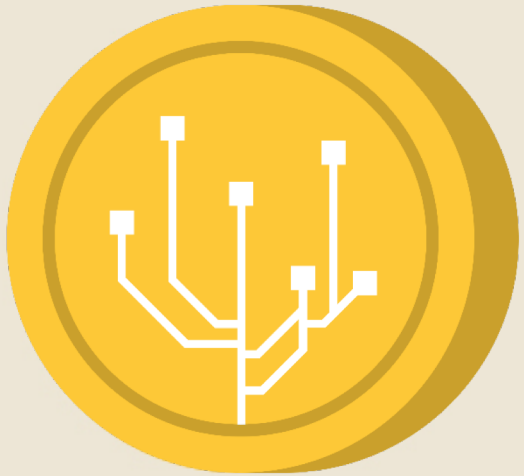

Making Money Smart

Indicative data analytics that could be supported by the smart money proof of concept

Companion document to the Making Money Smart Report
November 2018

CSIRO DATA 61

CommonwealthBank of Australia

Citation

Royal D[†], Lim N[†], Staples M*, Rimba P*, Gilder S[†] (2018) Making Money Smart: Indicative data analytics that could be supported by the blockchain proof of concept, Companion document to the Making Money Smart report, Data61 (CSIRO), Sydney.

[†] Commonwealth Bank of Australia
* CSIRO

Background

This is a companion document to the Making Money Smart Report: Royal D, Rimba P, Staples M, Gilder S, Tran A.B, Williams E, Ponomarev A, Weber I, Connor C, Lim N (2018) Making Money Smart: Empowering NDIS participants with Blockchain technologies, Data61 (CSIRO), Sydney.

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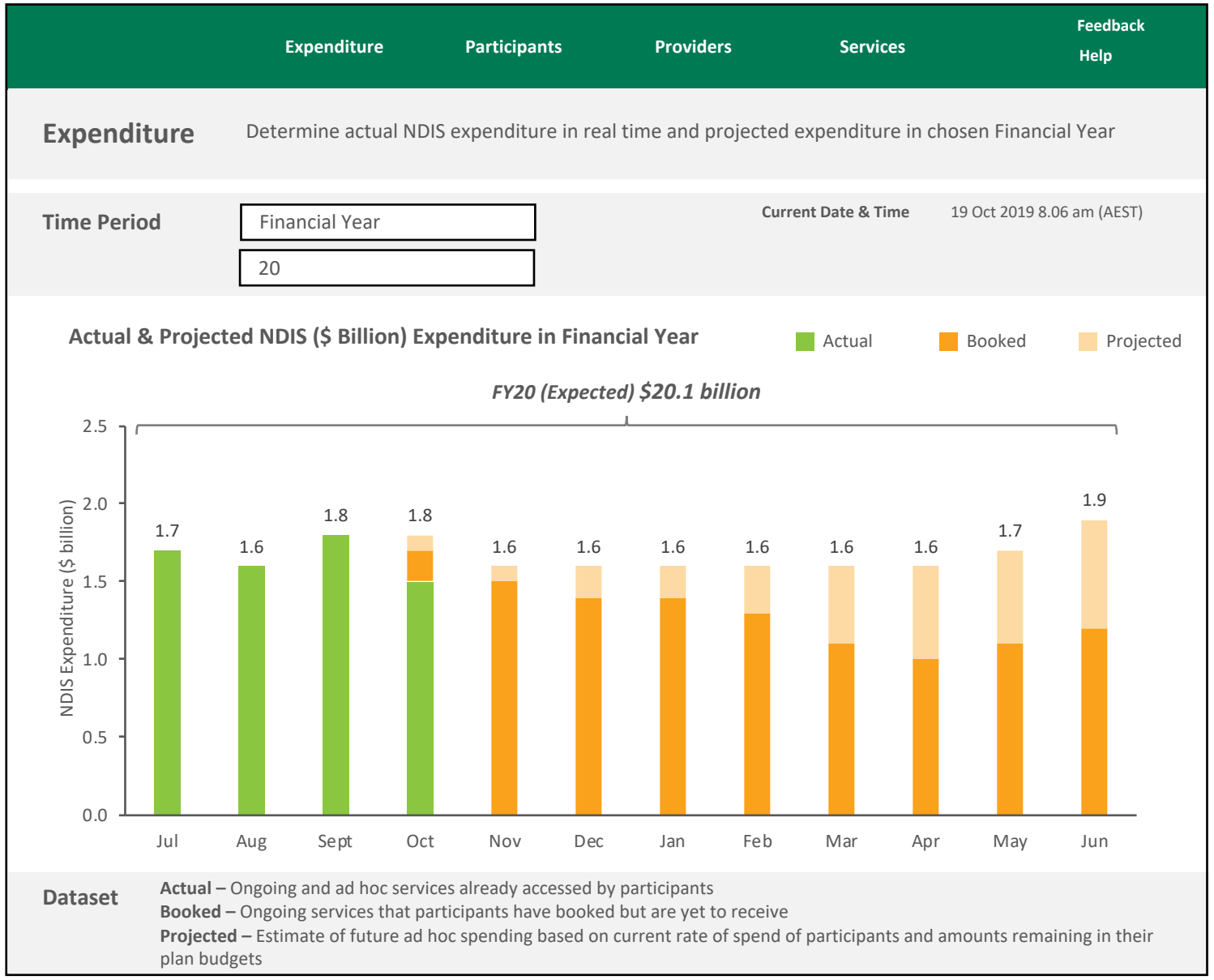
Executive Summary

1. This companion document provides examples of how the Making Money Smart proof of concept could support enhance data analytics for government and service providers (noting that data analytics benefits for participants are demonstrated in the working prototype and discussed in the Making Money Smart Report). The examples use synthetically created data. No real data is reflected in the examples. Any resemblance to actual data, people or businesses is purely coincidental.
2. Examples of data analytics that could assist government agencies and policy departments are provided on pages 4 to 16. The functions they could support include:
    - participant plan development and management/oversight
    - market custodianship
    - regulation of quality and safeguards
    - budget planning for the NDIS
    - policy analysis, development, review and improvement.
3. Examples of data analytics dashboards that could support Private or Agency Plan Managers are provided on pages 17 to 19.
4. Examples of data analytics that could assist service providers, including plan managers, are provided on pages 20 to 27. The functions that could support include:
    - improvements in service quality and customer centricity
    - improvements in service mix across regions
    - growth and sustainability of business models
    - plan management.
5. The proof of concept could support these functions by enhancing the visibility, timeliness, accuracy and coverage of data, while enabling appropriate controls to protect the confidentiality of participants and service providers. Transactional and budget-related data could be sourced from the blockchain-based system and be combined with backend data that the proof of concept captures but does not require blockchain to record (for example, service provider ratings and participants' self-assessments against their plan goals). In some instances, the data could also be combined with data held by government agencies and service providers to create richer datasets
6. The data analytics could be surfaced through a range of interfaces for government agencies, plan managers and service providers. These would require application programming interfaces (APIs) with strong security controls, the development of algorithms to structure the data and user friendly interface designs. The development of these elements were outside the scope of the Making Money Smart proof of concept.
7. Blockchain is not the only way to deliver these data analytics benefits in the future. The relative benefits of blockchain to, say, a centralised database are explored in Appendix A of the Making Money Smart Report. At a high-level, the key benefit of using blockchain is that it would create an immutable source of truth.

Examples of insights for government agencies and policy departments

Possible insights that the smart money proof of concept could deliver:	Page
1. Determine actual NDIS expenditure and automatically calculate forecasts	5
2. Compare the effectiveness of services in supporting participants to achieve their plan goals	6
3. Compare effectiveness of service providers as assessed by participants	7
4. Understand changes in the price of services over time	8
5. Compare the change in demand for different services over time	9
6. Compare the service utilisation levels of participants with different functional capacities	10
7. Understand service utilisation levels of participants from different backgrounds	11
8. Understand how well participants from different backgrounds are served	12
9. Estimate service coverage for specific services across regions	13
10. Understand trends in high risk / unusual spending activities over time	14
11. Identify outlier service providers for closer inspection	15
12. Identify jurisdictions with high proportions of registered providers relative to participant numbers	16

1. Determine actual NDIS expenditure and automatically calculate forecasts



Insight to action

- Produce timely budget forecasts at low cost.
- Ensure effective liquidity management for upcoming expenditure.
- Take proactive action to ensure sustainability of the NDIS within each financial year and across the forward estimates.

Illustrative example only – not based on real data

2. Compare the effectiveness of services in supporting participants to achieve their plan goals

Expenditure | Participants | Providers | Services | Feedback | Help

Participants

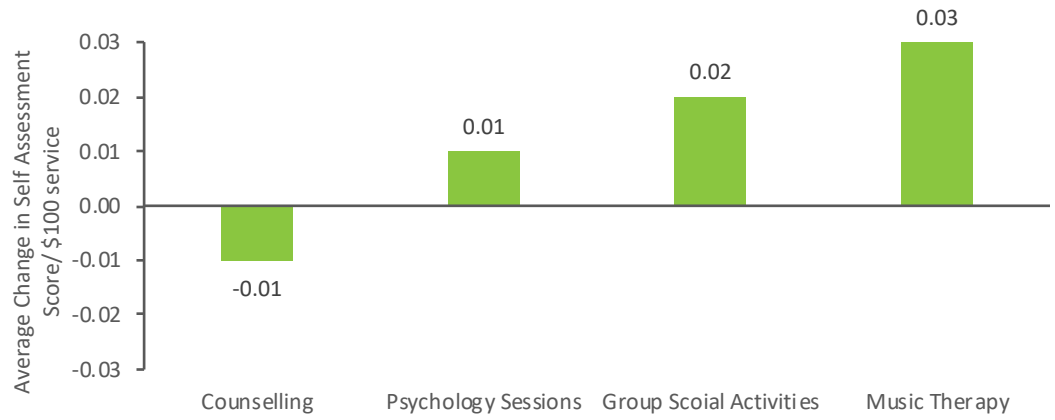
Determine which services have the strongest correlation with participants achieving their plan goals (per $100 of services accessed).

Current Date & Time 19 Oct 2019 8.06 am (AEST)

Primary disability	Autism	**Budget Type**	Capacity Building
Location	All States and Territories	**Budget Category**	Relationships

Correlation of $100 spends on services on participant plan goals over chosen time period (per $100 spend)

Date Range: 6m | **1y** | 2y | 3y



Dataset Self-assessment against plan goals by participants (scale of 1-5; 1-least impact, 5- most impact on achieving plan goals)

Insight to action

- Identify the types of services that best support participants with a particular disability.
- Ensure new participant plans provide access to the most effective services.
- Help service providers understand which services are most effective for people with different disabilities and encourage greater service provision where markets for these services are shallow.

Illustrative example only – not based on real data

3. Compare effectiveness of service providers as assessed by participants

Expenditure | Participants | Providers | Services | Feedback | Help

Providers

Compare value provided by different providers as assessed by NDIS participants (self-assessment against participants' goals)

Current Date & Time 19 Oct 2019 8.06 am (AEST)

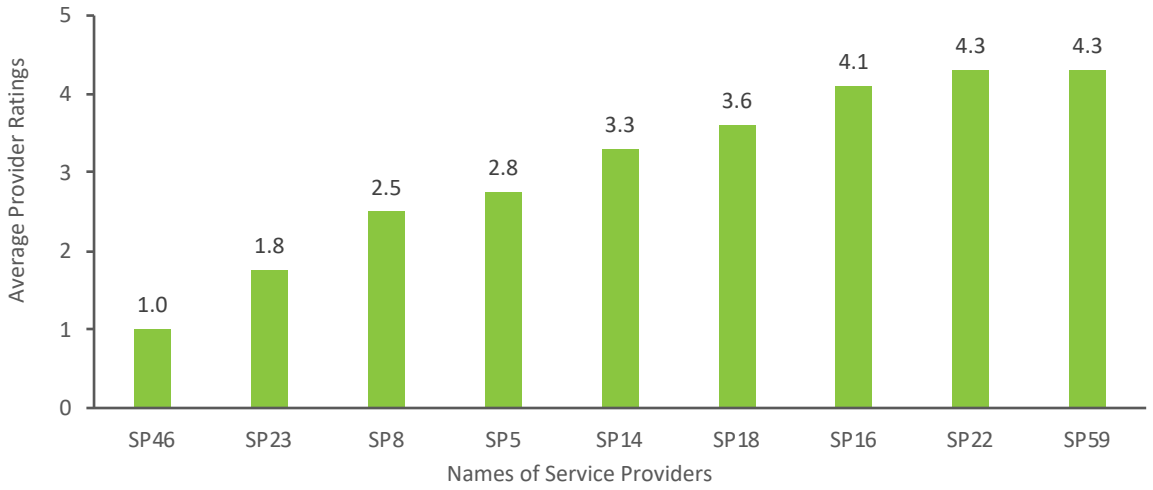
Provider Registration Group Community Nursing Care

Provider Location NSW - Riverina

Participant Disability Type Multiple Sclerosis

Service Providers Ranked by Average Participants' Provider Ratings

Date Range: 6m | **1y** | 2y | 3y



Dataset Average Provider Ratings by participants each time they access a service by a provider

Insight to action

- Understand participant satisfaction with services providers in a particular market.
- Engage proactively to understand the reasons behind different ratings and facilitate higher performance.
- Such analysis could include more granular information, including more specific geographic locations and additional participant categories such as age, gender, and cultural background.

Illustrative example only – not based on real data

4. Understand changes in the price of services over time

Expenditure | Participants | Providers | Services | Feedback | Help

Services

Determine change in price of a particular NDIS service over time

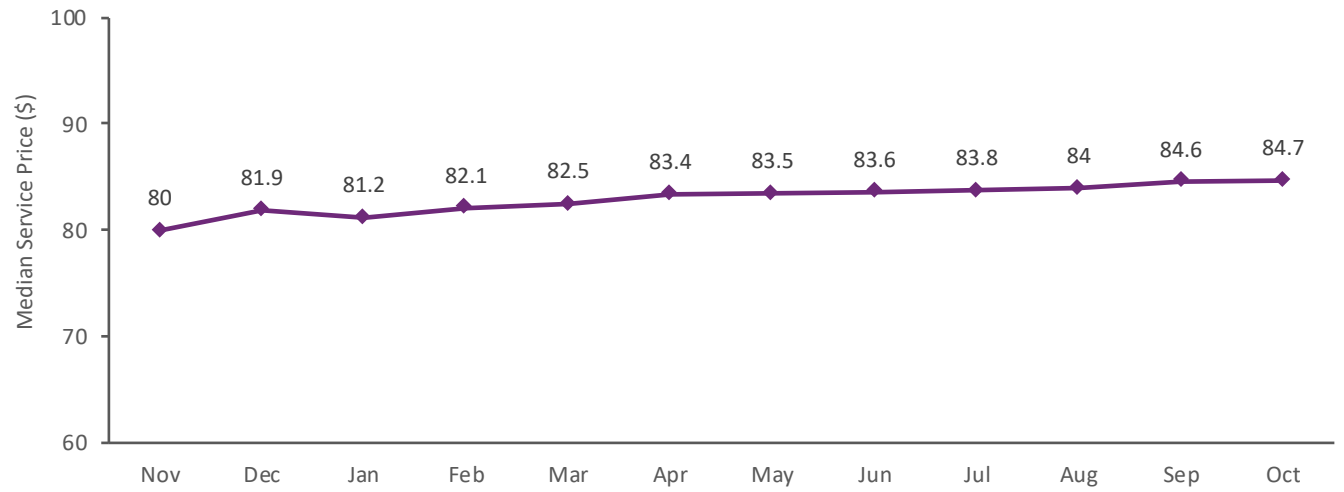
Service Type Exercise Physiology

Location VIC- Gippsland Region

Current Date & Time 19 Oct 2019 8.06 am (AEST)

Change in price & volume of NDIS Service (Exercise Physiology) Over Chosen Time Period

Date Range: 6m | **1y** | 2y | 3y



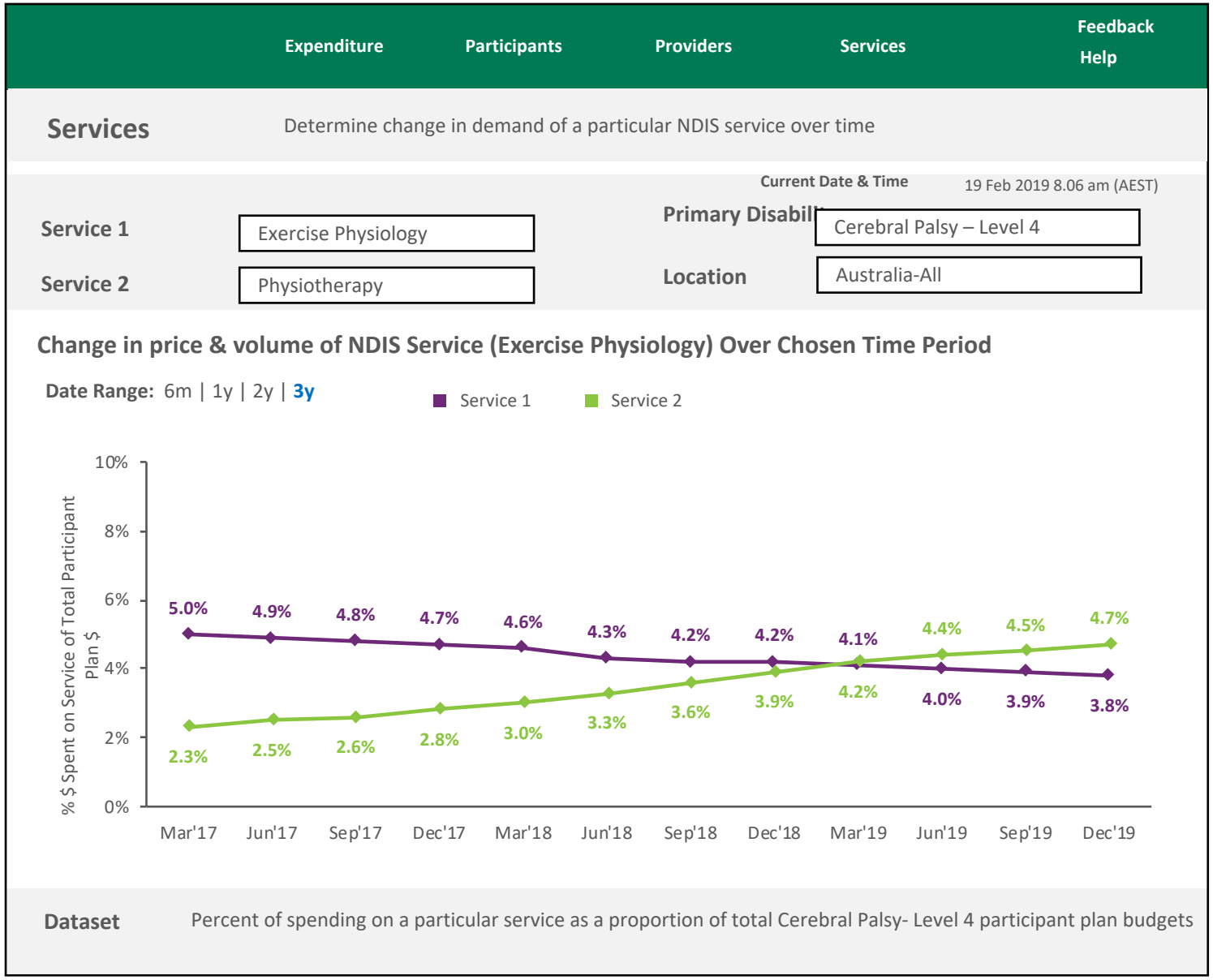
Dataset Price as recorded on the blockchain when participants release tokens to providers after provision of service

Insight to action

- Monitor price changes for NDIS services in particular regions over a chosen time period.
- Investigate areas where prices are rising without a clear explanation and intervene to improve market operations as appropriate.
- Ensure new participant plans reflect the prices of services available to participants.
- Estimate long-term costs of the NDIS.

Illustrative example only – not based on real data

5. Compare the change in demand for different services over time



Insight to action

- Identify services that are increasingly being used by people of a particular disability.
- Investigate the reasons behind shifts in demand and ensure new participant plans reflect these shifts as appropriate.
- Help service providers understand shifts in demand and ensure sufficient supply will be available.

Illustrative example only – not based on real data

6. Compare the service utilisation levels of participants with different functional capacities

Expenditure | Participants | Providers | Services | Feedback | Help

Participants Determine the level of service utilisation & average prices for a range of functional capacities

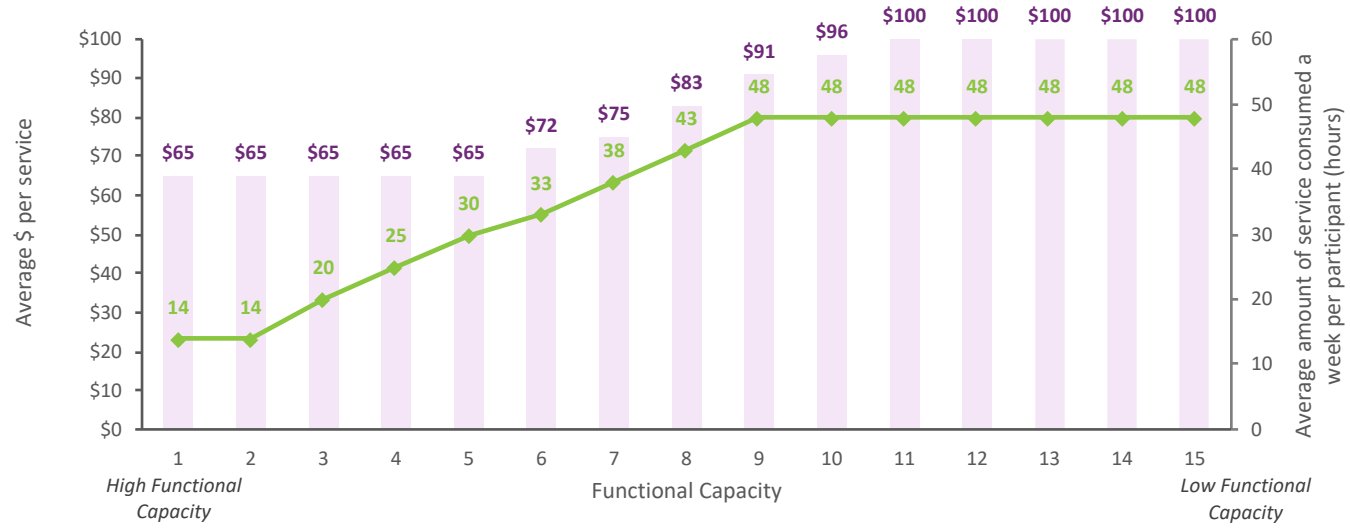
Current Date & Time 19 Feb 2019 8.06 am (AEST)

Service Daily Living Assistance

Primary Disability Cerebral Palsy

Location Australia - All

Level of service utilisation & average price of participants with different functional capacities



Dataset Service prices and amount of service hours as recorded in the blockchain

Insight to action

- Identify participant groups that are underserved.
- Encourage coverage for participant groups with complex needs through optimum price caps (e.g. the flat line in the example chart may indicate that people with low functional capacity are not receiving sufficient Daily Living Assistance services, potentially because service providers are unable to deliver the services sustainably at the $100 price cap).

Illustrative example only – not based on real data

7. Understand service utilisation levels of participants from different backgrounds

Expenditure | Participants | Providers | Services | Feedback | Help

Participants

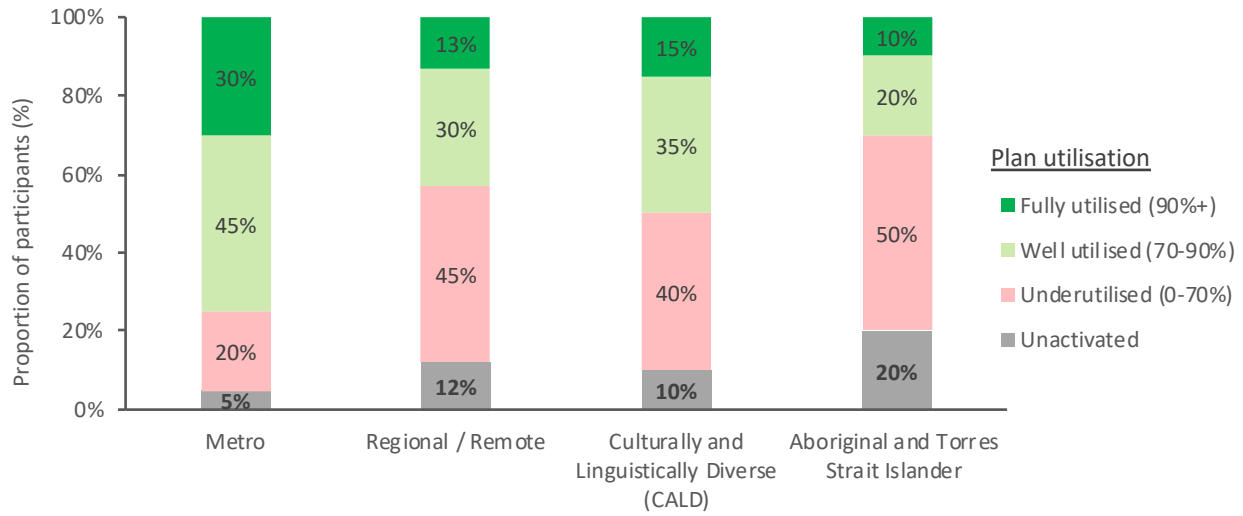
Determine service utilisation levels of participants from different backgrounds

Current Date & Time 19 Oct 2019 8.06 am (AEST)

Disability All

Location Queensland

Distribution of service utilisation levels by different participant groups



Dataset Plan utilisation rate calculated as total value of services accessed divided by total value of approved plans (for the latest full plan year by participant)

Insight to action

- Identify utilisation rates for participants from different backgrounds.
- Proactively design strategies to uplift NDIS utilisation rates, targeting participants with low utilisation rates and build on the success in regions where previous uplifts have occurred.

Illustrative example only – not based on real data

8. Understand how well participants from different backgrounds are served

Expenditure | Participants | Providers | Services | Feedback Help

Providers

Distribution of ratings of one provider registration group by different participant groups

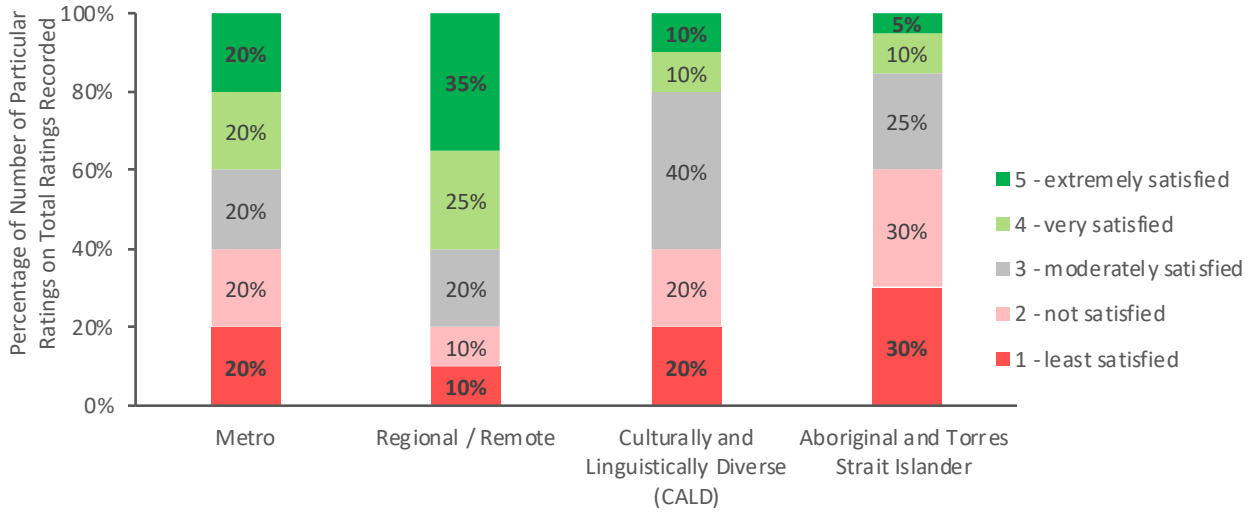
Current Date & Time 19 Oct 2019 8.06 am (AEST)

Provider Registration Group Daily Living Assistance

Provider Location Queensland

Ratings of provider registration group by different participant groups

Date Range: 6m | **1y** | 2y | 3y



Dataset Provider Ratings by participants each time they access a service by a provider

Insight to action

- Identify the effectiveness of different provider registration groups in serving participants from different backgrounds.
- Proactively engage with service providers and participants to understand the root cause of low satisfaction rates.
- Proactively engage with service providers and participants where service satisfaction is high to understand how their success can be shared across the NDIS.

Illustrative example only – not based on real data

9. Estimate service coverage for specific services across regions

Expenditure | Participants | Providers | Services | Feedback | Help

Providers

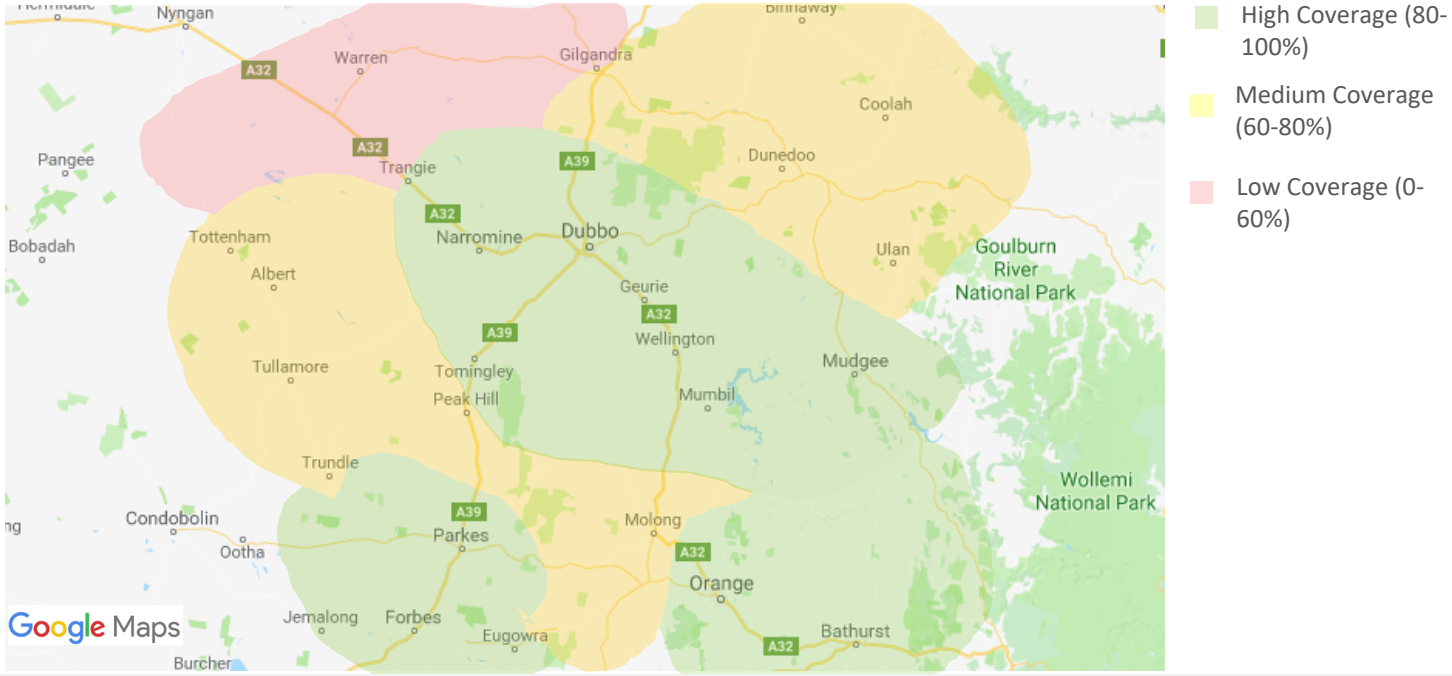
Determine coverage of a particular service provider (as a proportion of expected demand based on individual participant plans) in a selected region

Provider Registration Group: Home Modification

Location: NSW – Central West

Current Date & Time: 19 Oct 2019 8.06 am (AEST)

Coverage of service provider as a proportion of participants



Dataset: Coverage % = Total actual $ services accessed by participants as a proportion of total expected $ based on participants' plans (at a point in time)

Insight to action

- Understand areas where participants may be underserviced for specific services.
- Communicate market opportunities to service providers.
- Where markets are likely to continue to underservice participants, ensure participant plans have sufficient transport budgets.

Illustrative example only – not based on real data

10. Understand trends in high risk / unusual spending activities over time

Expenditure | Participants | Providers | Services | Feedback | Help

Expenditure

Identify high risk activities / unusual activities of participants

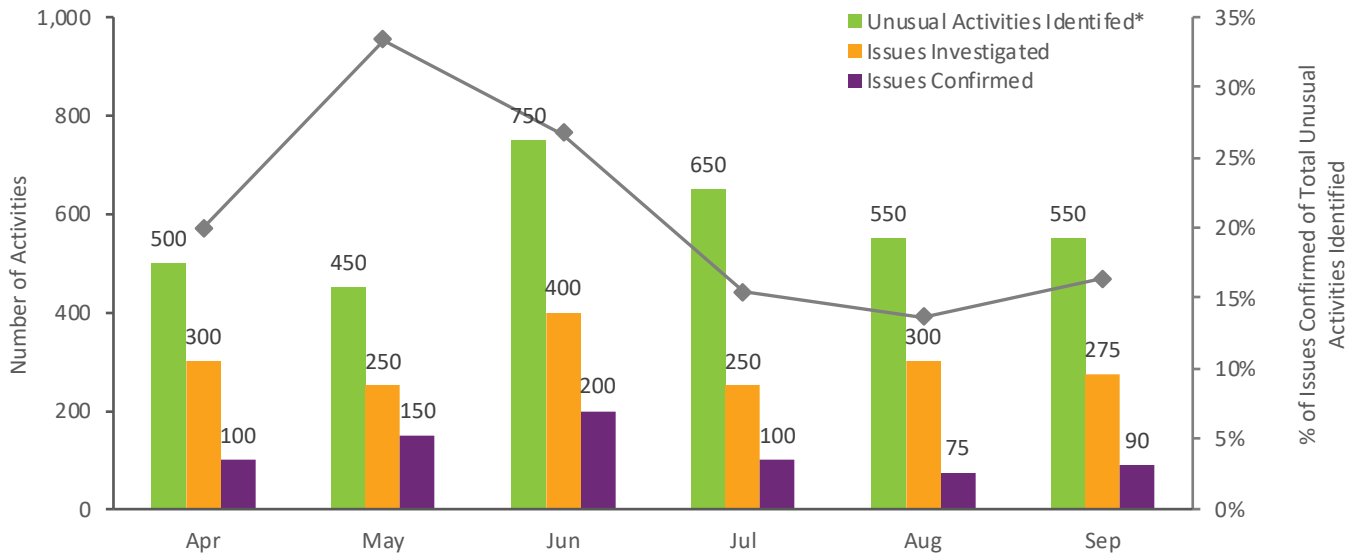
Location: NSW

Primary Disability: All

Current Date & Time: 19 Oct 2019 8.06 am (AEST)

Calendar Year: 2019

High Risk Activities Identified, Investigated & Confirmed



Dataset

- *Examples of unusual activities include: spending on services not common to people with that disability type; repeat spends in short durations; rapid increase in spending by nominees, etc.
- Machine learning could be used to improve accuracy of model in detecting unusual activity over time.

Insight to action

- Proactively identify participants at risk of misspending and, where relevant, help them get back on track.
- Identify and quickly address instances of uncompliant behaviour by nominees, plan managers and service providers.
- Prevent uncompliant behaviour through higher and faster identification rates.

Illustrative example only – not based on real data

11. Identify outlier service providers for closer inspection

Expenditure | Participants | Providers | Services | Feedback | Help

Providers

Identify providers that significantly price above* industry average for a particular service
* Greater than 3 standard deviations above average cost

Current Date & Time: 19 Oct 2019 8.06 am (AEST)

Provider Registration Group	Daily Tasks/Shared Living	Service	Assistance with Self-Care Activities
Location	QLD- Metro	Financial year	FY20

Providers that price significantly above* industry average for a particular service

* Greater than 3 standard deviations above average cost

Provider Name	Average Price Charged	% Greater than Average Price	Average Provider Rating by Participants
Provider Name 1	$267	70%	1.7
Provider Name 2	$219	39%	3.5
Provider Name 3	$216	38%	4.6
Provider Name 4	$214	36%	4.2
Provider Name 5	$214	36%	1.8
Provider Name 6	$213	36%	3.9
Provider Name 7	$210	34%	2.5
Provider Name 8	$208	33%	2.9
Provider Name 9	$208	33%	3.8
Provider Name 10	$208	33%	3.6

Average Price for **Daily Tasks/ Shared Living** Provider Group for **Assistance with Self-Care Activities** **$157 per day**

Total 33 listings

<**Prev** 10 listings **Next**>

Dataset Provider prices and service ratings obtained from blockchain.

Insight to action

- Identify outlier (and potentially high-risk) providers for further investigation.
- Develop strategies to intervene in markets where service providers are at risk of delivering sub-optimal value for money.

Illustrative example only – not based on real data

12. Identify jurisdictions with high proportions of registered providers relative to participant numbers

Expenditure | Participants | Providers | Services | Feedback | Help

Providers

Identify local government areas with high proportions of provider registrations relative to participant numbers

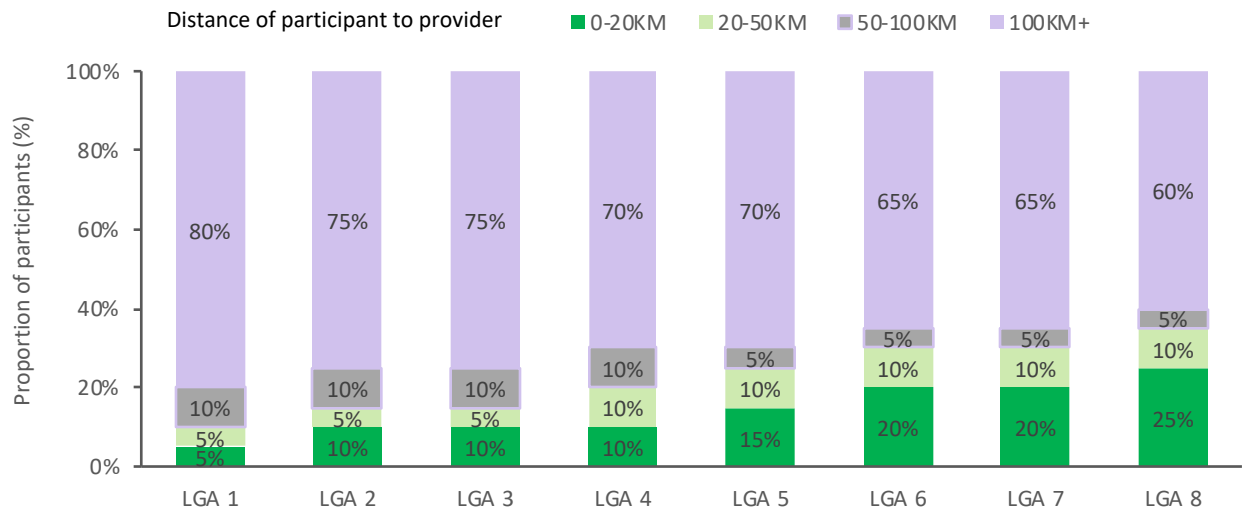
Location Australia-All

Distance Range 100KM+

Current Date & Time 19 Oct 2019 8.06 am (AEST)

Distance of participant to provider by Local Government Area

Date Range: 6m | **1y** | 2y | 3y **Sort** ▼*Proportion of Participants Large to Small*



Dataset **Distance of participant to provider:** Distance of registered address of participant to registered address of provider

Insight to action

- Identify Local Government Areas with disproportionately high ratios of registered providers to participants
- Consider if unusually high registration rates are driven by market forces or registration arbitrage (that may pose risks to service quality)

Illustrative example only – not based on real data

Examples of dashboards for private and agency plan managers

Possible insights that the smart money proof of concept could deliver:	Page
1. View comprehensive, real-time dashboards for portfolios of participants	18
2. View comprehensive, real-time dashboards for individual participants	19

Illustrative example only – not based on real data

1. View comprehensive, real-time dashboards for portfolios of participants

Welcome, Arturo Cuevas Sanchez (Plan Manager)

NDIA Staff ID 628064 Feedback
State SA Help

Sort by | Location: SA – Mt Gambier | Primary Disability: All | Current Date & Time: 30 Jun 2019 8.06 am (AEST)

202 results

Participant Name Example names only- not real	NDIS Number	Management Type Self, Plan or Agency Managed	Budget progress On-track · Overspend · At risk · Inactive	Self-Assessment Against Plan Goals Average across all participants' goals	Flags for action Click on participant name to look at detail	Plan Start Date	Plan End Date
Battii, Lisa	4312345678	Self			2	1 Oct 2018	30 Sept 2019
Batziolas, Bill	4356781234	Agency		No ratings given	0	5 July 2019	4 Jul 2020
Bazi, Ahmed	4300789567	Plan			1	1 Apr 2019	30 Mar 2020
Beaman, Tina	4387412340	Plan			0	29 Sep 2018	28 Sep 2019
Benjamin, Sue	4355558764	Self			2	15 Oct 2018	14 Oct 2019
Bhusan, Biji	4343567123	Agency			3	7 Jan 2019	6 Jan 2020
Biaggini, Miros	4353297431	Self			2	15 Dec 2018	14 Dec 2019
Bianco, Robert	4365879012	Plan		No ratings given	0	22 Oct 2018	21 Oct 2019
Bui, Thuy	4322151067	Self			0	31 Aug 2018	30 Aug 2018
Bui, Van	4369702312	Agency			0	1 Jul 2018	30 June 2019

Illustrative example only – not based on real data

2. View comprehensive, real-time dashboards for individual participants

Welcome, Arturo Cuevas Sanchez (Plan Manager)

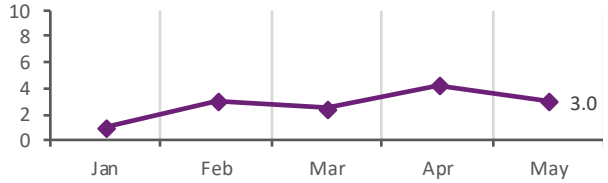
NDIA Staff ID 628064 Feedback
State SA Help

Participant Name Lisa Battii (F)
NDIS Number 4312345678
DOB 15 October 1997 (22 years, 5 months)
Address 23 Magnolia Cres, Mt Gambier SA 5290
2 flags for attention

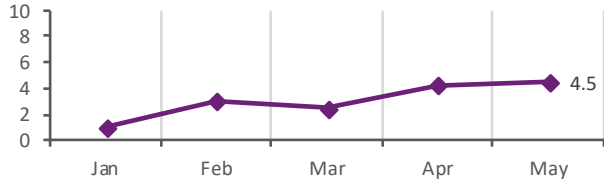
Cultural Group Aboriginal and Torres Strait Islander
Plan Mgmt Type Self-Managed
Plan Period 1 October 2018 to 30 September 2019 *(91 days remaining)*
Nominees Mary Battii (Mother) Authority: Spending

Goals and self-assessed progress

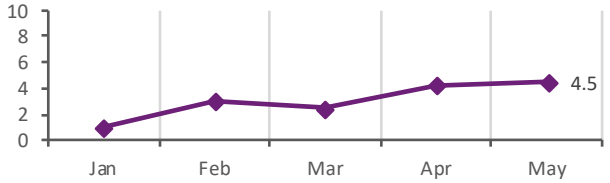
Lisa's first goal is to maintain her engagement with her community and start playing wheelchair basketball



Lisa's second goal is to get and maintain a job in public administration



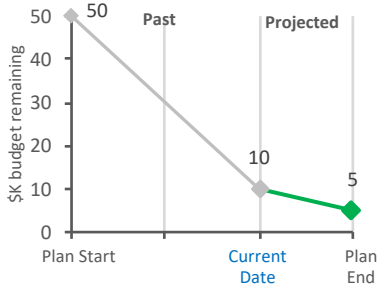
Lisa's longer term goal is live independently with her partner



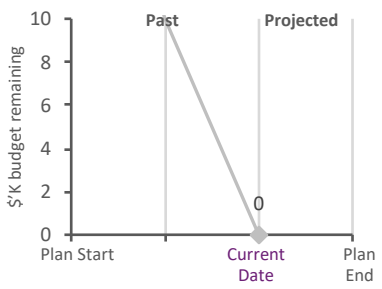
Primary Disability Spinal Chord Injury **Secondary Disability** Nil

Budget Progress

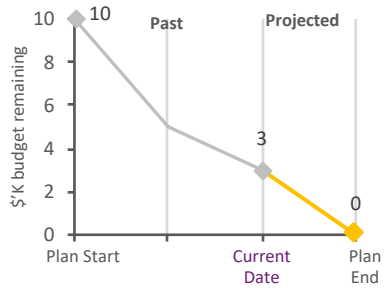
Core Supports



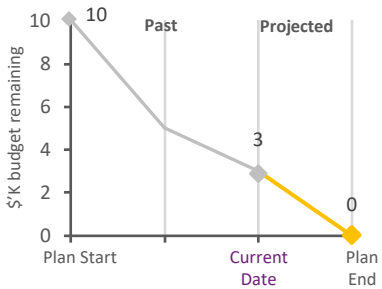
Capacity Building - Daily Activity



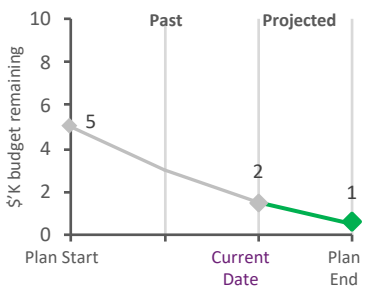
Capacity Building - Employment



Capital Supports – Wheelchair



Capital Supports – Stair lift



Flags

1. One unusual spend detected, due for investigation by 15 July 2019, see more
2. One request for plan review, due for review by 30 July 2019, see more

Additional Details

Illustrative example only – not based on real data

Examples of insights for service providers

Possible insights that the smart money proof of concept could deliver:	Page
1. View participant, revenue and ratings snap shot of your business	21
2. Understand relationship between participant satisfaction and market share	22
3. Monitor actual NDIS revenue and automatically calculate forecast revenue	23
4. Compare share of plan among other providers	24
5. Compare prices of services against other providers	25
6. Determine coverage of service providers in a selected region	26
7. Example of possible built-in confidentiality protections for tight search criteria	27

Illustrative example only – not based on real data

1. View participant, revenue and ratings snap shot of business

Welcome, Home Assist 4U Pty Ltd

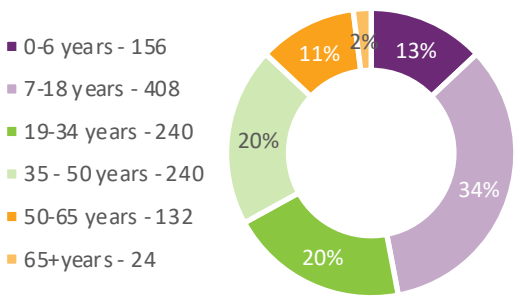
Provider ID 626666 Feedback
State NSW Help

My Portfolio

Current Date & Time 19 Feb 2019 8.06 am (AEST)

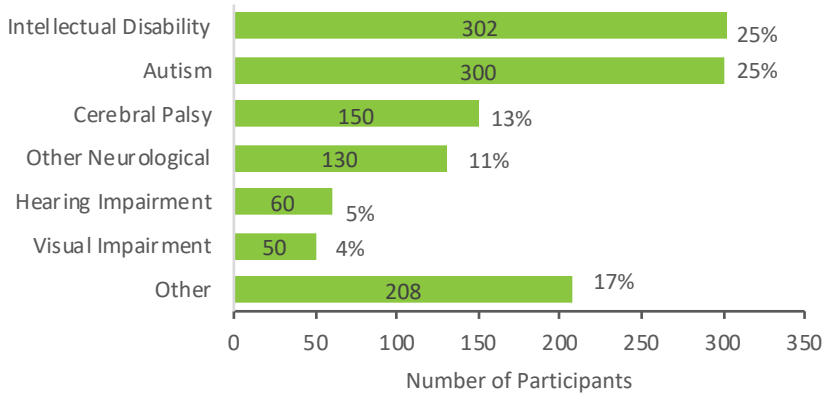
Your Participants

Age



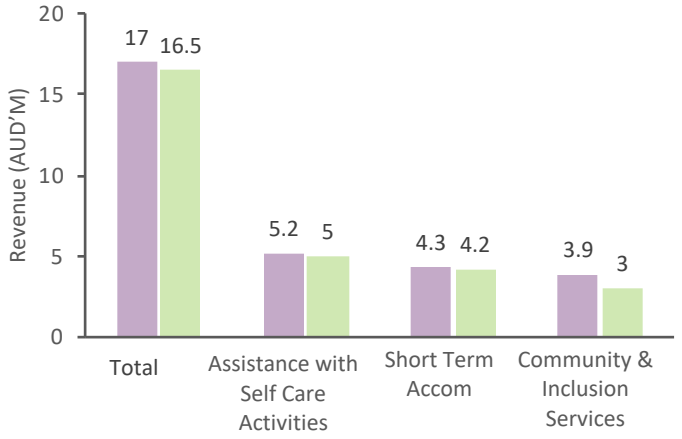
Total= 1,200

Primary Disability



Your Revenue

Top 3 Services



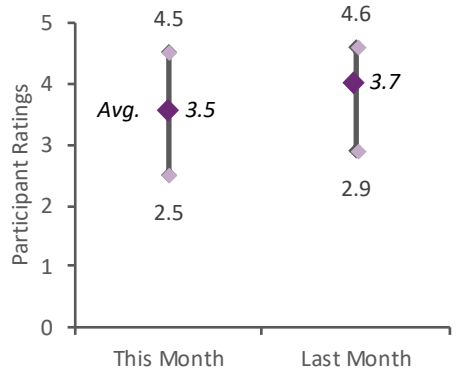
Top 3 Locations

Locations	Revenue AUD'M
1. Belrose NSW	2.55 (15%)
2. Wollongong NSW	2.23 (13%)
3. Reservoir VIC	1.97 (11%)

Avg. $ per Participant $14,167

Your Ratings

Service Ratings



Illustrative example only – not based on real data

2. Understand relationship between participant satisfaction and market share

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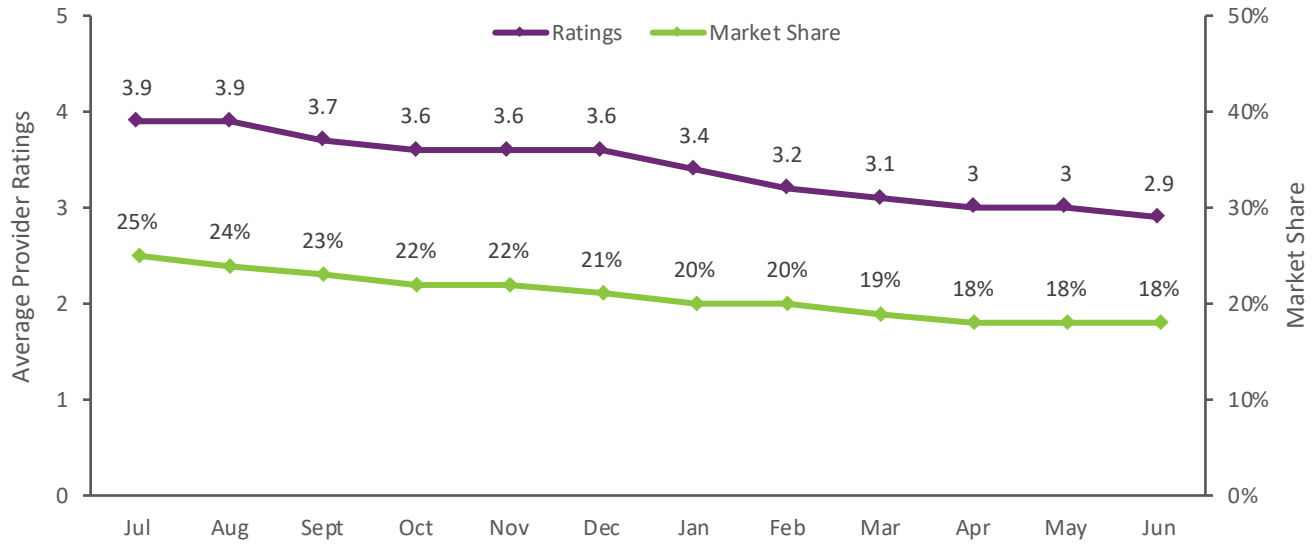
Ratings Understand relationship between participant satisfaction and market share

Location NSW Metro ▼ **Disability** Cerebral Palsy ▼ **Service** All ▼

Impact of Participant Ratings on Market Share

Date Range: 6m | **1y** | 2y | 3y



Dataset Average Provider Ratings (1-5 Scale) by participants each time they access a service by a provider

Insight to action

- Determine relationship between participants' ratings of services and impact on market share
- Proactively devise strategies to improve participant satisfaction if there has been a reduction in market share driven by declining participant satisfaction

Illustrative example only – not based on real data

3. Monitor actual NDIS revenue and automatically calculate forecast revenue

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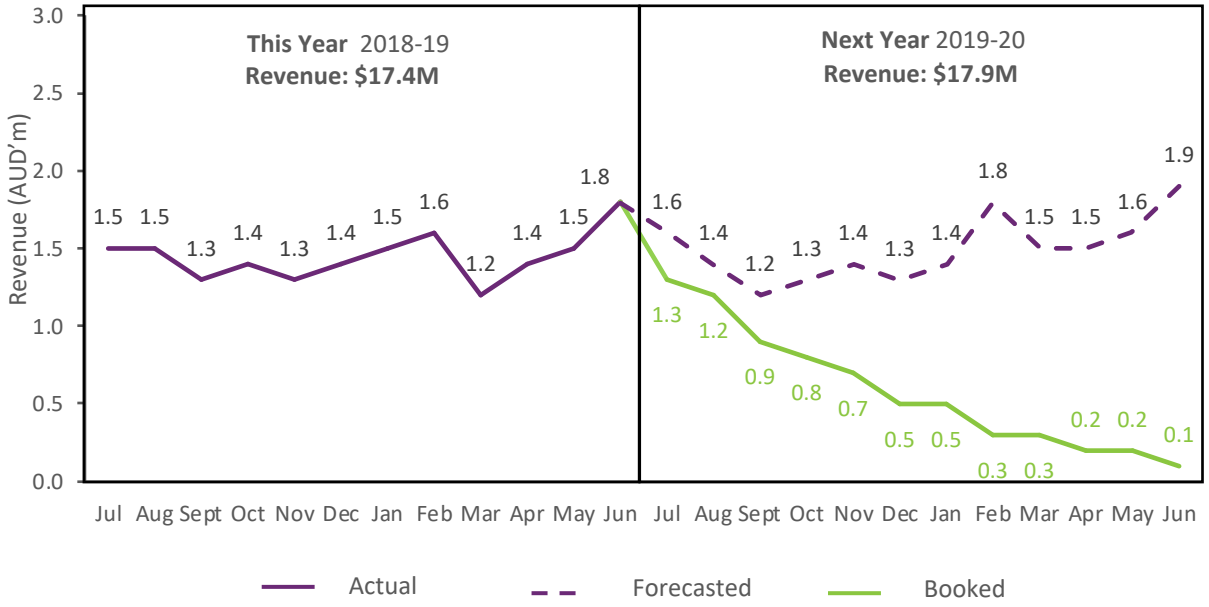
Revenue Monitor actual NDIS revenue and automatically calculate forecast revenue

Location: All | Disability: All | Service: All

Revenue (Actual & Forecast) Attributed to NDIS



Dataset

Actual – Ongoing and ad hoc services already accessed by participants

Booked – Ongoing services that participants have booked but are yet to receive

Forecasted– Estimate of future spending based on current spending rates and available funds in budgets

Insight to action

- Understand revenue received to date in real-time
- Forecast revenue based on services booked to assist with business planning (such as budgeting and rostering)

Illustrative example only – not based on real data

4. Compare share of plan among other providers

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Revenue Compare share of plan among other providers

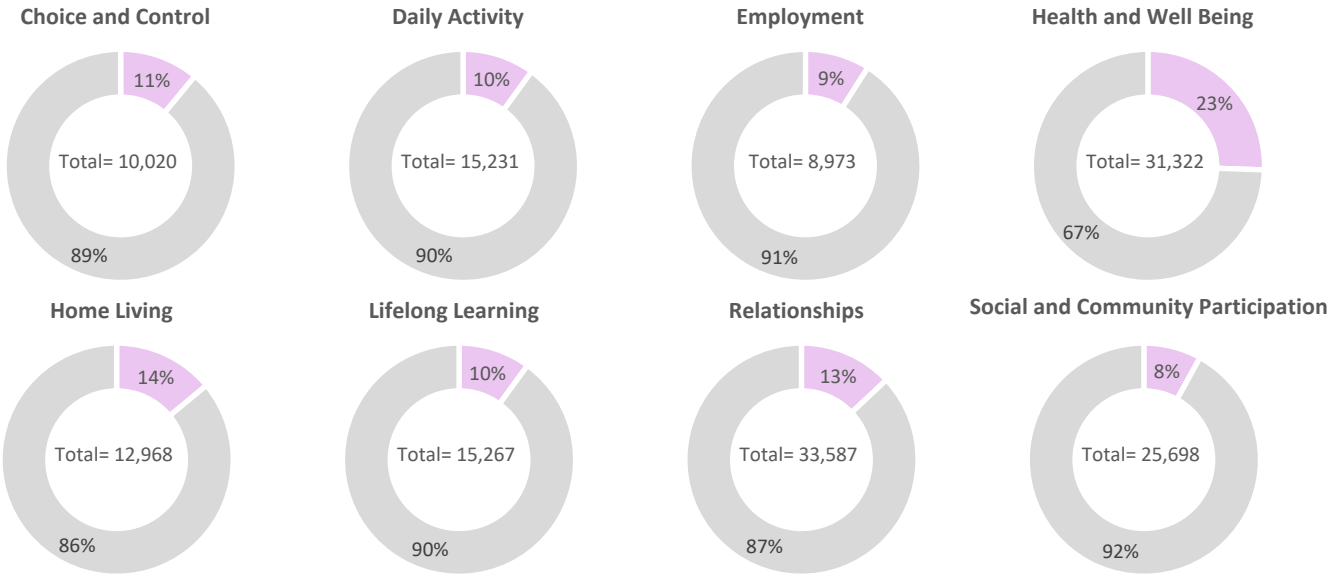
Location VIC **Budget Type** Capacity Building

Share of plan

Date Range: 6m | **1y** | 2y | 3y

Total Market Share across Capacity Building **12%** (Total=40,512 participants with approved plans)

Your Market Share



Dataset **Market Share-** calculated as the proportion of provider revenue (in a particular category) over total revenue in the same category

Insight to action

- Identify areas / categories where market share is lower than average
- Proactively devise strategies to either specialise in some markets or increase market share across multiple categories.

Illustrative example only – not based on real data

5. Compare prices of services against other providers

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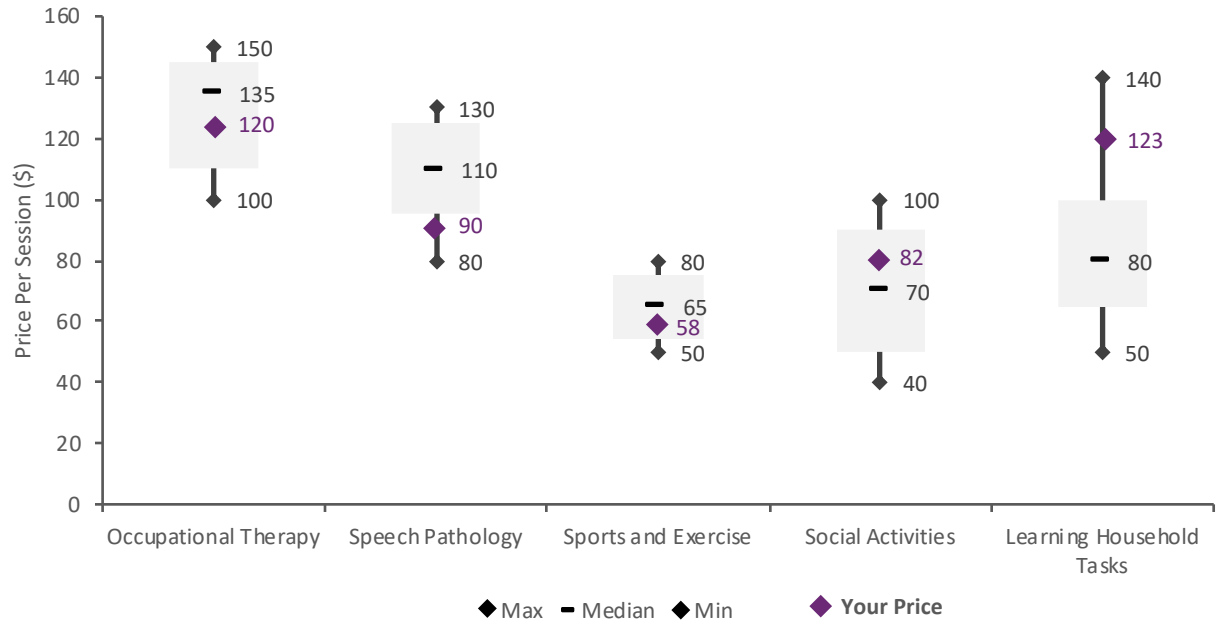
Services Compare prices of top 5 services against other providers

Location QLD

Prices of Top 5 Services vs. Other Service Providers

Date Range: 6m | **1y** | 2y | 3y



Dataset **Price Per Session** – as recorded in the app when participants use token for service

Insight to action

- Determine the price of services relative to competition
- Position prices to match value proposition in the market and maximise service sustainability

Illustrative example only – not based on real data

6. Determine coverage of service providers in a selected region

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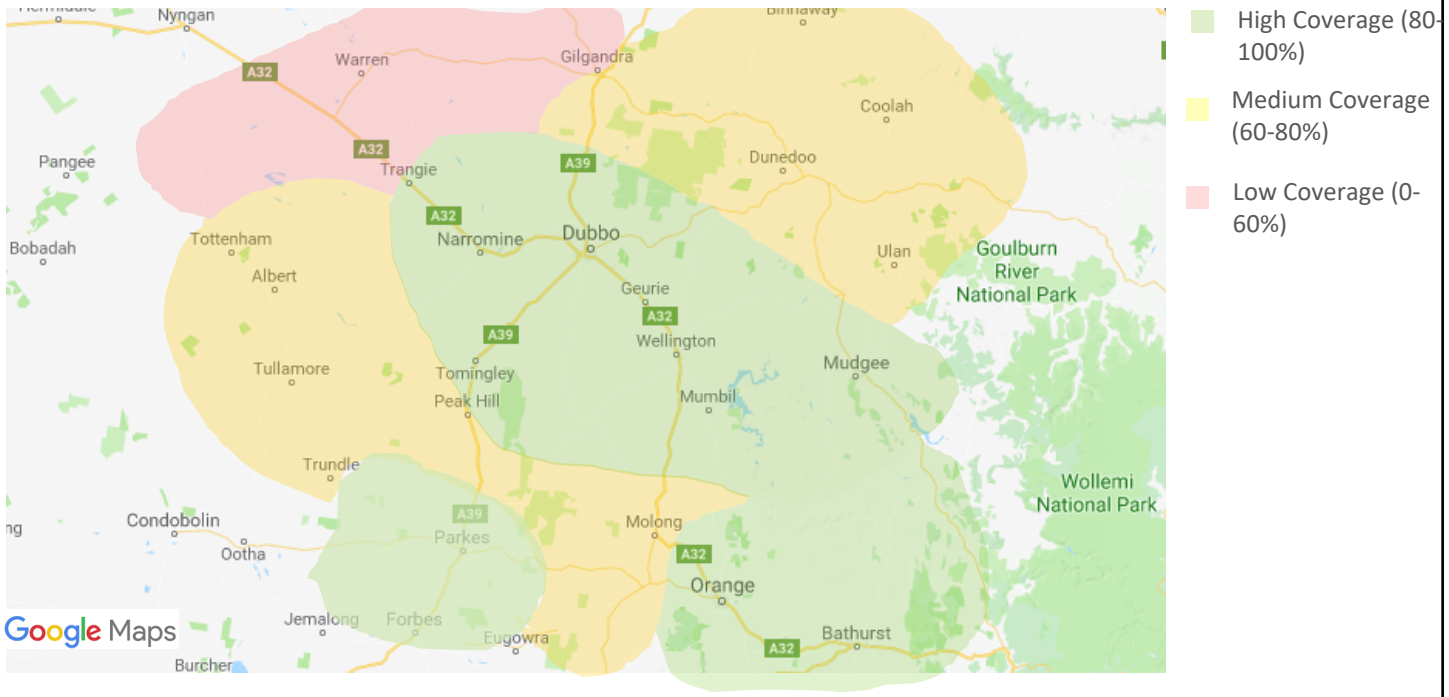
Services Determine coverage of service providers (as a proportion of expected demand based on individual participant plans) in a selected region

Location NSW – Central West **Service** Occupational Therapy

Coverage of service provider as a proportion of participants



High Coverage (80-100%)

Medium Coverage (60-80%)

Low Coverage (0-60%)

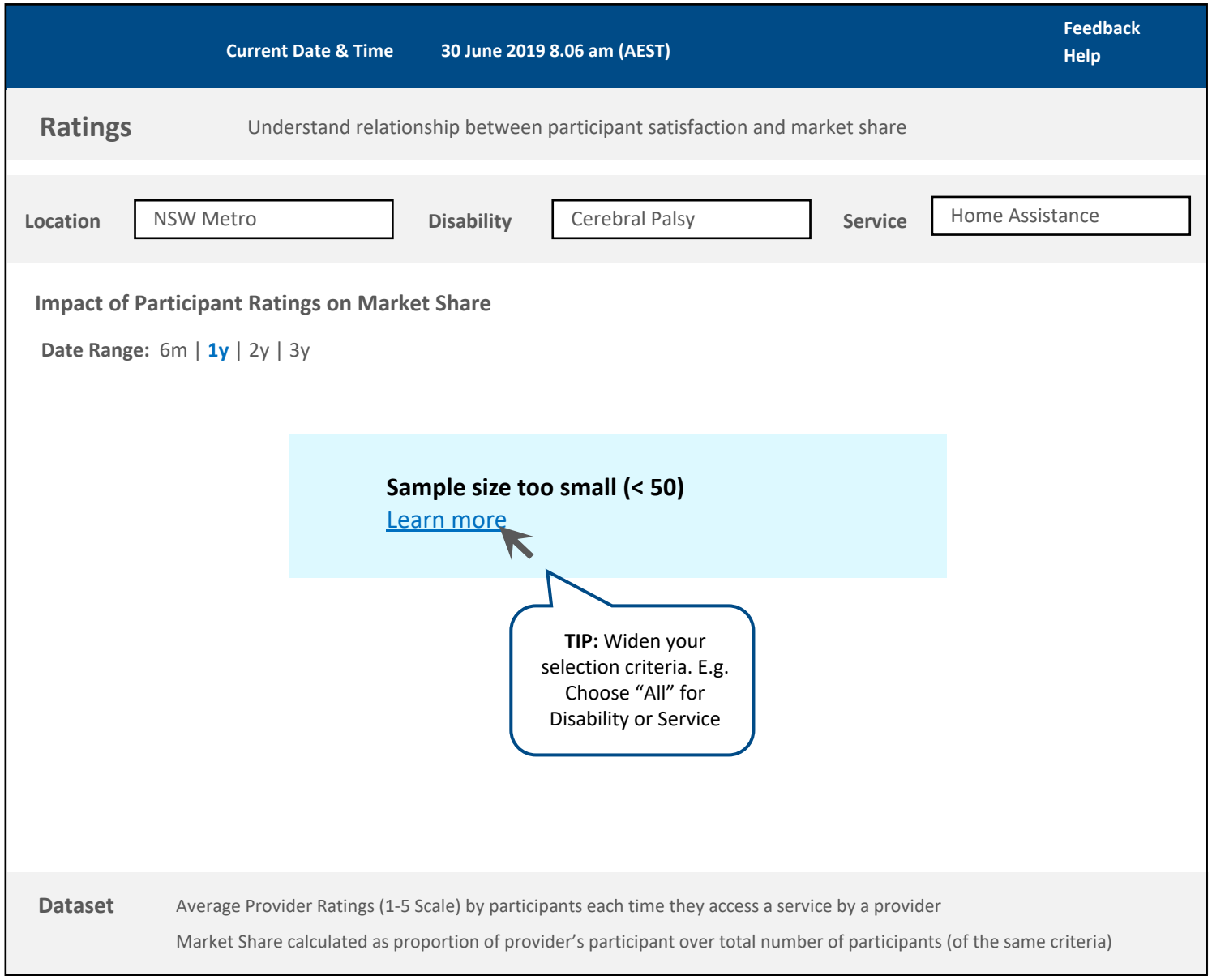
Dataset Coverage % = Actual service ($) accessed by participants as a proportion of expected expenditure ($) for services based on participants' plans

Insight to action

- Identify areas with low service coverage for NDIS participants (potential business opportunity)
- Proactively identify regions for expansion and specialisation

Illustrative example only – not based on real data

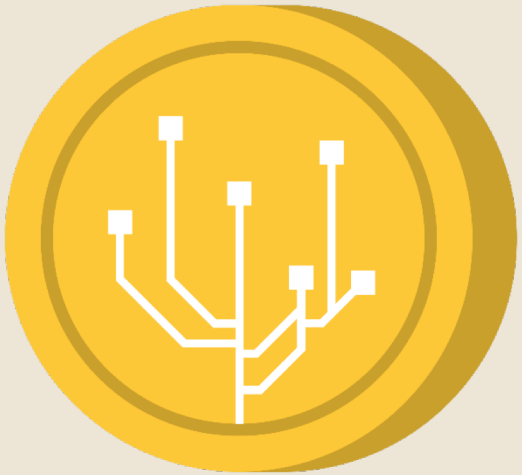
7. Example of possible built-in confidentiality protections for tight search criteria



Insight to action

- This page illustrates how privacy controls could prevent searches that result in small numbers of participants and/or providers (which could otherwise risk the confidentiality of participants' personal information or competitors market sensitive information).

Illustrative example only – not based on real data



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