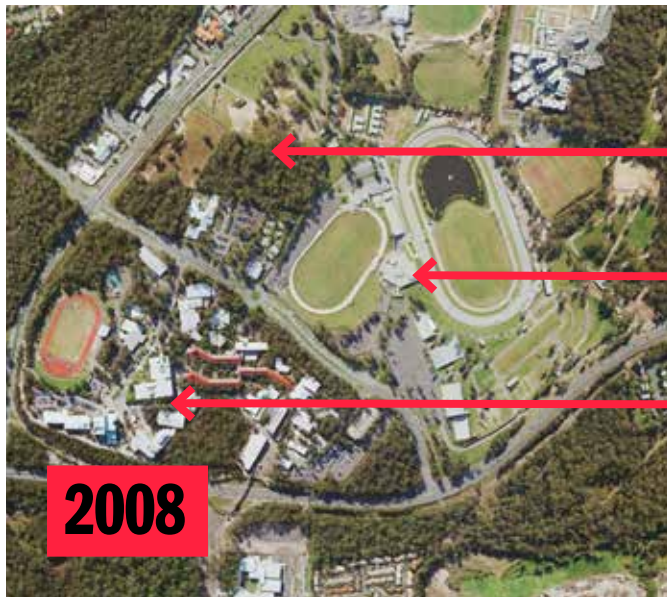
The converted Athlete's Village (The Smith Collective) contains 1200 apartments and a town centre, connecting to the Southport city centre by a light rail line that terminates between the hospital and the university.

Gold Coast University Health and Knowledge Precinct Partners

- Gold Coast University Hospital
- Gold Coast Private Hospital
- Griffith University
- The Smith Collective mixed-use development
- Lumina commercial innovation development
- AdAPT medical manufacturing research facility
- Southport Sharks Sports Venue



Gold Coast University Hospital, Southport, Australia
Photography by Christopher Frederick Jones



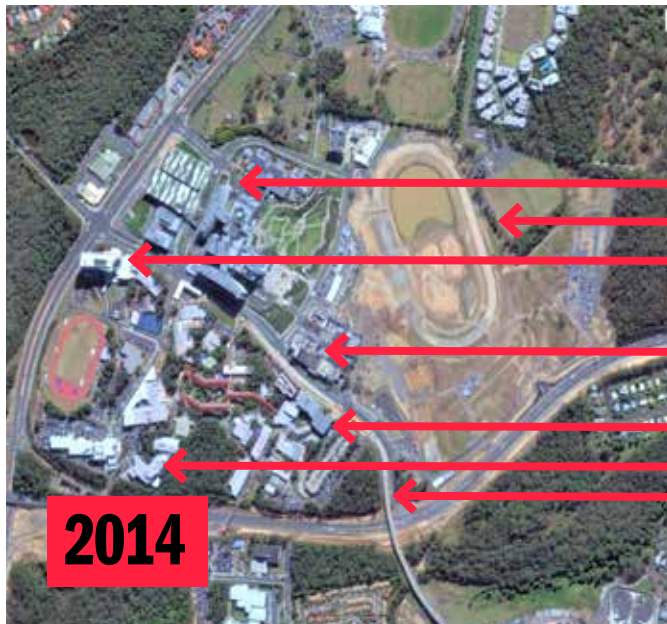
2008

PRE-DEVELOPMENT

Future hospital - greenfield site

Gold Coast Parklands Greyhound Racing facility

Griffith University



2014

HOSPITAL COMPLETION

Gold Coast University Hospital

Proposed Commonwealth Games Athlete's Village site

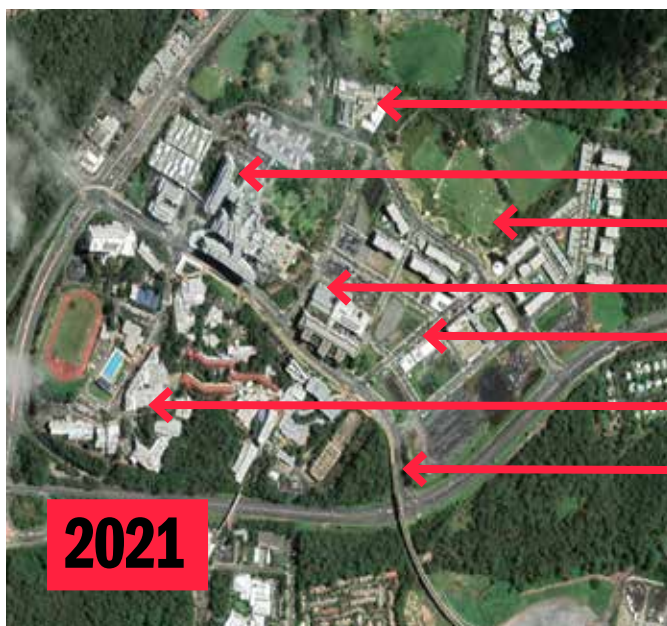
Griffith Health Centre Building

Gold Coast Private Hospital

Griffith Business School

Griffith University

Gold Coast Light Rail line



2021

ONGOING DEVELOPMENT

Southport Sharks Sports Venue

Gold Coast University Hospital

The Smith Collective Mixed-use Development

Gold Coast Private Hospital

Lumina commercial innovation development (in construction)

Griffith University

Gold Coast Light Rail line

Aerial photography by Google Earth Pro

Murdoch Specialised Activity Centre

Murdoch, Perth, Western Australia

Population

Perth City: 2 million

Murdoch/Kardinya Local Government Area:
13,055

Precinct size

280 hectares/690 acres

Public hospital beds

783

Private hospital beds

511

Murdoch Specialised Activity Centre

- Fiona Stanley Hospital
- St John of God Hospital
- Murdoch University
- Murdoch Health and Knowledge Precinct
(Mixed-use site, Development WA)

Fiona Stanley Hospital is at the centre of an integrated health, research and education precinct benefiting from links to the adjacent Murdoch University, the Western Australian Institute of Medical Research, the St John of God Hospital Murdoch and the Murdoch Rail and Bus Interchange.

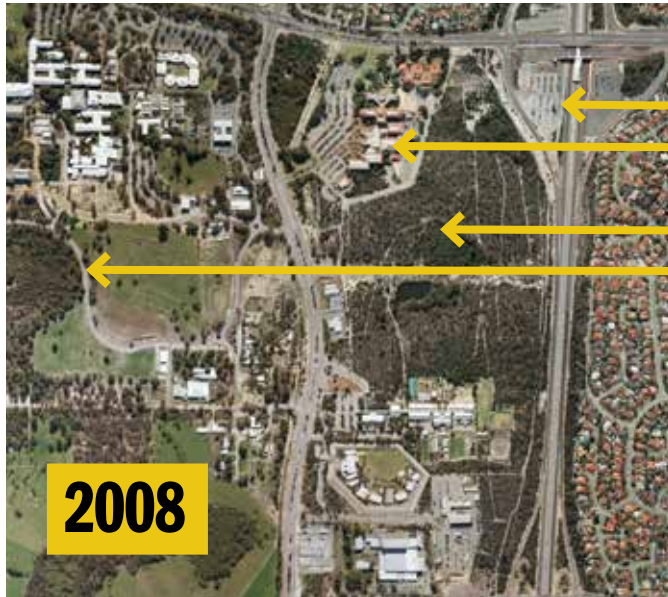
The precinct is designed to be a catalyst for local and regional growth, representing the first stage in the development of the Murdoch Specialised Activity Centre — a transport orientated mixed-use development that combines workplaces, residential offerings and educational facilities in one location. When completed, the Murdoch Specialised Activity Centre is projected to accommodate 35,000 jobs, 44,000 students and 4,000 homes.

FSH is built around five hectares of natural bushland, landscaped parks, internal gardens and plazas.

The hospital offers patients, staff, visitors and the Murdoch community access to areas for exercise, relaxation and rehabilitation through contact with the natural environment including conserved wetland, flora and fauna.



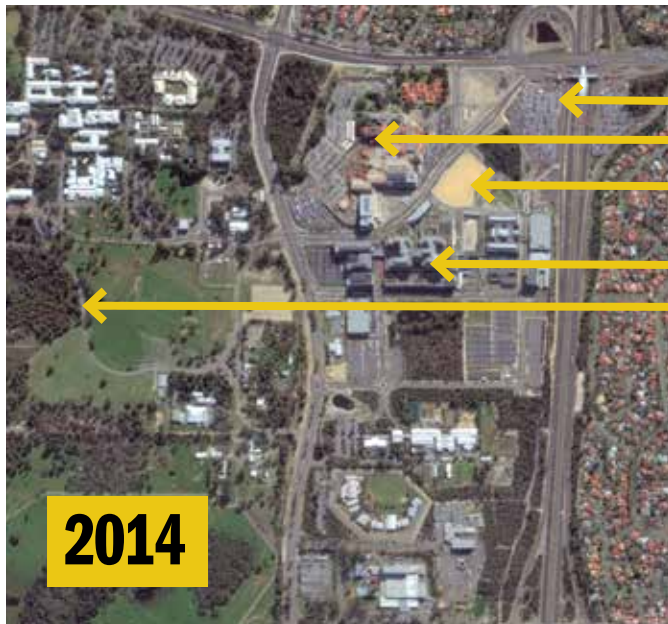
Fiona Stanley Hospital, Perth, Australia
Photography by Peter Bennetts



2008

PRE-DEVELOPMENT

- Murdoch Rail and Bus Interchange
- St John of God Private Hospital
- Proposed site Fiona Stanley Hospital
- Murdoch University



2014

HOSPITAL COMPLETION

- Murdoch Rail and Bus Interchange
- St John of God Private Hospital
- Proposed mixed-use development site
- Fiona Stanley Hospital
- Murdoch University



2022

ONGOING DEVELOPMENT

- Teaching building, currently in construction
- St John of God Private Hospital
- Mixed-use development, currently in construction
- Fiona Stanley Hospital
- Murdoch University

Aerial photography by Google Earth Pro

COMPARING GROWTH

Economic, social and infrastructure development progress

Development of buildings and infrastructure in the Gold Coast precinct has been more extensive and faster than the Murdoch precinct since the hospitals opened almost a decade ago.

In roughly the same amount of time, the Gold Coast precinct has benefited from the delivery of a light rail system, a residential community, two major university buildings, a private hospital, and the partial completion of a commercial med-tech innovation hub. In contrast, the development of the Murdoch precinct has stalled after the delivery of the hospital project.

This discrepancy in progress is due to a combination of factors, but perhaps most significantly the catalyst project of the Athlete's Village on the Gold Coast for the 2018 Commonwealth Games.

This residential, retail and hospitality development has provided considerable momentum to the Gold Coast precinct.

New buildings at the adjacent campus of Griffith University, including the Griffith Health Centre, Menzies Health Institute Queensland (2013) and Business School (2014), as well as the opening of the Gold Coast Light Rail (2014) and the private hospital (2016), have contributed to significant growth in activity. Lumina, the 10-hectare commercial cluster now developing within the precinct, is providing tenancies for life sciences, health and technology-related businesses.

In Perth, precinct development has recently accelerated after a period of limited activity. The mixed-use Murdoch Health and Knowledge Precinct site adjacent to FSH is now in the advanced stages of construction after delays due to constrained economic conditions. The market for Perth office space has been subdued for several years, limiting commercial feasibility.

The first stage will accommodate aged care, childcare, retail, office and residential buildings, as well as health facilities. A med-hotel will open in 2023, and construction will begin that year on the development's next stage — apartments and commercial floor space. Murdoch University has not added any significant campus buildings in the intervening years until recently, with a new teaching building currently under construction.

Despite this difference in building activity between the two precincts, Local Government Area (LGA) data indicate higher growth in population, health employment and education levels in the Murdoch area (see page 11).

Population growth since 2011 has been significant in the largely low-density residential suburb of Murdoch, although none of the new apartment developments proposed for the area around the hospital have been delivered. Population growth in that LGA (53 per cent from 2011 to 2020) has easily outstripped the larger city of Perth, which has only grown by 15 per cent in the same period.

On the other hand, The Smith Collective residential and retail development next to GCUH is complete and almost fully tenanted. The number of residents in the greater city of Gold Coast has grown by 23 per cent from 2011 to 2020 compared to 28 per cent in the suburbs around the new hospital.

Both precincts have had a discernible effect on health sector employment in their respective LGAs. While GCUH replaced an existing facility in the centre of Southport (and took an existing workforce with it), FSH was an entirely new facility, which provided a significant boost to health sector employment in Murdoch between 2013 to 2020, increasing hospital jobs in the LGA by 93 per cent, and medical services jobs by 14 per cent. This compares to an overall increase in employment in the area across all sectors of 9 per cent.

In comparison, in the Gold Coast North Southport LGA, overall employment increased by 21 per cent over the same period — including a 35 per cent increase in hospital jobs, and 74 per cent in medical services.

SOUTHPORT

(within the city of Gold Coast)

Southport North Local Govt. Area,
Australian Bureau of Statistics

MURDOCH

(within the city of Perth)

Murdoch/Kardinya Local Govt. Area,
Australian Bureau of Statistics



POPULATION:
Number of people



16,715 people
Up 28%

2011-2020
(Compared to City of Gold Coast 23% growth)



13,055 people
Up 53%

2011-2020
(Compared to Perth 15% growth)



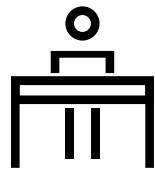
HOUSING: New
apartment residents



Projected: 2500
Delivered: 1700



Projected: 1200
Delivered: 0



EMPLOYMENT:
Hospital jobs



Up 35%
2012-2020



Up 93%
2012-2020



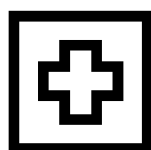
EDUCATION:
University educated



Up 3.4%
2011-2016



Up 4.4%
2011-2016



HEALTH:
Emergency Department
presentations



Up 13%
2016-2019



Up 7%
2016-2019

BIG DATA DIAGNOSTICS

Our big data analysis provides detailed insights into the two precincts, represented in high impact, easy-to-read spatial and statistical infographics. These can help stakeholders pose fundamental questions about their sites and identify potential improvements to the functionality of land and assets.

At an individual site scale, big data analytics can reinforce design decisions and assist in ongoing design and operational adjustments to site features like car parking, entrance locations and public seating, or commercial outlets.

At a bigger scale, comparative analysis of the two sites (with supplementary research on prevailing design, economic, environmental and social conditions) can aid understanding of how and why precincts develop in the way that they do, and what implications there may be for government and private stakeholders in new precinct ventures.

The data we collected for this project is helping us explore the following questions, which delve into the detail of the themes of People, Place and Prosperity.

1. Site activation

After eight years of operation, how well is the precinct activated? Where are the main areas of activity, and at what time of the day and day of the week?

2. Site connections

Precincts are often designed to encourage cross-institutional or inter-organisational collaboration. Are regular users (such as clinicians and university staff) moving between organisations? Where are the main links across the precinct?

3. Public realm use

The hospital was designed to encourage staff and patients to use the public realm and parks as healing/rest spaces. Who uses these spaces? When and how long do they spend time in them?

4. Transport

Does the transport infrastructure, both private (roads and car parking) and public (train, light rail and bus), support easy and efficient access to and from the precinct?

5. Hospital catchments

New hospitals often have higher than expected demand. Does the Emergency Department attract more than its fair share of patients and how far are they willing to travel to get there?



Site activation

The spatial distribution of activity shown as a heat map that highlights areas of high footfall or vehicle activity.



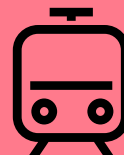
Site connections

Combining user origin and dwell time data, an indicator mapping user journeys from any location or building on the precinct to its next destination.



Public realm use

Measures when and how long people dwell in outdoor spaces.



Transport

Precinct user type (worker or visitor) estimated through algorithms that approximate regular and irregular users.

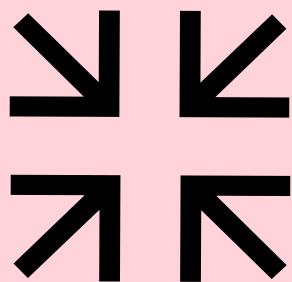


Hospital catchments

Precinct visitor origins by suburb revealing where and how far people travel to the site.



Public realm, Fiona Stanley Hospital, Perth, Australia
Photography by Peter Bennetts



1. SITE ACTIVATION

After eight years of hospital operation, how well is the whole precinct activated?

Activity heat mapping that shows concentrated areas of human movement helps us identify precinct locations where the provision of new buildings or amenities may encourage more efficient or productive use of assets. It can also show patterns of activity over the course of a day, month or year, which can guide the programming of events in locations that are under-utilised.

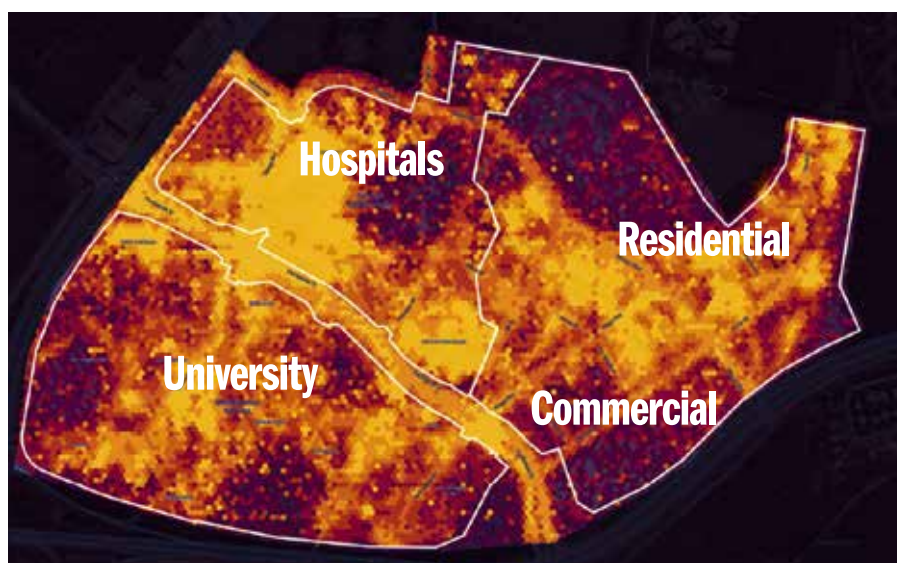
Gold Coast Health and Knowledge Precinct

The Gold Coast precinct is relatively evenly activated across its three main zones, with the obvious exception of large open spaces and commercial sites still under construction.

The two hospital buildings (public and private) and the university campus library accommodate the most activity within their respective zones. Statistical analysis reveals that around two-thirds of all activity is concentrated on the hospital site, which is unsurprising given the significant multi-storey form of the main hospital building and the relatively consistent activities of healthcare compared to the variations across the academic year of the university.

The new residential development, previously the 2018 Commonwealth Games Athletes' Village, is now fully let to the private market. This area shows significant activity, while the commercial area to the south east corner of the precinct is not yet complete.

These patterns highlight the challenges of consistency in space utilisation for universities. Are there alternative uses or scheduling options to increase activity on campus during academic holiday periods? Can the campus be more densely developed to accommodate more students? Or is the environmental and experiential value of an open, bushland campus more important to the university?



Gold Coast precinct
Activity heat map

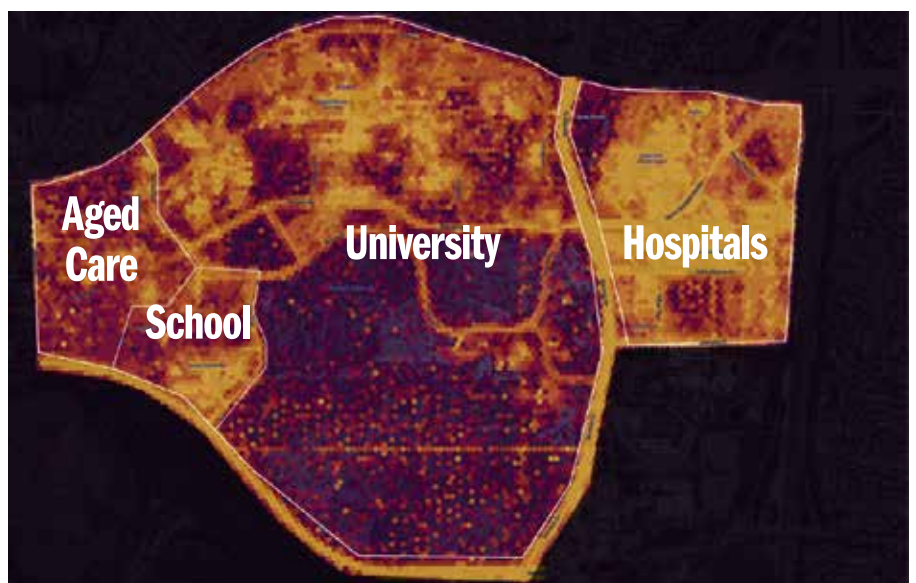
Less activity More activity

Murdoch Specialised Activity Centre

In a similar vein to the Gold Coast precinct, the hospital zone at Murdoch has significantly more activity than the university campus, which is developed at a much lower density and height profile.

The hospital buildings and campus library within the Murdoch precinct are central activity nodes. There are no substantial new buildings around the hospitals or university campus, although this will change in the next few years as the mixed-use site to the north of FSH begins construction.

The large expanses of open space around the precinct reflect the importance in the original design brief of ecological sustainability — habitat restoration and indigenous planting to reinforce local place identity, and the importance of nature in healing. These spaces were not intended to be heavily activated, and provide a value hard to measure, but easy to see.



Murdoch precinct
Activity heat map

Less activity More activity

How do the precincts operate over time?

Picking apart the activity data, we can also explore how the precincts operate throughout the day and across the week. This can help to identify where improvements to the programming of spaces can be focussed.

While the graph below shows the expected patterns of peak use (mid-morning to mid afternoon, and less activity at the weekends), the data raises some space utilisation questions for the institutions.

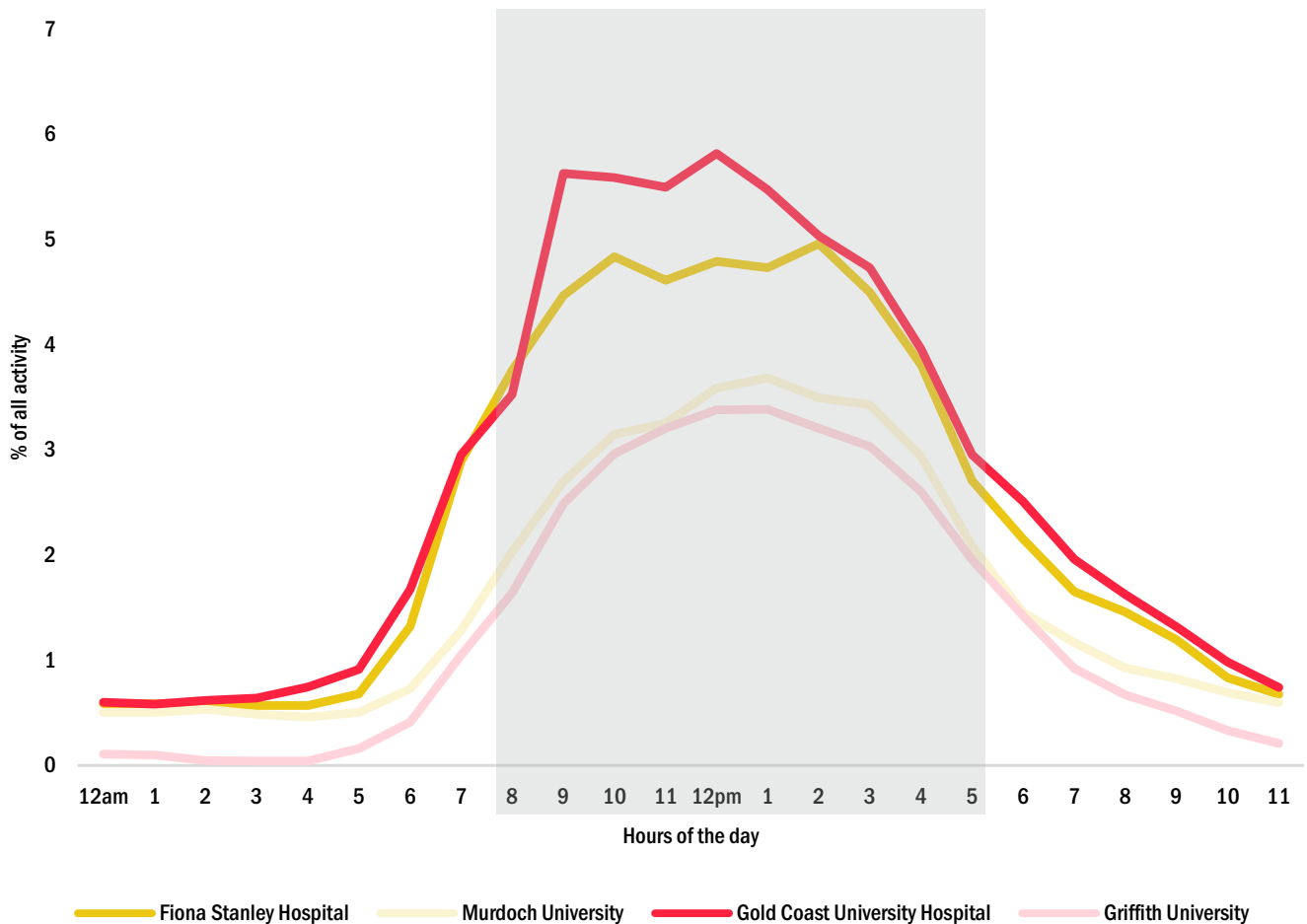
Is there a way to extend activity later into the afternoon, particularly at the Gold Coast precinct, where activity peaks at midday? What effect do staff work schedules have on activity levels? Is it just human nature to get things done in the morning and head home as soon possible, or can the site provide services and spaces that encourage afternoon and evening activities?

Activity in the Murdoch precinct is more evenly split between the campus and the hospitals. Does this highlight potential for Griffith University to increase its building density or campus programming?

The university campuses have a similar pattern of activity, although the Murdoch precinct (at both hospital and campus) has a slightly longer peak period of activity.

This may be related to the tropical climate on the Gold Coast that makes afternoon activity less comfortable in some seasons. Or it may be due to more pragmatic operational factors such as clinic or teaching schedules, or the variety or nature of services available.

Whatever the reasons, and they will certainly be multi-factorial, there's potential for improving utilisation for major public investments in buildings and transport infrastructure in these precincts.



Both precincts
Average weekday activity in university and hospital zones

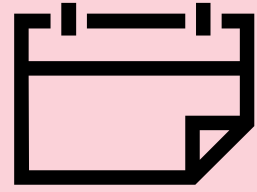
2PM

**is peak time in the
Murdoch precinct
compared to 12pm in the
Gold Coast precinct**

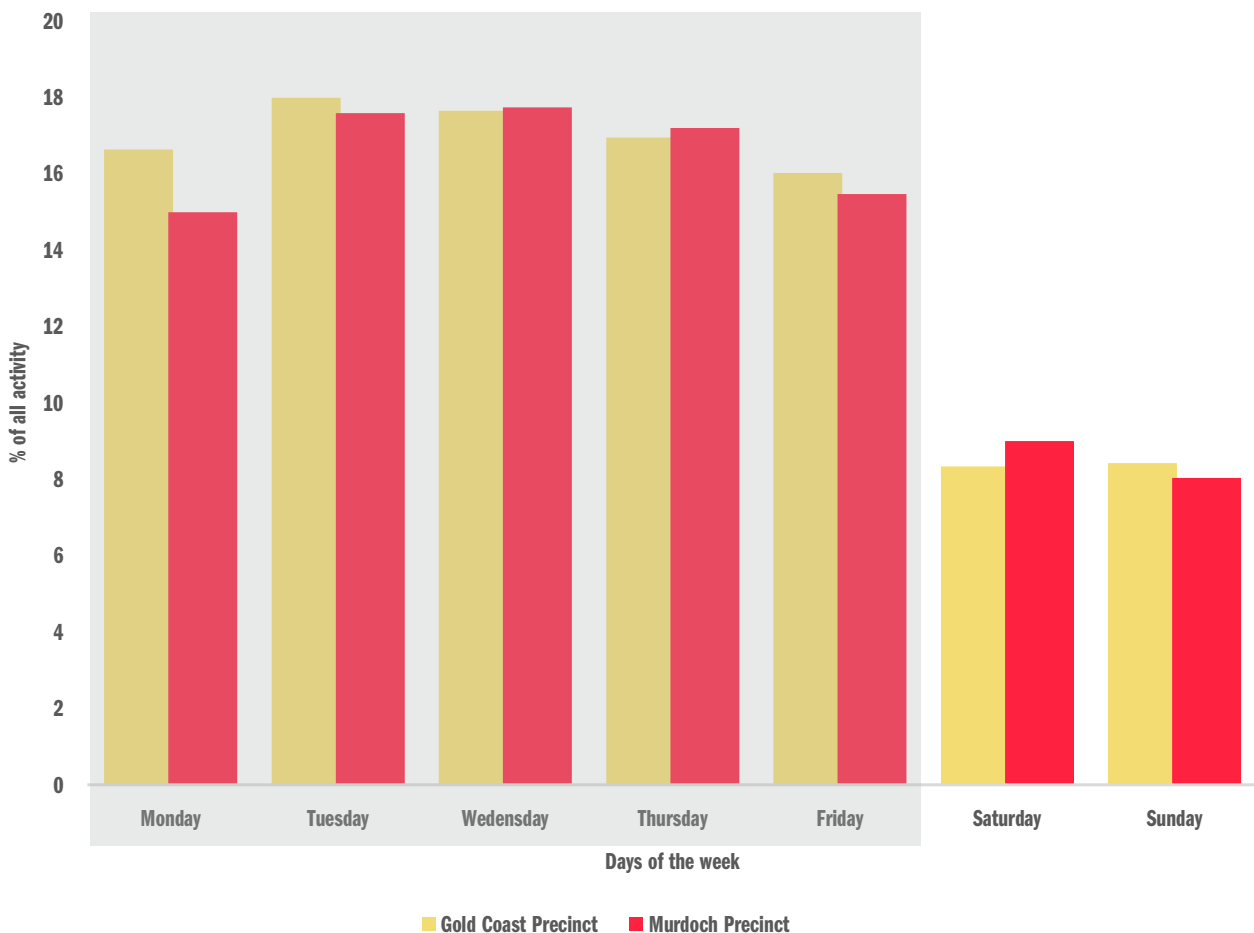
The precincts show a familiar pattern of activity across the days of the week, with Tuesday and Wednesday the peak use days, and activity decreasing after that. This follows established patterns of workplace behaviour across many sectors (not just health) that are likely to be cemented after long periods of working from home during the COVID-19 pandemic.

With substantial open and recreational space in and around both precincts, is there an opportunity to increase weekend activity at both precincts to maximise the use of transport infrastructure?

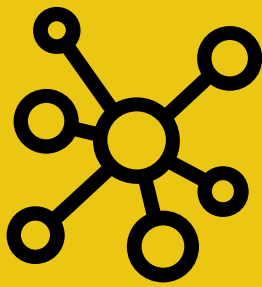
Could this be achieved through design interventions such as the provision of sporting facilities, public art or playgrounds? Or is it more a matter of event and work programming?



**Tuesdays & Wednesdays
are peak days of activity
at both precincts**



Both precincts
Average weekly activity in whole precinct



2. SITE CONNECTIONS

What are the main site connections? Where are people moving from and to within the site boundaries?

Visual representations of the link (see red lines, below) between cross-site journey origins (yellow dots, below) and destinations help us understand the connections between buildings and spaces within the precincts. The thicker the line from origin to destination, the greater the proportion of all journeys represented. This study is useful for identifying the strongest spatial relationships within the precinct and hopefully uncovering links between institutions for clinical and academic staff, and support for amenities and retail or other land uses.

Gold Coast Health and Knowledge Precinct

One of the strong drivers of the co-location of universities and hospitals is the potential for institutional links that create value through sharing staff and knowledge. The Gold Coast precinct is much smaller and more compact than the Murdoch precinct. This contributes to the links between the university and hospitals appearing much stronger and more concentrated at the Gold Coast precinct.

In addition to this spatial influence on connections, the network of links also reflects the healthcare focus at Griffith University, and validates investment in the new Griffith Health Centre at the campus edge closest to hospital. (See page 20 for site connections from the Griffith Health Centre.)

Animal Sciences is a greater focus at Murdoch University than Health Sciences, so there is less reason for clinical and academic staff to be on both sites.

The density of activity in the Gold Coast precinct is also driven by the centrality of the public transport infrastructure. There are two light rail stops between the hospitals and the university, on a route that follows the main road through the centre of the site.

This compares favourably to the location of the train station at Murdoch, which is at the eastern edge of the precinct and necessitates a long walk or bus ride to the university and other sites when arriving or departing by train (see pages 24-25 for transport site connections).



Gold Coast precinct
All site journeys

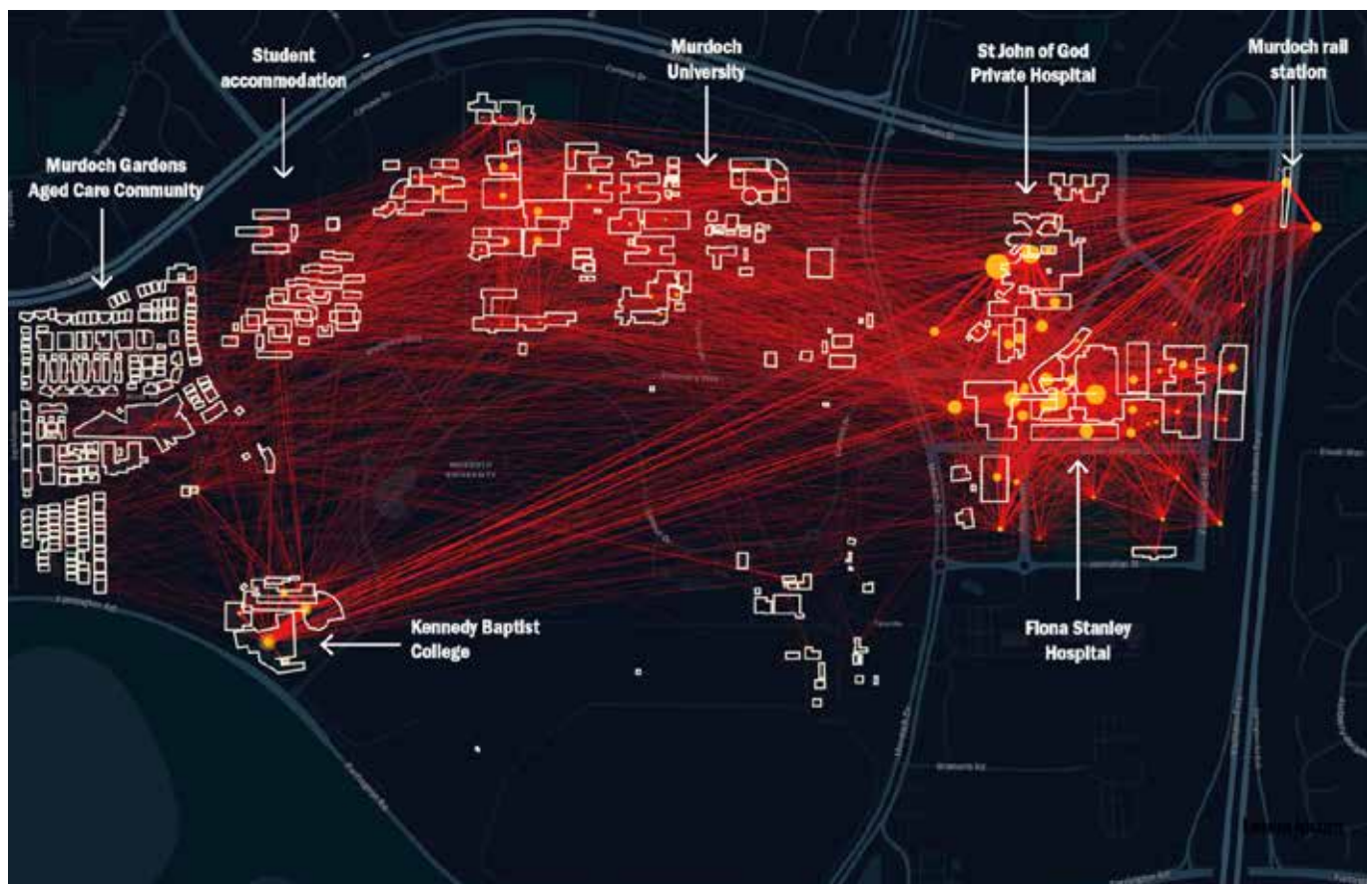
Murdoch Specialised Activity Centre

The strongest connections in the Murdoch precinct are located around the hospital zone, the train station and, notably, to the secondary school on the western edge of the precinct.

Murdoch University is a low density, bushland campus with low rise buildings, ground level carpark and large open spaces. The connections between the university and other locations are diffuse due to the dispersed nature of the campus buildings, but also suggest only limited cross-over of university research and clinical care.

5%
of all journeys from
hospital buildings in the
Murdoch precinct go to
university buildings

compared to
28%
in the Gold
Coast precinct



Murdoch precinct
All site journeys

Gold Coast Health and Knowledge Precinct

Looking in more detail at the trips originating from individual buildings, we can start to understand whether specific precinct planning objectives have been met. These diagrams screen out all journeys except those originating from the source building (yellow dot).

The Griffith Health Centre combines health care (dental clinics), teaching and research labs with a public auditorium and outdoor gathering spaces. This combination of activities and its location close to the hospital (but on the university campus) enable easy cross-site and cross-institutional connections.

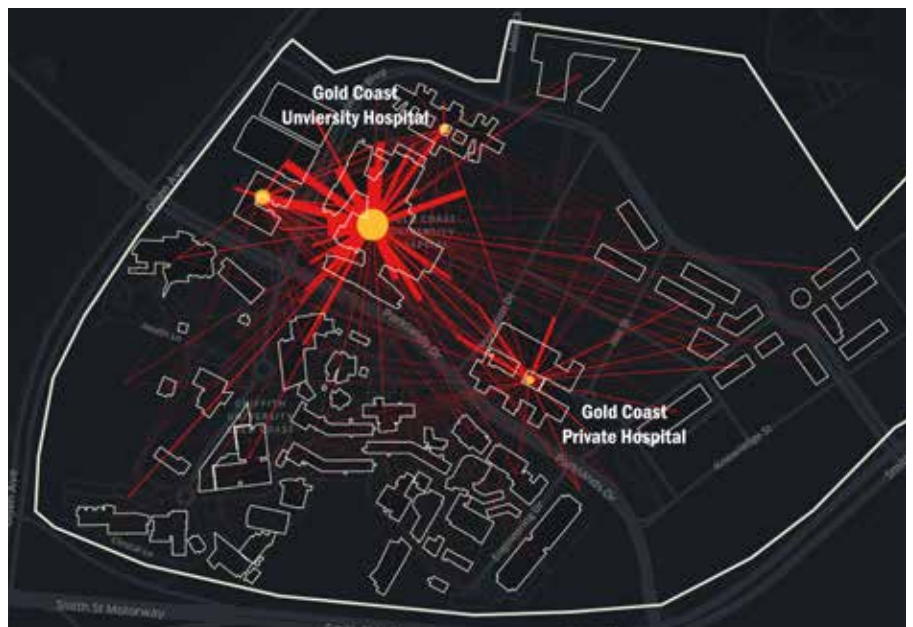
Gold Coast precinct Journeys from the health sciences building on university campus

Beyond the strong connections from hospital buildings to other adjacent clinical buildings, journeys beginning at the two hospitals scatter to the university campus, the transport infrastructure and to the residential and retail development.

Gold Coast precinct Journeys from hospital buildings

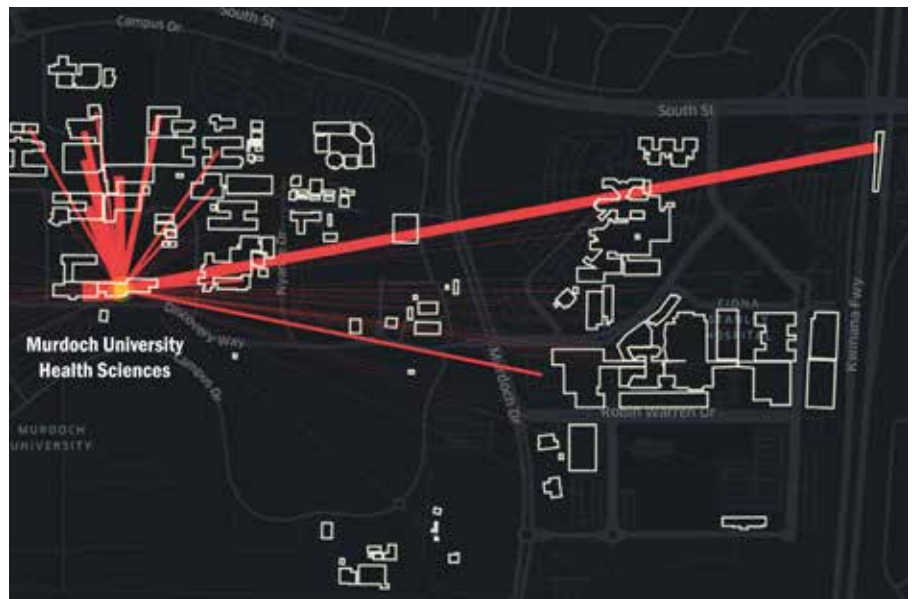
This diagram shows journeys from the supermarket and food outlets in the commercial development zone. While residents from the residential area are using the retail as expected, so too are people from the university and hospital sites. This compares starkly to the Murdoch precinct food and supermarket links (see next page), which indicates no connections to the hospital zone at all. This retail catchment evidence is valuable to clients looking to attract new tenants that contribute to a truly mixed-use community.

Gold Coast precinct Journeys from the supermarket and food court



Murdoch Specialised Activity Centre

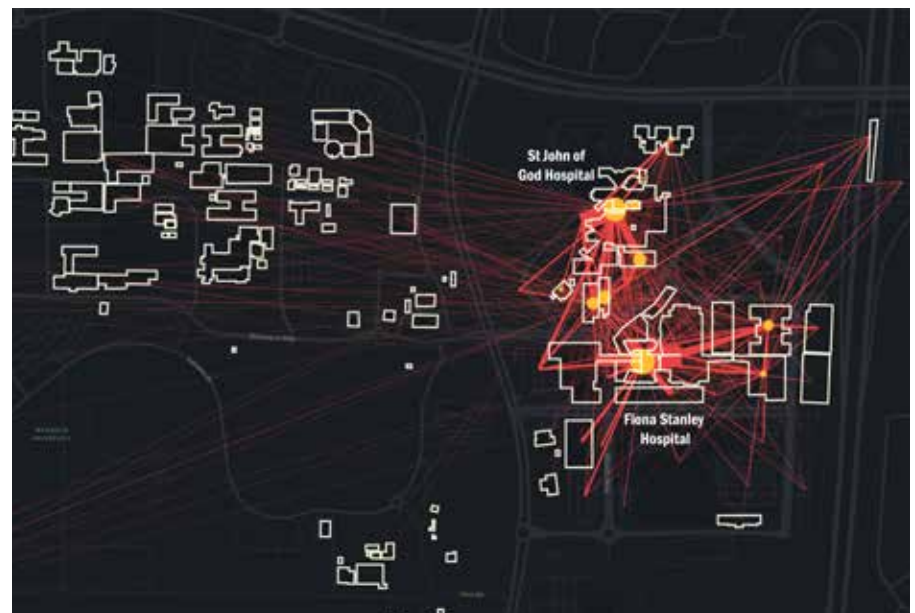
This diagram indicates no cross-institutional journeys between the hospitals and the health sciences research building on the Murdoch campus. The connections beyond campus are to transport infrastructure — either to hospital car parks or the rail and bus interchange.



Murdoch precinct

Journeys from the health sciences building on the university campus

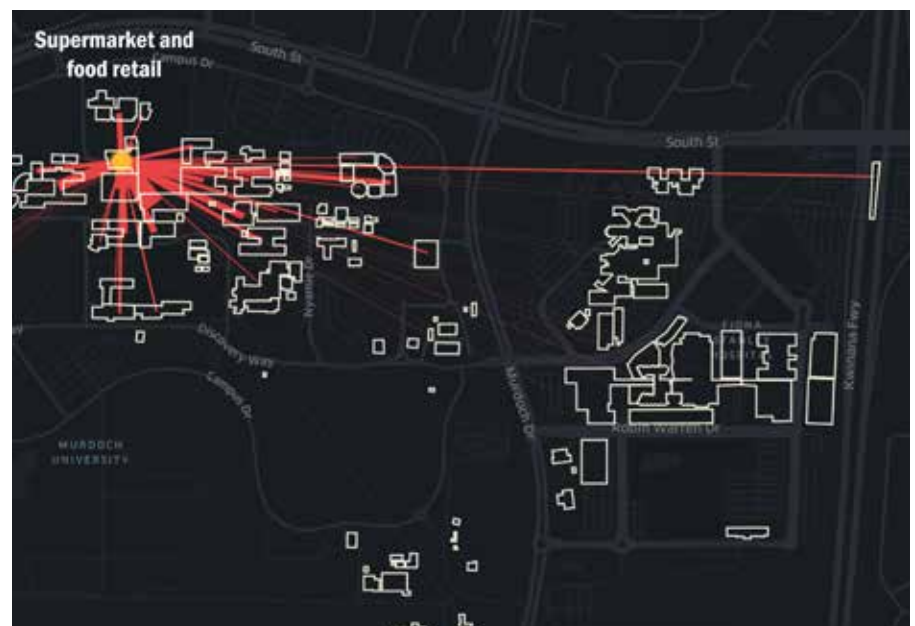
Journeys originating from the two hospitals are mostly to spaces associated with other hospital functions — rehabilitation, mental health etc, as well as car parks and the transport interchange. Only around three per cent of all journeys originating in the hospital zone go to the university campus. Those trips end at a variety of buildings, with no strong connection patterns emerging.



Murdoch precinct

Journeys from hospital buildings

There are no connections from the campus supermarket and food outlets to the hospitals. While food priced for students may be appealing to some hospital users, it is too far to walk in a lunch break, and may not be well known beyond the university.



Murdoch precinct

Journeys from food retail and supermarket on university campus



3. PUBLIC REALM

Evidence shows that access to nature helps patient recovery times and staff stress. Both precincts have significant public realm for rest and recreation. Who uses these spaces, and how long do they linger in them?

Given the strong focus in both hospital design briefs on public realm spaces, the following studies focus on outdoor spaces immediately adjacent to clinical areas at the two public hospitals. By combining activity heat maps with site user-type data, we can discern who is spending time in those spaces and at what time they are most popular.

The benefits of designing with access to, or views of, nature are well documented. Leaning heavily on principles of Evidence Based Design, the FSH schematic design specifically documents the following key principles:

- Create a strong sense of place and improve users' well-being, while contributing to attracting and retaining quality personnel
- Provide safe external spaces that foster social interaction, promote a healthy environment and improve the well-being and comfort of overall users, and
- Create a variety of setting types and spaces that can be used for different purposes including civic public spaces, patient rehabilitation, staff amenity, and natural habitat, as well as active and passive recreation areas.

Dwell times (measuring people's location in three minute intervals) is an indicator of the attractiveness, comfort or convenience of a place. This can be useful in identifying public realm areas that may need more seating, shade or access to food and beverages, or areas that people may avoid at night due to lighting and safety concerns.

For example, at FSH, around two-thirds of the users of public realm spend only 18 minutes or less in those spaces, which, given the generally favourable climate in Perth, is a relatively short amount of time. Supplementary qualitative data will help us understand why this is the case.

By measuring the regularity on site of a specific device signal, we can estimate whether a person in the precinct is a regular precinct visitor. This is not an exact science, but signals detected regularly over the course of a month indicate the likelihood that the device belongs

to staff, students or long term patients, whereas few, or one-off, signals are more likely to belong to patients or visitors.

In this way we can determine whether staff and students or less frequent site visitors (patients or family visitors) use particular spaces throughout the precinct, and tailor those spaces to suit specific needs.

One of the goals of the FSH project was to provide an environment that attracted and retained high quality staff. The data indicates 65 per cent of all users of the outdoor public realm around the hospital are staff. The proportion of visitors in the public realm spaces across the week stays relatively low and consistent, while staff numbers are much higher during weekdays.

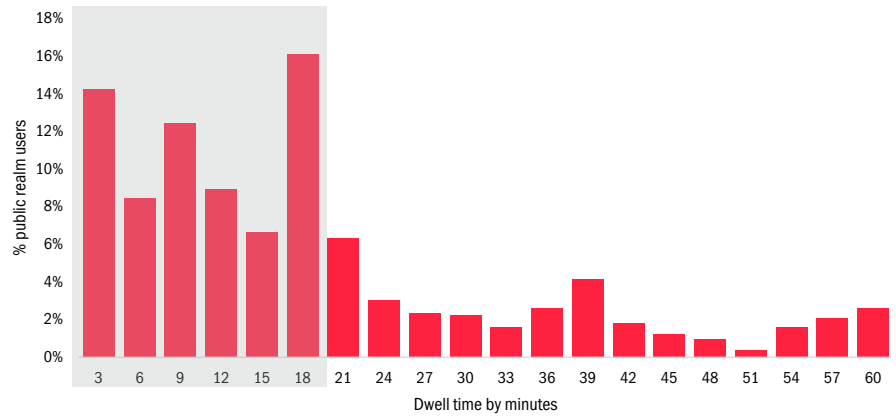
In contrast to the Fiona Stanley Hospital, at the Gold Coast University Hospital the proportion of staff using the outdoor spaces remains consistent across the weekdays and weekends.

Future studies combining activity heat maps with user-type data and supplemented by qualitative data will help reveal which spaces are most popular with staff and which spaces are more convenient for patients.



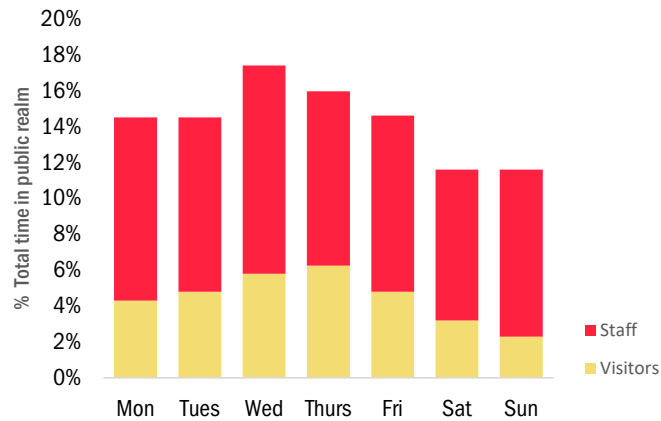
**Fiona Stanley Hospital
Public realm activity heat map**

67%
of people around
Fiona Stanley Hospital
stay for 18 minutes or
less in the public realm



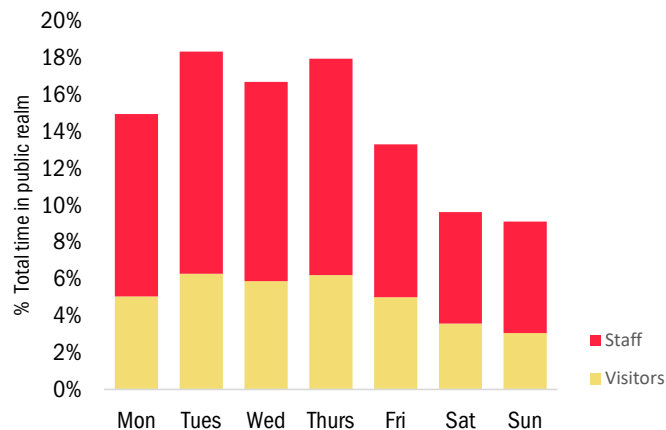
Fiona Stanley Hospital
Public realm dwell times at lunch time

69%
of people using the
public realm around
Gold Coast University
Hospital are staff

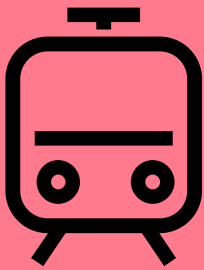


Gold Coast University Hospital
Visitor and staff use of public realm

65%
of people using the public
realm around Fiona
Stanley Hospital are staff



Fiona Stanley Hospital
Visitor and staff use of public realm



4. TRANSPORT

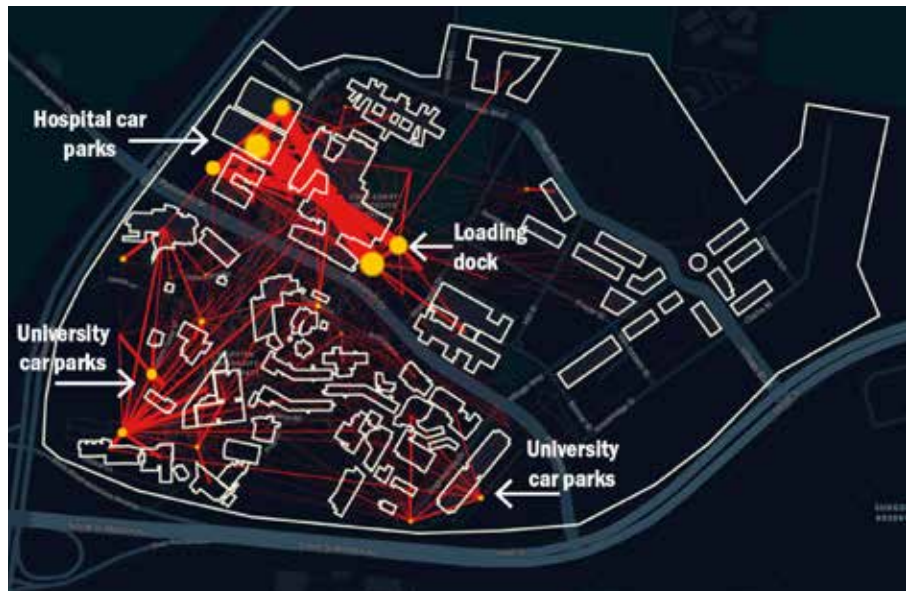
Does the transport infrastructure, both private and public, support easy access to and from the precinct?

These journey studies show the connections between transport nodes (yellow dots below) and buildings throughout the precincts, and can be used to consider infrastructure spending for site features such as car parking, public transport and footpaths. Transport infrastructure includes car parks, light rail (Gold Coast precinct), heavy rail (Murdoch precinct) and bus stops.

Gold Coast Health and Knowledge Precinct

The multi-storey car parks and the loading dock at the Gold Coast University Hospital generate the most car park connections across the precinct, but there are also a number of at-grade university car parks whose users fan out across the campus.

Gold Coast precinct
Site journeys from car parks



There are two light rail stops along the main road through the Gold Coast precinct. The major stop adjacent to the main entrance of the hospital is located underground, allowing access to both sides of the road without having to cross it. The main hospital building has the largest proportion of public transit users, but the university also accounts for a considerable proportion also.

Gold Coast precinct
Site journeys from light rail stops



Murdoch Specialised Activity Centre

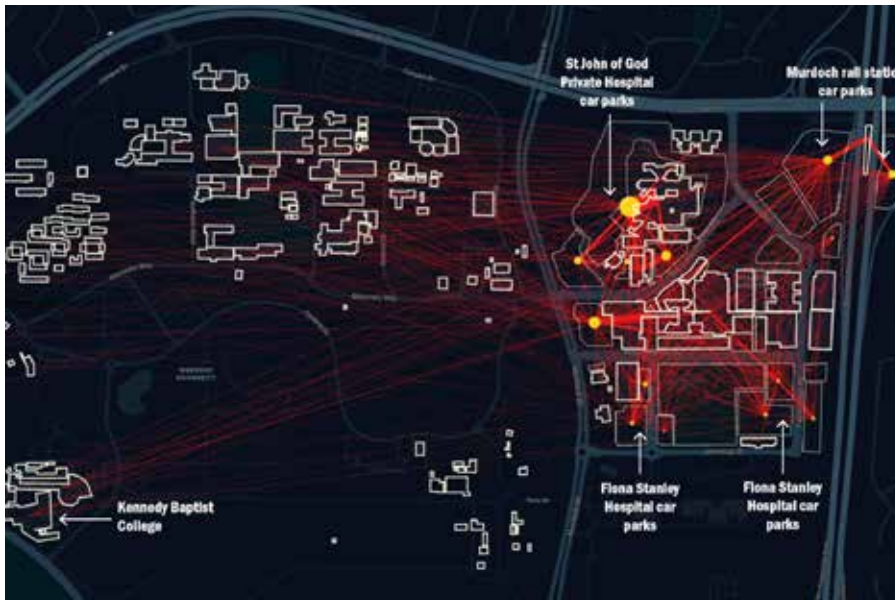
Journeys from the Murdoch train and bus interchange and from the hospital car parks to all other locations within the precinct are illustrated below.

One interesting link shown in the first diagram indicates staff (or perhaps senior students) at the secondary school are using hospital car parks, as are a number of people on the university campus, although the multi-storey car parks at both precincts are taking the bulk of traffic. Does the school need to provide more car parking for its community?

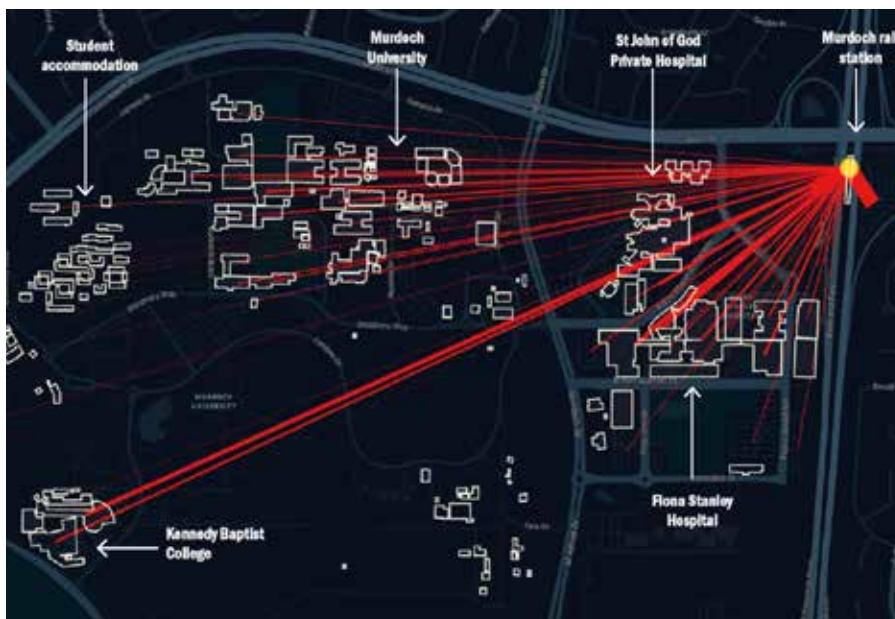
Around 12 per cent of all journeys within the precinct originate at the train station, but the second diagram shows the largest proportion of those connections are to the two car parks either side of it, indicating significant commuter parking activity at Murdoch train station. That is, many people are travelling to the station by car from elsewhere, then leaving the precinct for work or other reasons.

In the second diagram we can also detect a very strong connection between the train station and a secondary school at the precinct's western edge, which is over half an hour's walk away. It also shows strong use of the train by university campus visitors and the hospital sites.

12%
of all journeys within
the Murdoch precinct
originate at the
train station



Murdoch precinct
Site journeys from hospital car parks



Murdoch precinct
Site journeys from train and bus interchange



5. HOSPITAL VISITOR CATCHMENTS

New hospitals often have higher than expected demand. Do the Emergency Departments attract more than their fair share of patients, and how far are people willing to travel for care?

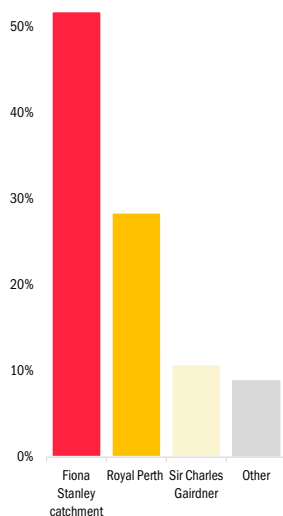
In response to nation-wide increases in Emergency Department (ED) presentations, we identified which suburbs people were travelling from to attend the ED and compared them to state government designated catchment zones. On the map, the darker red tones on a suburb indicate higher rates of attendance, and the catchment borders are indicated by coloured lines.

Murdoch Specialised Activity Centre

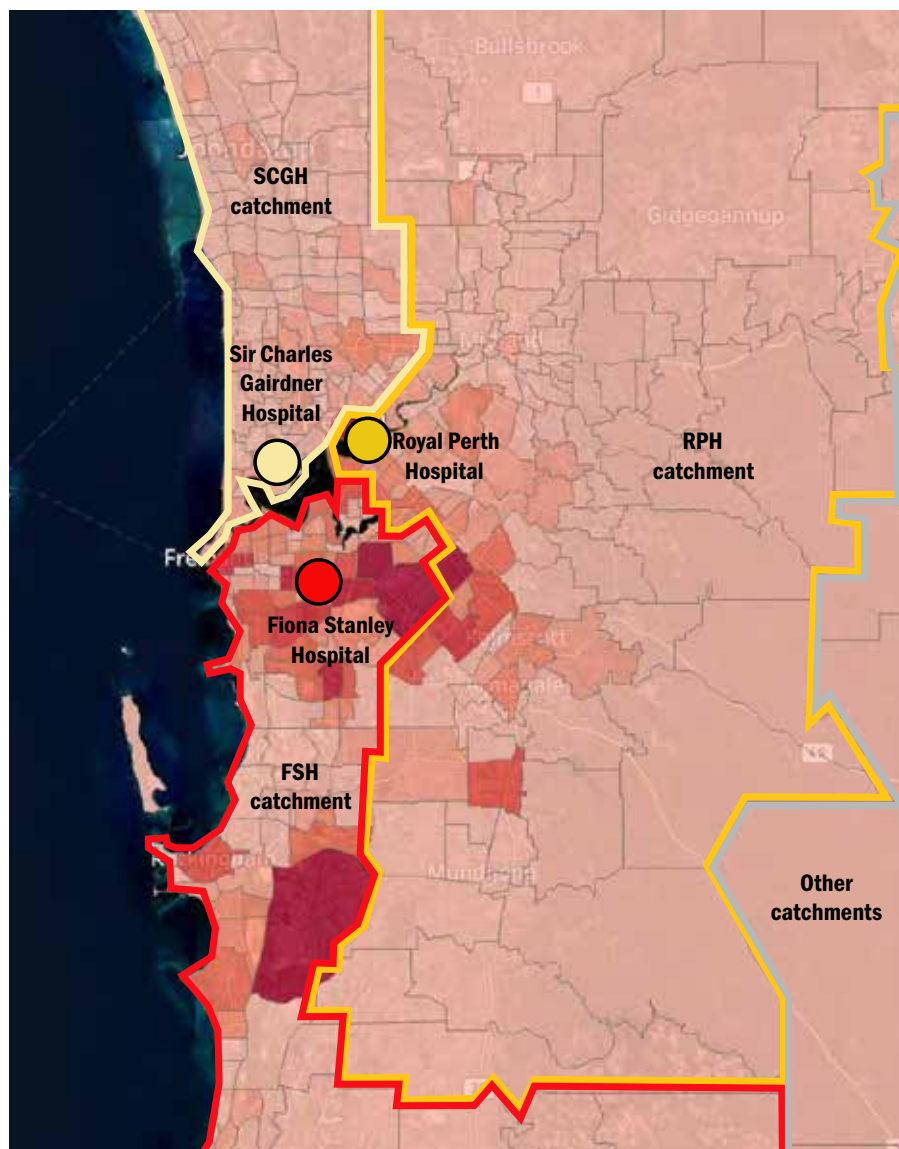
This data allows us to explore the magnetism of new hospital infrastructure and whether the distance people are willing to travel diminishes over time. This can be useful to clients to understand, for example, where health funding should be allocated, or where to focus localised efforts for staff recruitment.

The data indicates that only around 52 per cent of the people attending Fiona Stanley Hospital ED are coming from within the designated health service catchment. At the Gold Coast University Hospital ED it was even lower, at around 39 per cent.

Why are so many people attending from beyond the intended catchment areas? The reasons may vary. It may be freeway access, higher quality spaces, shorter waiting times, or general awareness of larger, newer facilities.



Murdoch precinct
Percentage of total ED visitor by suburb compared to government health service catchment boundaries in Perth region



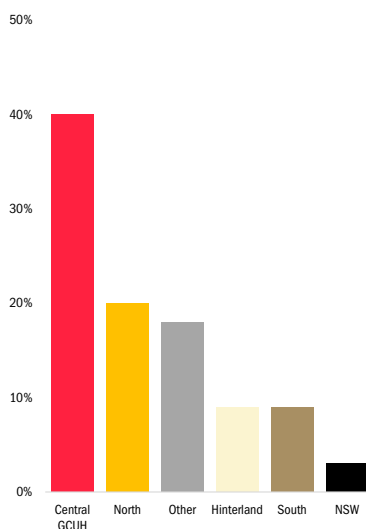
Least Most
Number of people attending Fiona Stanley Hospital ED

Gold Coast Health and Knowledge Precinct

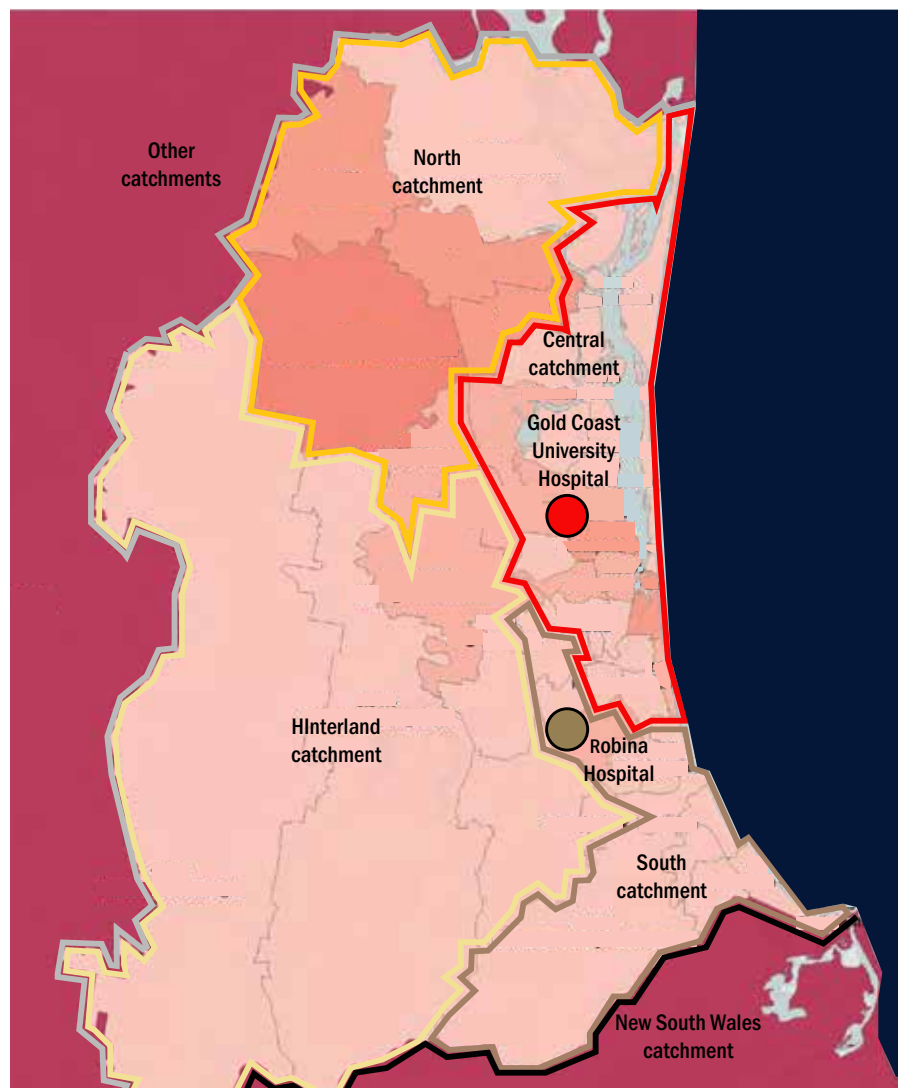
The major difference between the two diagrams of ED visitor origins is the percentage of people attending the Gold Coast University Hospital ED from catchments external to the Gold Coast region (either from New South Wales or catchments from western Queensland).

People from external catchments in Western Australia do not appear to attend the FSH ED in any greater proportion than the outer Perth suburbs. This may be because the other two major facilities in Perth, the Royal Perth and Sir Charles Gairdner Hospitals take a greater share of rural and regional ED visitors so the load is more evenly spread.

Whatever the reason, such large percentages of ED visitors coming from outside their designated catchments (51 per cent for FSH and 39 per cent for GCUH) indicates people are willing to travel significant distances to access high quality health services and facilities.



Gold Coast precinct
Percentage of ED visitors by suburb and government health service catchment boundaries in Gold Coast region



Least Most
Number of people attending Gold Coast University Hospital ED

Only **39%**

of visitors to the Gold Coast University Hospital ED come from the designated GCUH health service catchment

CONCLUSION

Both precincts deliver economic and population growth to suburban locations earmarked for specialised activity, and provide an attractive destination for healthcare and education.

Using big data, we explored the urban design aspirations and outcomes of two emerging health and education precincts in Australia of comparable age, size and design intent through the lens of three themes: People, Place and Prosperity.

The more compact Gold Coast Health and Knowledge Precinct is developing into a work/live/play destination that gives people the practical advantages of density. At the Murdoch Specialised Activity Area, a distinctive low-density local bushland setting for several institutions results in separate but complementary land uses across a large site. The location and nature of transport infrastructure, food and retail services in both locations contribute significantly to precinct activity patterns.

This research project is just the start of our exploration of big data as a diagnostic tool in precinct design. While this type of data can help us understand 'what' is happening on site, we need supplementary qualitative data to tell us 'why'.

We will continue to dig deeper into the implications of our design decisions from almost a decade ago on these two major city-shaping projects. The lessons we learn will help us design places and spaces people love.



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Photography by Christopher Frederick Jones

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