

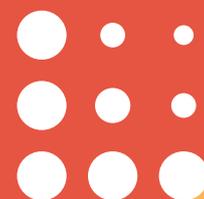
Lumos Evaluation

Report 3

October 2023



Lumos



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CONTENTS

	From the Executive Sponsor	4
	Key findings	5
	The Lumos program evaluation	7
Domain 1	Engagement Advancing social license, collaborative partnerships and stakeholder engagement	9
Domain 2	Technical Solutions Integrating primary and acute care data into standard operational procedures	21
Domain 3	Analytics and Reporting Meaningful, reliable and practical insights	27
Domain 4	Delivery of value High quality, policy relevant and system-wide transformational insights	35
	Appendix 1: Stakeholder List	47
	Appendix 2: GP Survey	48
	Appendix 3: Representatives of Lumos Practices	57
	References	58

From the Executive Sponsor

I am delighted to introduce the Lumos program's third evaluation report. This report marks the end of funding of the program as a feasibility exercise, and the beginning of its transition to business as usual. The engagement with stakeholders has seen continuous growth, and the data asset's value is widely acknowledged, including at the Commonwealth level. This support for the Lumos program reflects the increasing enthusiasm for comprehensive, system-wide data covering the entire patient journey.

Over the last year, the Lumos program has concentrated on establishing itself in a business-as-usual environment. It is now recognised as a valuable source of system-wide data that contributes to evidence-based decision-making, enhances health service planning and delivery, ensures cost-effective solutions, and improves patient outcomes.

Lumos continues to provide valuable evidence to back national, state, and local priorities. Lumos has been instrumental in supporting the implementation of urgent care services that aim to reduce the strain on hospital emergency departments.

Participation in the Lumos program has been made a prerequisite for primary care services that wish to offer NSW Health funded urgent care services. Lumos will play a crucial role in delivering data for evaluating and understanding the outcomes of these initiatives.

In November 2022, the Lumos program was a winner in the 24th Annual NSW Health Awards in the Health Research and Innovation Category. Numerous articles in the public media have spotlighted Lumos and its value and impact, highlighting how Lumos data can identify opportunities to enhance patient care, decrease hospital readmissions, and, ultimately, support system sustainability.

Lumos is widely viewed as an exemplar in healthcare data linkage nationally and has also been of considerable interest internationally. This third evaluation report dives deeper into the program's accomplishments, progress, and success. We extend sincere thanks to our dedicated partners for their invaluable contributions in helping us reach this pivotal milestone over the past seven years.

Sharon Smith
Lumos Executive Sponsor and Executive Director
System Information and Analytics (SIA)
NSW Health

KEY FINDINGS

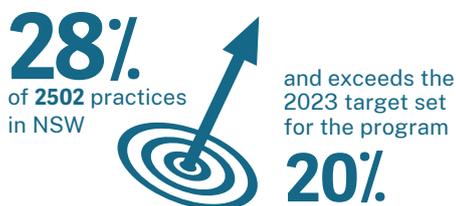
Stakeholder engagement is broad and satisfaction is high

Over the past 12 months, the Lumos program has focused on building greater and stronger relationships at various levels, including Commonwealth and state, and with Aboriginal stakeholders, Primary Health Networks (PHNs), and general practitioners.



participating in the Lumos program at the time of reporting, capturing information on more than 5 million patient journeys across NSW.

This represents



Looking to the future: a national model

- There is growing interest in replicating Lumos's value nationally to follow patient journeys in health systems.
- A national hub and spoke model for sharing health service data has received in-principle approval by Health Ministers to improve population health planning and patient outcomes. Design and feasibility considerations of the model will commence in 2024.
- Lumos has the potential to provide valuable information and evidence to monitor and evaluate the national MyMedicare initiative in the local NSW context.

The Lumos program facilitates secure and scaled technical operations

- Data privacy remains a top priority, with a strong focus on ethical compliance and public trust. The Lumos program is actively exploring ways to expand data linkages to improve healthcare planning and delivery while engaging a wide range of stakeholders.
- The Lumos team is committed to remaining vendor-agnostic, with established automated data extraction processes and continuing expansion to allow the inclusion of new data extraction vendors as required.

KEY FINDINGS

Lumos delivers meaningful, reliable and practical insights

The Lumos program delivers actionable insights in a variety of consumable formats including practice reports, insight reports, and factsheets.

These reports consistently receive positive feedback regarding their usability and relevance. For example, in a recent survey of participating practices, 64% of general practices (GPs) reported finding the reports easy to digest and 78% consider the content relevant to their individual practice.

78% of participating practices consider the reports relevant to their practice

- Stakeholders, including GPs and PHNs, have increasingly utilised Lumos data for service planning and quality improvement initiatives. At the state level, Collaborative Commissioning and the Statewide Diabetes Initiative are utilising Lumos to improve healthcare outcomes for targeted population groups.
- Improvements to the structure and visualisation of practice reports to enhance the user experience, will be implemented in 2024. A project is underway to address faster reporting, aiming for a six-month reporting cycle.

The value of Lumos is evident

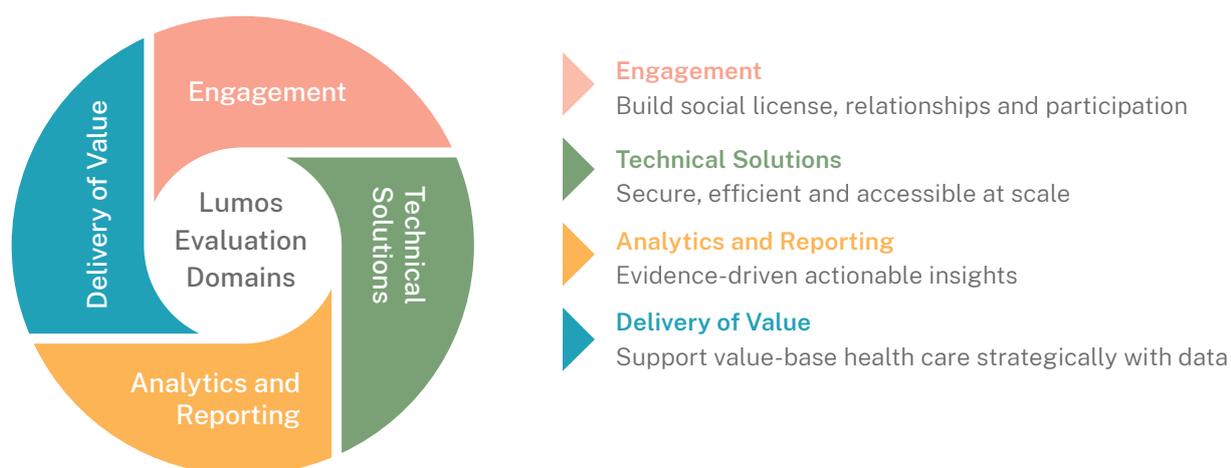
- Large-scale linkage of general practice data with health system data offers more complete visibility of patient health care journeys; Lumos demonstrated that valuable information to support decision-making in healthcare can be harvested from a better understanding of patient journeys and their outcomes.
- The Lumos data asset has been used to inform the NSW state planning for Urgent Care Services (UCS), with UCSs aiming to reduce the strain on emergency departments. Lumos data will also be crucial for evaluating the impact of UCSs on emergency department presentations and patient flow.
- Lumos data has been used to study various aspects of healthcare, including diabetes, cardiovascular disease, heavy menstrual bleeding treatment pathways and healthcare usage among aged care residents. These insights from Lumos data inform strategies for improving patient outcomes and healthcare services.
- Stakeholders recognise Lumos as a catalyst for healthcare innovation and research and partnerships are leveraging Lumos data to improve patient care and outcomes, including for cardiovascular risk and diabetes screening and management.

The Lumos Program Evaluation

The Lumos program evaluation presents the culmination of seven years of collaborative efforts. Lumos has benefited from approximately \$15 million in funding from NSW Health and Commonwealth Health Innovation Fund grants over the last 5 years, with the program being developed to continue to operate as business-as-usual. This report is the third evaluation and assesses the program's progress across four domains including engagement, technical solutions, analytics and reporting and delivery of value. The evaluation draws on a variety of documents and data sources, including key informant interviews and survey feedback from participating general practitioners. Originating as a pilot project in 2016 and transitioning to scale-up in 2020, Lumos seeks to establish a robust data asset that underpins state-

wide healthcare initiatives in primary and acute care. As Australia's first state-wide linked data asset, Lumos demonstrates innovative technology, advanced privacy management, and sophisticated data governance capabilities. It aligns with key healthcare strategies at both the national and state levels and has played a pivotal role in supporting healthcare reform initiatives. By providing essential data for accountability and evaluation, Lumos contributes to better healthcare decision-making and patient outcomes, making it a valuable resource in the healthcare landscape. Monitoring and evaluating the Lumos program is structured around four domains that provide the foundation for translation of the framework's overarching evaluation questions into detailed measurable objectives and milestones (Figure 1).

Figure 1
Four Evaluation Domains are structured around the Lumos program



The evaluation process adhered to the [Monitoring and Evaluation Framework](#), and data collection involved three primary sources:

1. Stakeholder Consultations:

- The objective was to assess the value and benefits of Lumos, challenges encountered, and prospects for the future, particularly in a business-as-usual environment.
- Health Consulting Collaborative, an independent party, conducted consultations with key stakeholders, ensuring data de-identification. Findings from these consultations were consolidated through thematic analysis aligned to the evaluation domains. Refer to Appendix 1: Stakeholder consultation list, for a register of stakeholder organisations engaged.
- Participants represented nine NSW Primary Health Networks (PHNs), selected Local Health Districts (LHDs), and prominent system and external stakeholders.
- Consultations revisited themes explored during previous evaluation consultations ([Evaluation Report 1](#) and [Evaluation Report 2](#), completed 24 and 12 months ago respectively).

2. GP Survey:

- All participating Lumos GPs were invited to complete a concise self-report survey (refer to Appendix 2 for a summary of survey results).
- The survey focused on the relevance of GP reports, confidence in Lumos’s privacy and security, motivation for participation in the Lumos program, and the perceived value of Lumos data at systemic, professional, and local levels.
- A total of 83 Lumos practices responded to the survey, from nine of the 10 NSW PHNs.
- The key findings from this survey are presented in the Engagement domain chapter of this report.

3. Existing Program Data:

- In addition to the above sources, existing program data, including presentations, operational documentation, and routine reports, were utilised to document program achievements. These are discussed in the context of the relevant evaluation domains.
- This report will systematically address a series of sub-questions for each domain and provide supporting evidence accordingly.

As part of monitoring against the indicators, an overview of maturity of achievements is included:



- **Emerging:** beginning to develop
- **Progressing:** advancing through the stages of development
- **Evolving:** nearing full development
- **Mature:** fully developed

Domain 1

Engagement

Advancing social license, collaborative partnerships and stakeholder engagement

Overarching goal: To achieve strong stakeholder endorsement, trusting relationships and partner participation

OVERVIEW

The Lumos program enjoys comprehensive stakeholder involvement and support. The scale and transformative nature of Lumos necessitates effective governance structures that encourage and embody collaboration. The primary aims are to establish:

- Trusting and dedicated relationships encompassing a diverse spectrum of stakeholders.
- Substantial relationship capital with key stakeholders.
- Elevated levels of stakeholder engagement.

Monitoring and evaluation of the Lumos program to date has identified the presence of robust relationships ([Evaluation Report 1](#) and [Evaluation Report 2](#)). Simultaneously, it has recognised the importance of enhancing relationships with PHNs, LHDs and the NSW Ministry of Health and Pillars, with the objective of enabling Lumos to operate seamlessly within a unified stakeholder environment.

Engagement achievements were assessed by the following sub-evaluation questions, as detailed in the Monitoring and Evaluation Framework:

Is stakeholder engagement becoming comprehensive and inclusive?

- PHNs and GPs
- MoH and others
- LHDs*
- Is best practice governance in place?
- Is participation reaching expected levels with the appropriate jurisdictional and sociodemographic spread?
- Are appropriate foundations for Aboriginal data collection and use being established?
- Are stakeholders satisfied?

* Engagement with LHDs is noted separately in the above table, recognising that the value proposition for LHDs is different to that of PHN, GPs and other stakeholders. Efforts to engage more broadly with LHDs are underway and will continue throughout the coming year.

KEY FINDINGS

Stakeholder engagement is broad, and satisfaction is high

Lumos has focused on enhancing relationships at the Commonwealth and state level, and building new relationships with Aboriginal stakeholders, while maintaining strong existing relationships with PHNs and GPs. At the same time, engagement with LHDs and the NSW Ministry of Health and Pillars continues to increase.

Stakeholder consultations have revealed evolving perceptions, ongoing opportunities for engagement, and areas for improvement from various perspectives.

The Lumos program has demonstrated the central importance of local level collaboration for success. The program has mature models for collaboration, stakeholder management, program governance, social license, data management, and analytics and reporting that may be translatable elsewhere.

All stakeholder groups highlighted the importance of ensuring that people understand Lumos to further garner support, drive engagement, and maximise the impact and sustainability of Lumos into the future.

Currently Lumos collects data from approximately 28% of NSW GPs and includes the patient journeys of over half the NSW population

- Lumos collects data from a significant portion of NSW GPs and has strong participation from all 10 PHNs, and over 5 million patient journeys.
- The Lumos program has exceeded its target to enrol 500 practices by mid-2023, with 711 practices currently enrolled.
- Strong relationships between PHNs and both the Ministry of Health and GPs were highlighted as a key success factor in engagement. Many PHNs provide valuable support to practices in understanding and using the Lumos data to make decisions and improvements.



- Some resistance from larger corporate GPs was noted regarding Lumos participation. Securing involvement of these practices is a consideration for future sustainability.
- The Lumos program recognises PHNs as key partners and critical for improving healthcare delivery through recruiting informed and consenting GP participants.

Lumos is actively engaged in collaborative efforts with Aboriginal stakeholders, focusing on co-design, resource allocation, capability building, and ethical guidance to ensure meaningful participation and data-driven improvements in Aboriginal health

- The current Lumos engagement model is a PHN-led model, which is not always fit-for-purpose for a significant proportion of the Aboriginal community. In order to ensure the Lumos engagement model actively supports Indigenous Data Sovereignty, extensive consultation is being undertaken with the Aboriginal community about how to exercise data sovereignty in the Lumos program.
- Lumos is actively collaborating with Aboriginal stakeholders, including the Aboriginal Health and Medical Research Council (AH&MRC), Aboriginal Community Controlled Health Organisations (ACCHOs) and Aboriginal Medical Services (AMSs). The AH&MRC Ethics Committee provided valuable feedback and guidance, contributing to progress in this area of engagement.
- Lumos recognises the importance of co-designing governance arrangements and technological support with Aboriginal communities to ensure data sovereignty and meaningful participation.
- Despite challenges posed by the COVID-19 pandemic, progress is being made in engaging Aboriginal health services. Efforts are underway to support Aboriginal stakeholders to better understand the purpose, use and interpretation of the Lumos data asset.
- A pilot project to develop and trial a different engagement model with Aboriginal health services is being co-designed, highlighting a commitment to innovative approaches. This model will include consultation with the Aboriginal community to determine how to uphold the principles of Indigenous Data Sovereignty in any future Lumos engagement model proposals.

A working group comprising Aboriginal health service providers from across NSW is co-leading the development of the pilot as well as being volunteer participants in it. See governance, figure 2 below. A submission for the pilot ethics protocol will be delivered to the AH&MRC ethics committee for consideration.

- Lumos has had preliminary discussions with the Kowa Collaboration (<https://www.kowacollaboration.com/>) about assisting the Lumos team with Aboriginal community engagement to inform co-design of the model to be assessed in the pilot. The Kowa Collaboration is a profit-for-purpose enterprise 'supporting First Nations organisations and communities to amplify their purpose through impact measurement, evaluation and learning'. The OCCAAARS Framework, developed by Kowa Collaboration, is a tool to support organisations to consider and define data sovereignty and provides guidance to operationalise and embed these principles.
- Lumos has committed program resources to support engagement with the Aboriginal sector. Funding is allocated to facilitate mobilising an Aboriginal Data Governance Committee, developing an Indigenous Data Sovereignty Framework, and facilitating involvement of Aboriginal investigators in the team. Importantly, the purpose of the funding has not been pre-determined: it will be collaboratively decided as engagement and governance mechanisms mature.
- Aboriginal participants are positive about the future value of Lumos for AMSs and the system more broadly. Lumos has the potential to enhance patient care through a better understanding of patient journeys, for example, by monitoring discharge against medical advice, readmissions to hospitals, and emergency department data for Aboriginal people.
- Lumos is considered a valuable tool at the system level and future areas flagged for further exploration include using Lumos for needs assessments, co-designing solutions with clinicians working across settings and future evaluations within the Aboriginal health sector, offering powerful data for funding and business cases.

Engagement with Lumos spans a diverse range of stakeholders, each contributing to its development and impact

- Lumos proactively engages with a wide spectrum of stakeholders, from government bodies to researchers and consumers. This collaborative approach ensures that Lumos remains aligned with healthcare goals, is inclusive of diverse perspectives, and can drive improvements in healthcare delivery at both local and national levels.
- Lumos is actively engaging with relevant NSW Ministry of Health branches including System Purchasing, Integrated Care, and Strategic Reform. These collaborations are supporting the broader NSW Health priorities, initiatives, and goals.
- Local Health Districts are engaging with Lumos through specific initiatives such as the Statewide Diabetes Initiative and Collaborative Commissioning. The Lumos program team has engaged with LHDs to promote its integration into local analysis to identify priority populations, understanding of current healthcare delivery, and in program evaluation.
- The Agency for Clinical Innovation (ACI) continues to use the Lumos data asset to support healthcare improvement initiatives. Lumos is currently being used to understand clinical variation in hysterectomy rates across NSW Health.
- Lumos continues to actively involve consumers in its stakeholder representation and data governance committees, emphasising the importance of their perspective in shaping healthcare delivery. Consumers are encouraging discussions with Aboriginal organisations, ensuring inclusivity and cultural relevance.
- Lumos recognises the importance of building a social license and is leveraging opportunities such as conference presentations to raise awareness and garner support for its initiatives.

Building a social license:

Lumos conference presentations serve as a vital platform for engaging stakeholders and fostering support for Lumos. Presentations in the past 12 months include:

- Achieving value-based healthcare through whole system linked datasets and patient reported measures. Presented by Dr Walid Jammal and Dr Paresh Dawda. International Forum on Quality and Safety in Healthcare. Copenhagen. May 2023
- Connection of data: proving that continuity of care in general practice matters. Presented by Dr Walid Jammal and Associate Professor Charlotte Hespe. GP 22. Melbourne. November 2022.
- The Lumos program has engaged in some collaborative activities with researchers and other external users. However, any external users (including researchers) must undertake to work in partnership with the direct collaborators of Lumos (PHNs and NSW Health). The uses of Lumos data in these collaborations only permits purposes aligned to the planning, funding, management and evaluation of health services, as stipulated under Lumos ethics approval. Such work must focus on health service provision, ensuring that insights are relevant and actionable.
- The Lumos program team are actively seeking collaboration with the Royal Australian College of General Practitioners (RACGP) to identify important key questions that can be addressed by Lumos data. This is to ensure continuous improvement of primary care and further strengthen the Lumos program's engagement with the primary care community.

Continued engagement at the Federal level is enabling Commonwealth initiatives

- At the February 2023 Health Ministers Meeting an options paper was presented for establishing national ongoing health service data sharing to follow patient journeys in both primary care and state health systems. The Health Ministers endorsed the creation of a national hub and spoke model for sharing healthcare data, based on the Lumos model.
- The potential national scaling of Lumos presents an opportunity to leverage the lessons learned from the NSW implementation, thereby capitalising on existing investments and knowledge for the creation of a national linked primary-acute care data asset. The overarching goal of this national linked data asset is to better understand the patient journey across the healthcare system to inform improvements in population health planning, service delivery and patient outcomes.
- NSW Health, in collaboration with the Department of Health and Aged Care (DoHAC), has formulated a proposal for the design phase which has since been endorsed for funding from the National Cost-Shared Budget by the Health Minister's Meeting.

Strong technical, clinical and operational governance underpins Lumos

- Lumos has laid a strong foundation for robust data governance that has been endorsed through successive independent privacy impact assessments. This governance structure is considered highly functional and provides a solid foundation for the program's ongoing development. It includes mechanisms for addressing changing data needs through potential additions or modifications, with flexibility to adapt and expand as needed to meet evolving program requirements.
- The Lumos Data Governance Committee (DGC) operates to advise the Executive Sponsor on the direction of data governance, including the use, access and disclosure of data, to drive data sharing and connection, and better-informed health policies. The Committee comprises representation from the Lumos Implementation Team and Data Governance Reform Group within the NSW Ministry of Health, LHDs, participating PHNs and GPs, health consumers and Aboriginal community members. In line with the committee terms of reference, membership was refreshed in 2023 and a new Chair appointed. The existing governance structure, as illustrated in Figure 2, is currently being adapted to facilitate the inclusion of Aboriginal health sector data and appropriate Aboriginal representation.
- The Lumos Data Governance Framework (DGF) is reviewed annually, in consultation with the DGC and other relevant stakeholders, to ensure it remains fit-for-purpose. Furthermore, a current action item open for the DGC is to 'Develop a staged framework for data capture of DGF performance measures.' This comprises the final stage needed for completion of the current DGF. An initial framework for performance measures has been drafted for discussion by the Committee, covering accountability, enablers and data management.

Establishment of the Aboriginal Community Engagement Working Group: an important step forward

- The inaugural Aboriginal Community Engagement (ACE) Working Group meeting was held in March 2023. The working group agreed on Terms of Reference, scope and purpose of the group and will meet on a bi-monthly basis.
- Following the inaugural meeting, the ACE working group was expanded to include LHD representation and all AH&MRC member regions. An Executive Group comprising of Aboriginal Health and Medical Research Council (AH&MRC) and Aboriginal Community Controlled Health Organisations (ACCHO) Chief Executive Officers was established.
- Moving forward the group will be supported through extended engagement with the sector, an Aboriginal Data Governance Committee, specialist expertise to support the development of an Indigenous Data Sovereignty Plan and the engagement of Aboriginal investigators.

Current and proposed governance structure supporting robust program oversight

- Figure 2 illustrates the current governance structures (indicated by the dark blue boxes) and the proposed structure being implemented (indicated by the light blue boxes).

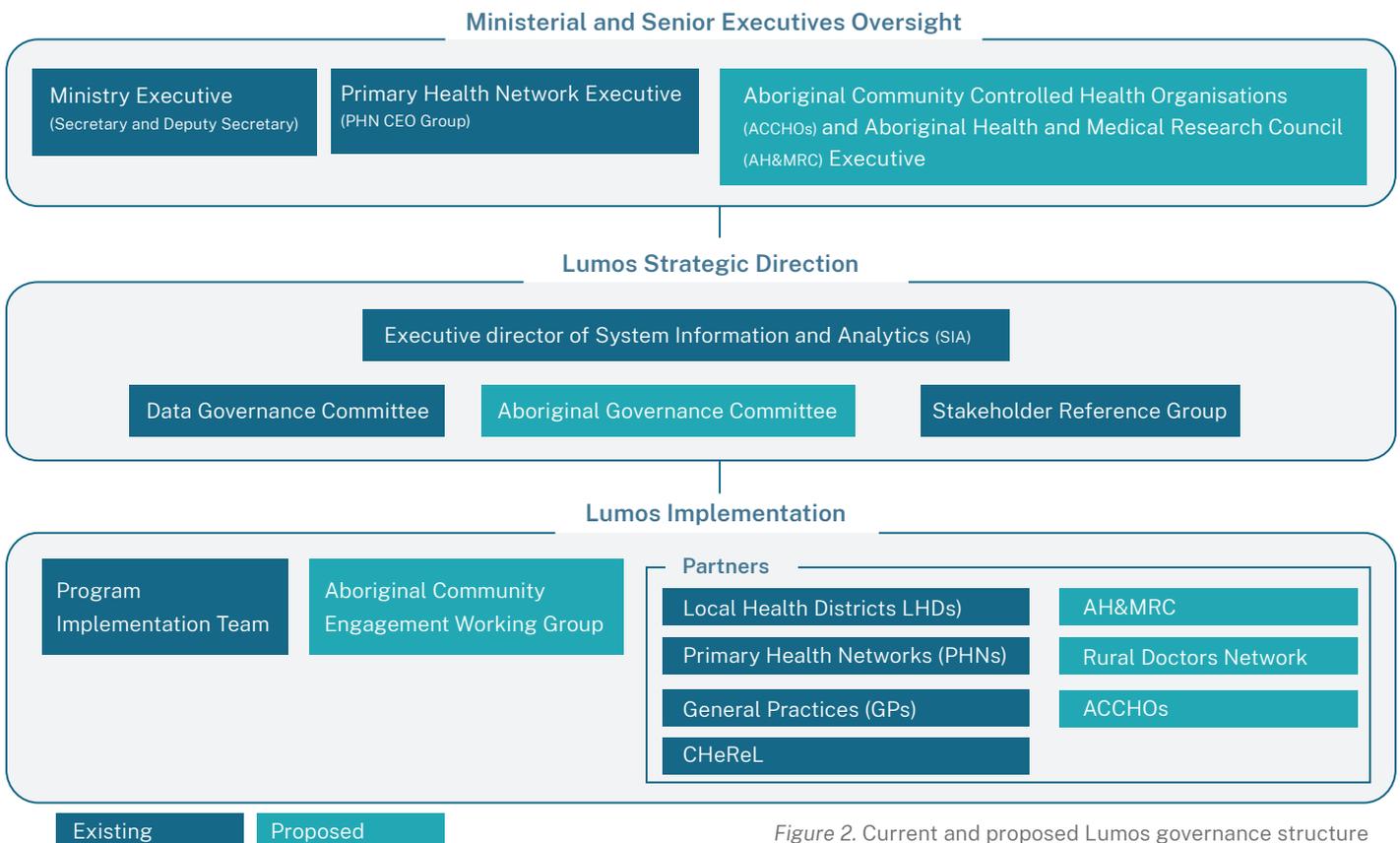


Figure 2. Current and proposed Lumos governance structure

Enhancing communication with a broader range of stakeholders

- Ensuring stakeholders understand Lumos is crucial to garner support, drive engagement, and maximise its impact.
- The Lumos program recognises the importance of communication with a broad range of stakeholders and has invested in engaging with stakeholders through diverse channels, including email, social media, the community of practice and prominent medical blogs. By harnessing these multifaceted avenues, Lumos key messages reach the right audience in a timely manner.
- Lumos is accepted among stakeholders as a valuable tool for healthcare improvement. Stakeholders agree that clear and effective communication about Lumos is essential to promote its adoption, engage healthcare practices, empower patients, and demonstrate its impact on healthcare quality, policy, and funding.
- Recommendations from stakeholders for improving communication include expanding benchmarking, introducing Lumos Awards, increasing the visibility of Lumos to patients, providing more frequent reports, and creating informative resources for clinicians.

Online survey: Participating General Practices

As reported, 83 practices across 9 PHNs responded to the survey, with 81 providing usable information. These usable surveys provided the basis for the information reported below. The survey and responses can be found at Appendix 2.



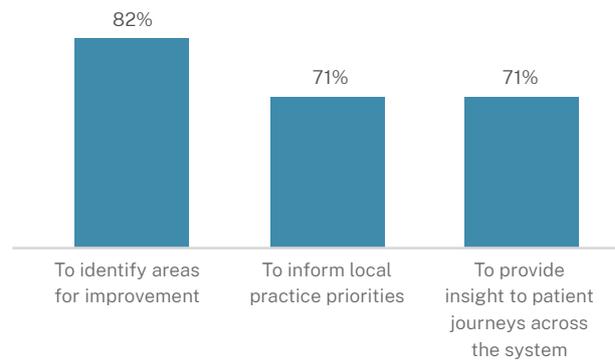
Using the data well is important to GPs

The core principle guiding the development of the Lumos data asset has been the necessity to enhance visibility of patients healthcare journeys across different care settings, ultimately facilitating more effective support for enhancements and reforms. General practitioners demonstrated both awareness and strong endorsement of this objective.

The predominant reason cited for GPs' participation in the Lumos program was the desire to identify areas that would benefit from improvement (82%), followed by informing local practice priorities (71%) and providing insight about patient journeys across the system (71%), see figure 3.

Figure 3.

GP survey question: What was the motivation for you to engage your practice in the Lumos program? (select as many answers as relevant)



GPs participating in Lumos reported consistent views about their aspirations for the use of the data

General practitioners exhibited appreciation for the system and strategic benefits of the Lumos program. When surveyed about their aspirations for how Lumos data should be used, their leading responses related to national reforms (Figure 4) and practice improvement (Figure 5).

Figure 4.

GP survey question: How would you like to see the Lumos data being used at the system level?

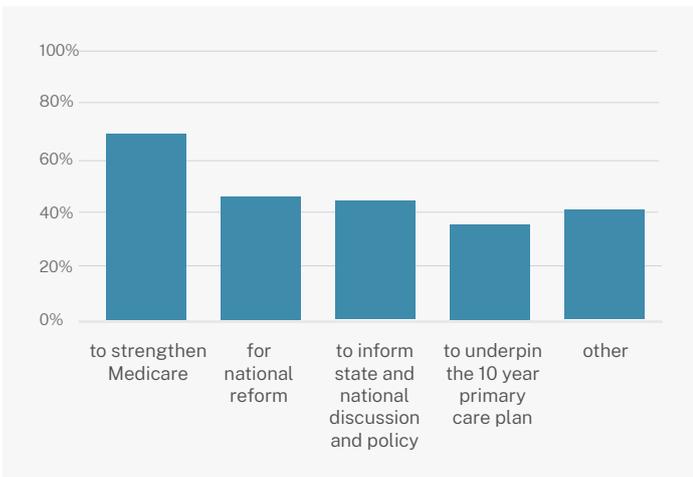
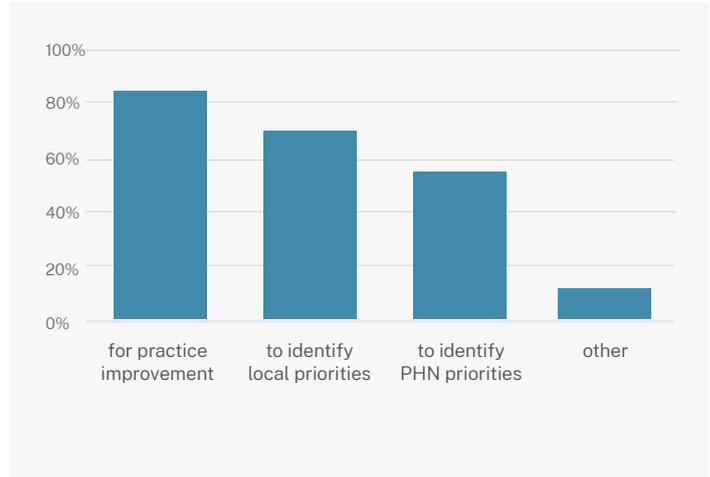


Figure 5.

GP survey question: How would you like to see the Lumos data being used across the profession?



Practice participation is exceeding expectations, both in quantum and reach

As at 20 October 2023, 711 general practices were enrolled in the Lumos program. This represents 28% of 2502 practices in NSW (as per the September 2022 National Health Services Directory (<https://about.healthdirect.gov.au/nhsd>)).

Of these, 628 practices contributed data in time for the most recent linkage (April 2023). The level of participation exceeds the 2023 target set for the program (20% of NSW practices).

Improved Lumos participation and associated value of the data asset

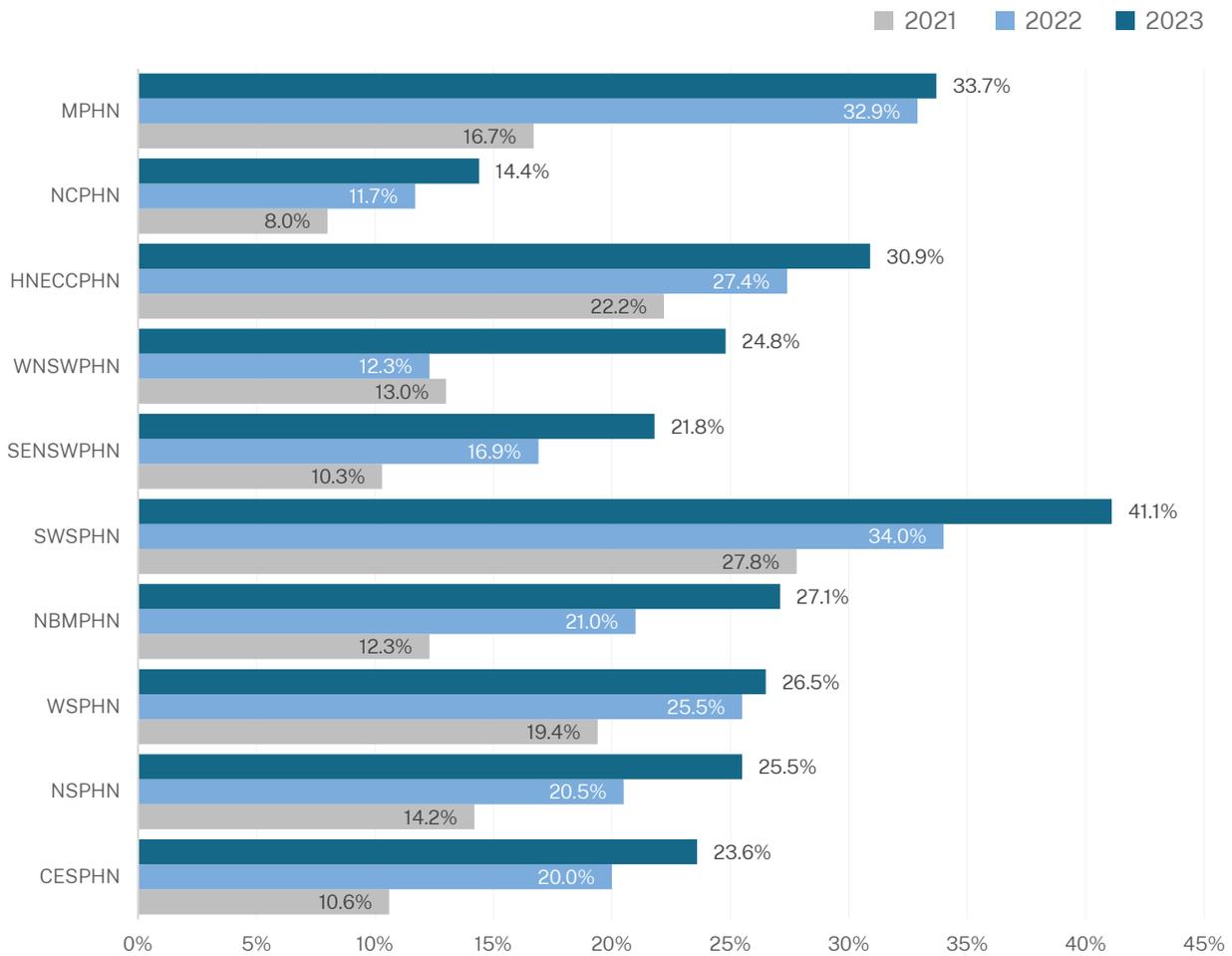
A number of stakeholders described the increased participation of GPs in Lumos over the past year and how 'seeing the patient journey provides a more holistic view of the patient to identify outcomes and get insights'



As Figure 6 and Figure 7 shows, jurisdictional coverage has become increasingly comprehensive. Figure 6 presents the growth in Lumos participation by PHN from 2021 to 2023.

Figure 7 shows practice participation spans all 10 PHNs in NSW and includes metropolitan, rural, and remote practices.

Figure 6. Participation in Lumos by PHN, geographic location and regionality of practices



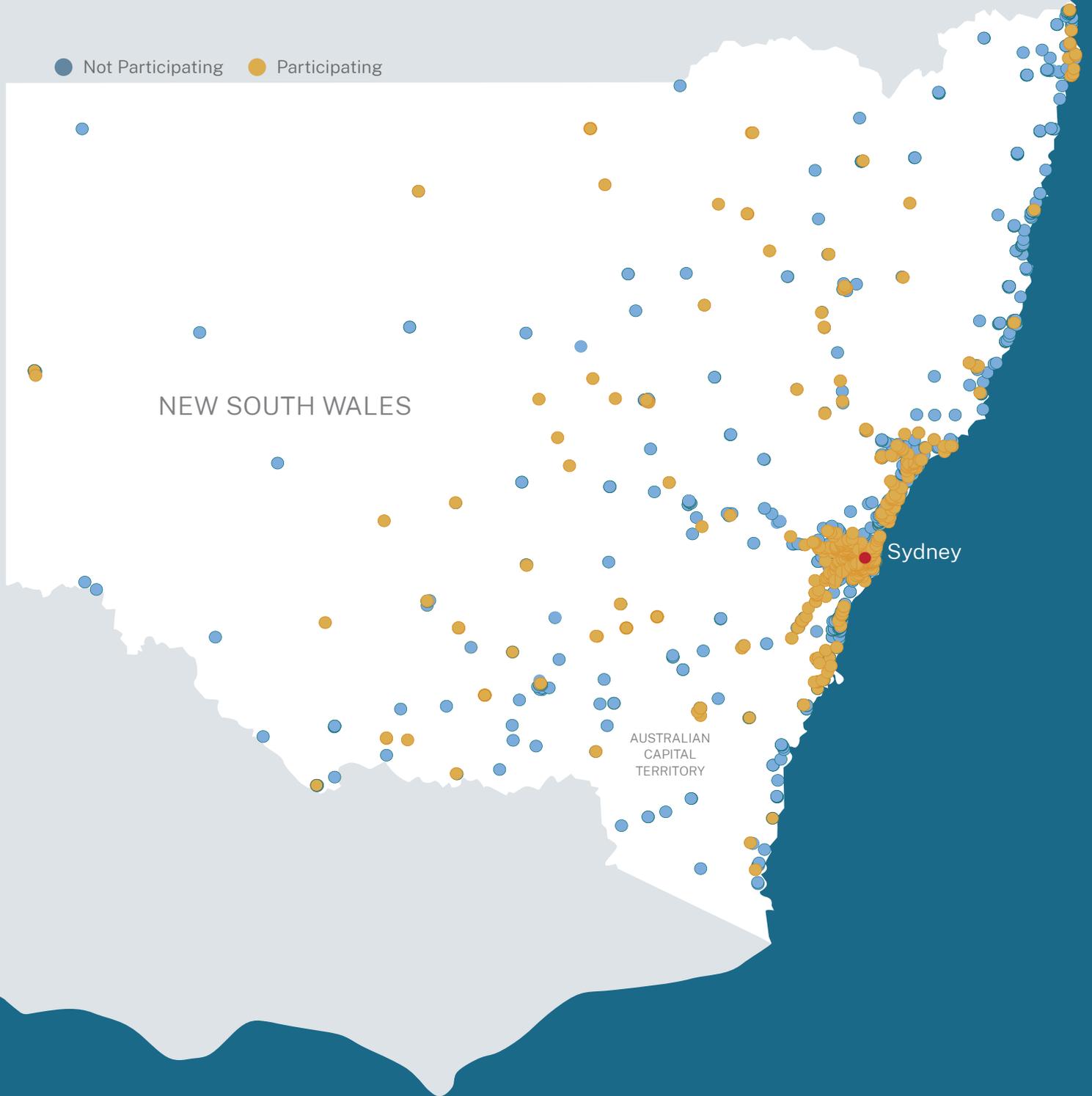
Note: Full PHN names can be found in Appendix 2.

Analysis to understand the degree to which Lumos data is representative of the NSW community suggests overall the data remains strongly aligned with NSW population features. Based on the data reported in April 2023, sociodemographic coverage is representative of the NSW population. Analysis indicates that at the state level the demographic distribution of Lumos patients was 91% aligned to the demographic distribution in the NSW population

(age, sex, regional distribution, and socioeconomic status).¹ Alignment also appears to be high within each PHN catchment.

These estimates of representativeness are updated with each linkage as the data become available. It is expected that representativeness will improve as coverage of the NSW general practice population continues to grow. A table detailing measures of representativeness by PHN is provided in Appendix 3.

Figure 7. Participation in Lumos in 2023 by geographic location and regionality of practices





Domain 2

Technical Solutions

Integrating primary and acute care data into standard operational procedures

Overarching goal: Data transfer, storage and access that is secure, efficient, accurate and scaled.

OVERVIEW

Lumos represents a pioneering initiative in Australia, collating data from acute, community and primary healthcare settings to strengthen policymaking, evaluation and reform efforts. The ability for stakeholders outside of the NSW Health system to access data from NSW Health services breaks down barriers and promotes collaborative efforts founded on informed, evidence-based decision-making. Achieving this milestone demanded significant technological advancements, which directly influence the program’s success and long-term viability. The range of data included in the Lumos program is shown in Figure 8.

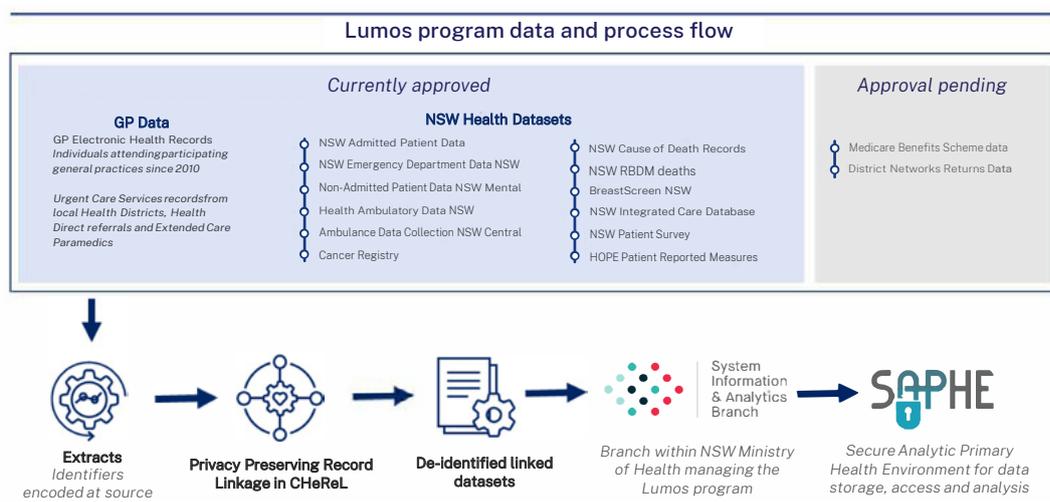


Figure 8. Lumos Program Data and Process Flow

Measuring success of technological solutions was guided by the following sub-evaluation questions:

- Is data transfer and linkage occurring for the expected number of practices (20 per cent of NSW practices)?
- Can stakeholders access Lumos data?
- Is patient and practice privacy optimised throughout the data lifecycle?



KEY FINDINGS

Lumos maintains the highest level of privacy and security, while continuing to scale the asset.

The Centre for Health Record Linkage (CHeReL) links multiple sources of data and maintains a record linkage system that protects privacy. The Lumos team provides ongoing technical support during data extraction and transfer, providing active support to PHNs and GPs where, on occasion, data may be missing or incomplete. The Lumos program has implemented automated data extraction thereby ensuring there are minimal barriers for GPs to participate in the program with ease. The automation has been designed such that it can support any preferred data extraction vendor and a range of GP clinical information systems. The most recent data extraction vendor, Primary Sense, is due to deliver its first Lumos extracts in November 2023. Lumos will continue to take this vendor agnostic approach, working with PHNs and other provider groups to develop technical specifications which comply with whatever extraction vendor has been procured.

During the pilot phase of Lumos, identifiable patient information was collected to calibrate the privacy-preserving record linkage (PPRL) approach. To test the accuracy, the identified data were subjected to a probabilistic matching process and compared with the application of PPRL methodology. This comparative approach allowed verification that the matching process, using encoded data, was consistent with the results from the identified data, revealing a 96% overlap.

Currently, any testing for linkage accuracy (and assurance) will be conducted on encoded data only. With Lumos operating at a far more extensive scale (700+ practices) than the pilot (15 practices), the ability to gather identifiable patient information for recalibration is currently outside of ethics and legal conditions under which the Lumos program operates. The Lumos team have indicated that they will explore options to do this as a standalone benchmarking project to further tune the PPRL linkage settings.

The Lumos team remains committed and aligned strategically with national developments in linkage methodologies. Above all, its foremost priority is ensuring the privacy of patients. Ensuring compliance with ethical standards and maintaining the trust of the GPs and the public is paramount.

Scaling Lumos nationally presents an opportunity to leverage the key learnings from local implementation and capitalise on the existing investments made, significantly reducing the cost to create a national linked primary-acute care data asset from inception.

Lumos program technology approach endorsed.

In August 2021, Deloitte were engaged to review data and technology in the Lumos Program. The review considered the end-to-end data linkage, the current technology landscape and the overall design of Lumos. The review provided a positive appraisal of the Lumos technology approach and highlighted opportunities for further enhancement.

In July 2022, Deloitte completed a supplementary assessment related to the enhancement of the Lumos data analytics pipeline and provided a future state options analysis. It recommended three initial actions:

- Deep dive into technical options to investigate specific features which may influence the operation of the azure components.
- Code review and streamlining (currently in progress and due for completion in early 2024).
- Detailed implementation planning for transitioning the ETL pipeline into the Secure Analytics Primary Health Environment (SAPHE).

The Lumos team is working with key stakeholders to further investigate the feasibility of implementation of these actions, and where appropriate, make further enhancements to the Lumos technology approach.

Continued investment in SAPHE onboarding and usability is needed to support engagement and retention of end user stakeholders.

Lumos data is stored and accessed in the SAPHE, a highly secure cloud environment. The SAPHE has the capability to allow access to multiple users from both within and outside the NSW Health system to Lumos data and analytic tools. It also provides multi-level access controls for users with different needs, authorisations and security clearances.

Stakeholders with access to Lumos (refer to Figure 9) have exhibited varied capacity and capability in accessing, analysing, and employing Lumos for local initiatives (e.g., planning or evaluation). The Lumos team has observed this variability, and as a response, additional funding has been identified in future business cases to offer more support in this domain.

The procedure for gaining access to SAPHE is structured and rigorous. Through consultation, several notable opportunities for improvement were identified to improve the usability, engagement and retention of stakeholders accessing SAPHE. Examples include:

- Improving user onboarding with semi structured training and education. It was suggested enhancements to the data dictionary including more detailed descriptions, additional context descriptors for data fields, and specific examples of application would be beneficial.
- Consumable information or product tours on dashboard functionality, use cases and limitations that promote just-in-time learning.
- Development of eLearning modules and My Health Learning Pathways through the Health Education and Training Institute (HETI) to support SAPHE users. This is particularly relevant for those who have no previous training or technical experience with large datasets or Business Intelligence (BI) platforms.
- Changing the format of the bimonthly SAPHE Community of Practice sessions to have time dedicated for basic instruction on simple data interrogation techniques.

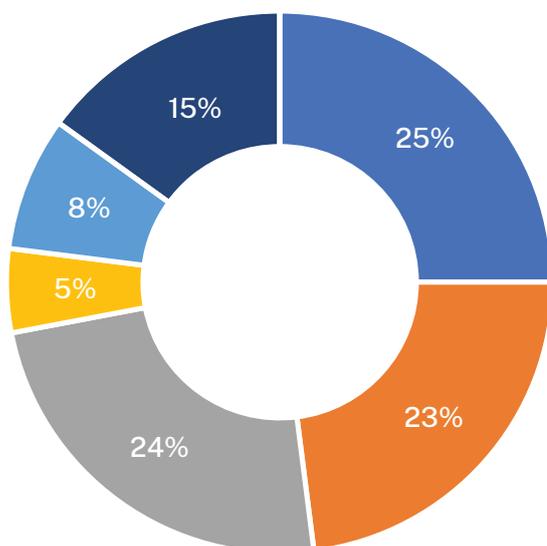


Figure 9. Active SAPHE users 2023

- Local Health District
- Ministry of Health
- Primary Health Network
- Pillar
- University/ Research
- Other-Non NSW Health

There has been continued interest in accessing Lumos for research purposes.

Lumos continues to drive interest from the research community and has the potential to be leveraged to deliver broader value. While there is no scope for investigator driven research, involvement of external research groups is allowable when in partnership with the key Lumos collaborators (NSW Health and PHNs) to do work that aligns to Lumos purposes i.e. improve the planning, management, funding, and evaluation of health services. This facilitates access to expertise and methodologies to better maximise the potential of the data and is enabling more robust use of the data for its primary purposes. There are currently two active streams of work to provide selective access to researchers:

1. Researchers from external organisations can enter into partnerships with the Lumos collaborating organisations to do work of mutual benefit or to provide additional expertise. This partnership approach brings increased rigour and discipline to the improvement of health service planning and delivery.
2. The Lumos program is actively pursuing the development of a future synthetic Lumos dataset through application of state-of-the-art generative modelling approaches. The most recent ethics amendment included approval to broaden possibilities of access to Lumos data by users outside of its immediate collaborators and outside of the SAPHE. Creation of synthetic Lumos data potentially provides a mechanism for broader access to Lumos data with the ability for maintaining the highest standards of security, including for testing and training, without unnecessary use of 'real' data. The following is an excerpt from the amendment request to the ethics committee:

This amendment seeks approval to use Lumos data as a reference data set for the creation of synthetic data, using generative modelling approaches. A generative model is a software function that can create data via a simulation process. This approach to creating data contrasts with data randomisation and data augmentation, which take existing data and apply a combination of random changes to values and random recombination of record fragments. In a generative model, statistical tables from existing 'reference' data allows the model to represent statistical interactions of the reference data, without direct access to the real records. Notwithstanding these interactions, care is required to ensure private information in existing data is not leaked into synthetic data.

The Lumos team continues to identify and evaluate additional data set linkages that provide value to end users

The Lumos data asset continues to mature, providing an increased range of data and more extensive NSW population coverage. Lumos continues to actively bridge the data gap between GPs and episodes of other types of healthcare services across NSW. In the past 12 months, new and approved data sets for the Lumos linkage include:

- The Medicare Benefits Scheme (MBS) data pertaining to GP services is actively being pursued with Commonwealth data custodians in DoHAC. The inclusion of the MBS data to the Lumos linkage will enable the tracking of GP encounters among Lumos GP patients by non-Lumos practices. The MBS linkage will address the current limitation of Lumos, which only includes GP services from enrolled practices, and may not capture all interactions with multiple GPs. The addition of MBS GP visit data thereby enhances the comprehensiveness of NSW GP care data in Lumos. This amendment has been extensively discussed with relevant teams in DoHAC who confirmed these criteria can be implemented. The criteria for MBS records sought in this amendment will be:
 - Records from the preceding five years
 - Relating only to GP service dates and basic encounter type (telehealth, long consult, short consult)
 - Relating to service events at GPs in NSW and adjacent border areas.
- District Networks Return (DNR) data was also approved in the last ethics amendment to the Lumos program and is awaiting data custodian sign-off. DNR data comprises patient-level expenditure data relating to occasions of service in hospitals and outpatients in NSW since July 2012. Inclusion of DNR data enables examination of the direct costs of these services.
- Addition of Health Establishment Registration Online (HERO) ID in the Non-Admitted Patient (NAP) data. The HERO identifier is a mandatory requirement to register locations and service units within NSW. HERO ID numbers recorded in NAP data identify the NSW Health clinic visited. This enables segmentation of NAP clinics in Lumos data.
- Patient Reported Measures - Ethical approval has recently been granted to expand the Lumos data linkage to include patient reported measures (PRMs) records available on the Health Outcomes and Patient Experience (HOPE) platform. The HOPE platform, held by NSW Ministry of Health, houses and manages the PRM online surveys and the database of responses provided by patients. HOPE data will be supplied and linked in accordance with the Lumos protocol that includes application of the separation principle and use of privacy preserving record linkage.
- Variables continue to be added to General Practice Electronic Health Record (GP EHR) data as approved through ethical amendment including:
 - MBS Item description category to segment patient cohorts and services: This will make it possible to select cohorts of people and encounters that are of interest, through selection of program-specific MBS description categories.
 - Program cohort flags: A yes/no flag when patients are participants in a nominated project or program. This allows segmentation by a project or program cohort to perform specific analyses to monitor or evaluate the outcomes of that activity. It will provide an adjunct to MBS Item description categories above to ensure more complete data capture.
 - Program cohort items: Additional structured information recorded at individual encounters when a patient is from a flagged cohort (refer to previous), allowing analyses relating a specific program to characteristics in an encounter.

Expansion of the Lumos cohort for the purposes of monitoring and evaluating Urgent Care Services (UCS) initiatives in NSW. The Lumos cohort is being expanded beyond GP patients to include patients attending community-based urgent care services including those run out of GPs, outpatient clinics and ambulance services. An opportunity exists to provide feedback to key stakeholders on progress and expected timing of additional data linkages. Feedback of this nature supports continued social license, recruitment and retention of practices contributing to Lumos.

Significant Lumos ethics amendments recognised by consumer representative as transformative to healthcare planning and delivery

‘Congratulations to you and the team involved in making this happen. This is indeed a significant milestone in the evolution of Lumos and a testament to the power that the Lumos data sets deliver/will deliver to support better healthcare planning and delivery. Well done!’

As the potential use cases for Lumos grows, so does the number of suggested options for future data linkages

Through consultation, several data sets were identified as potential options for future linkage. Assessment of each dataset against ethics, security, and privacy legislation are critical requirements for linkage. The Lumos team have been active in documenting and prioritising the assessment of new datasets. Suggested linkages and specific use cases are documented in Table 1.

Table 1. Additional data sets for linkage identified during consultation

Data Source	High-level benefit of linkage
Healthdirect (expansion)	Ability to track pathways for patients who use Healthdirect telephone triage service and their health service usage thereafter.
National Disability Insurance Scheme (NDIS)	Allows for centralisation of information for planning. Allows PHNs/GPs to increase knowledge of service utilisation and support
Social Services	Ability to follow social care pathways on a geographic and demographic level would support the identification of service gaps.
Medicare subsidised Allied Health data*	Expands the coverage of primary based services available via Lumos for local planning and service quality improvement.
Medicare subsidised specialist health care*	Specifically, this refers to use of specialty services e.g. imaging services utilised by patients outside of the public system. This provides a more comprehensive view of patient pathways and system costs.

Non-health data sets were also identified as further expansion options. Department of Education and Department of Communities and Justice information could contribute to calculations related to expected lifespan, and risk adjusted life years support the identification of high-risk populations and highlight gaps in service coverage. While not covered in the current ethics and technical foundations of Lumos, such non-health linkages could be considered by national agencies in the future.

*According to the Lumos Privacy Impact Assessment and in the current Lumos operating model, inclusion of this information would require recruitment and enrolment of the relevant Allied/Specialist Health providers. It is not permissible to collect and report on clinical service activity without the consent of the providers. This is why Lumos has currently only requested GP MBS Items for basic encounter types.

Domain 3

Analytics and Reporting

Meaningful, reliable and practical insights

Overarching goal: Creation of practice relevant evidence base that is accessible and used for continuous improvement.

OVERVIEW

In advancing high value health care through the Lumos data asset, it is critical that analytics and reporting are credible, relevant, and present actionable insights. This is paramount for assessing the overall value of the healthcare system and stimulating continuous improvements. Furthermore, opportunities for engaging with the data at both practice and local region levels will strengthen and support localised improvement initiatives.

Measuring success of Lumos analytics and reporting was guided by the following sub-evaluation questions:

- Does the Lumos data asset link a range of relevant health data sets?
- Can Lumos data reliably inform improvement strategies?
- Are unique and actionable insights revealed and disseminated?
- Does the Lumos asset underpin improvements in practice?

To sustain ongoing adoption and engagement, the Lumos team has contributed significant effort in producing outputs that facilitate stakeholders' strategic initiatives. Delivery of actionable insights across the range of stakeholders has been an active focus of the program.

Collaborative engagement with end users is supporting meaningful use of the data with initiatives such as a data community of practice, enhancements to practice reports and factsheets, and the ongoing evolution of interactive dashboards.



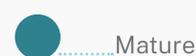
Emerging



Progressing



Evolving



Mature

KEY FINDINGS

Practice reports, insight reports and factsheets are delivering actionable information in a consumable format.

Feedback collected during consultation was principally positive in relation to the usability and applicability of practice and insight reports. Sixty four percent of respondents from the GP survey agree or strongly agree that the reports are easy to digest. Furthermore, 78% of respondents agree or strongly agree that the content is relevant to their individual practice.

Feedback from consultation and the GP survey was positive.

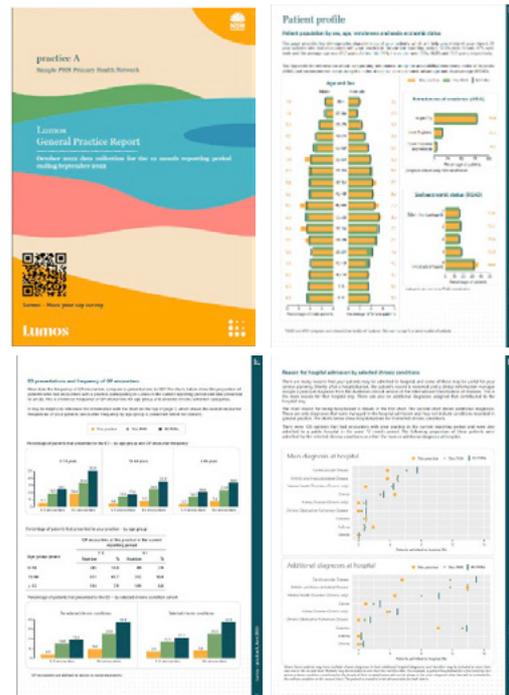
- Thank you for providing this information and thank you to the PHN (PHN representative) for providing valuable insight and talking me through the report.
- It is a good benchmark for performance of the practice and directly links to PIP QI*. I appreciate the visual representation of data; it is user friendly.

Additionally, other feedback from stakeholders to improve the structure and visualisations of the reports was provided. The Lumos team has used this feedback as an opportunity to reframe reports, engaging a statistical communicator to review and refine outputs with the aim of enhancing GP experience. Extensive consultations have been conducted with end users to understand where improvements can be made. Suggestions received through these consultations include:

- Developing ways to provide ranges of 'normal/good' for GP practice data
- Include comparative data from previous years
- Present summary information at the start of the report (i.e. a snapshot)

The report redesign incorporating user feedback is in progress, with the revised reports due for release in early 2024.

Figure 10. Lumos practice report example



Benchmarking was also identified as an effective tool in reviewing practice performance outcomes and supporting planning. Some PHNs noted reports and benchmarking enabled ongoing engagement with practices, thereby contributing to recruitment and retention of practices in the program. Since enrolments for Lumos scale-up commenced 4 years ago (December 2019), participating practices have been, on average, enrolled in the program for 30 months (2.5 years).

Through consultation several future benchmarking suggestions were put forward, including:

- Healthy ageing strategy
- Chronic illness
- Comorbidity scores
- Vaccine and immunisation rates.
- Regional healthcare needs

* Quality Improvement Practice Incentive Payment

The Lumos team have initiated a project that will deliver practice reports six months after extraction.

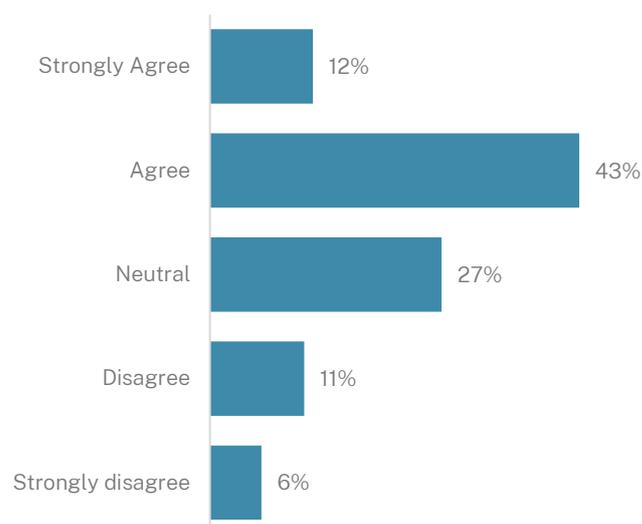
Based on evaluation consultations, there has been overwhelming feedback indicating a pressing need to enhance the timeliness of reports. However, under the existing technical frameworks, the current speed (nine months) is the minimum at which reporting can be executed. The timeline allows for diagnoses coding, time to perform privacy preserving record linkage (PPRL), and time to cleanse and process the data. It is noteworthy that there is a substantial project in progress that aims to revamp the data pipeline for Lumos. The primary objective of this initiative is to facilitate quarterly data linking and set a goal for reporting six months after extraction.

Consultations and written feedback collated via the GP survey identified the need for delivering timely reports.

- The timeliness of the report remains an issue. Data from 12 months ago doesn't reflect our current patient base or workforce.
- Good information but reports are quite out of date by the time we receive them.

Most GPs responding to the survey indicated that the information in the reports is relevant to their practice in terms of timeliness (55% agreed or strongly agreed); while 27% of respondents were neutral and 17% disagreed or strongly disagreed that the reports were relevant in terms of timeliness (see Figure 11).

Figure 11.
Lumos GP Survey Question 5: The information in the report is relevant to my practice in terms of timeliness



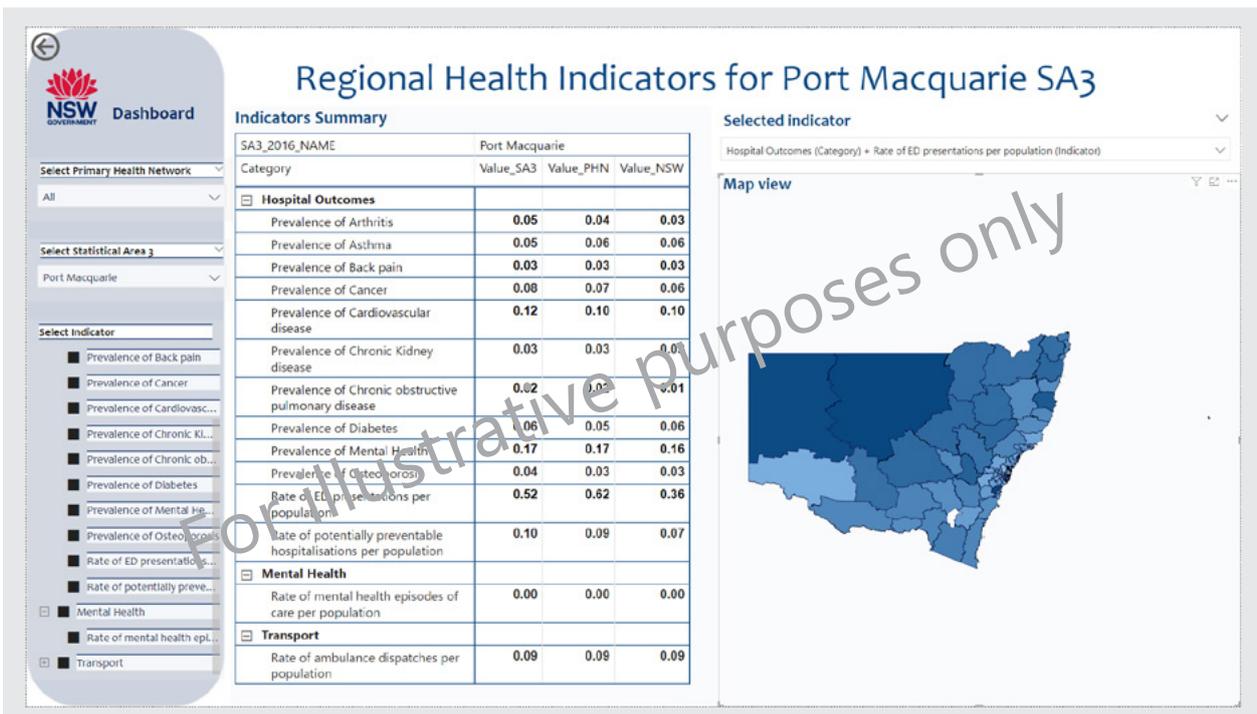
New dashboards and enhancements to existing dashboards support and underpin improvement initiatives.

The SAPHE platform has proven to be a valuable tool, especially in monitoring trends and tracking changes over extended periods. Its effectiveness is evident in the positive reception it has garnered, which was notably communicated through communities of practices and showcases. Among the features provided, the interactive COPD tool stood out. It was met with particularly favourable feedback, with users noting its outputs as easily digestible and highly useful for planning, engaging clinicians and developing hypotheses for further investigation.

In a bid to enhance the user experience and extend the platform’s capabilities, the SIA Dynamic Simulation Modelling team has made a significant investment in development of a Regional Health proof-of-concept dashboard, as illustrated in Figure 12. This dashboard brings together different

measures from the Lumos data asset, including primary care and acute activity, and prevalence of chronic conditions. It will be used to inform the strategic priorities for the Regional Health division. Such a tool would be invaluable for LHDs, PHNs, and GPs, granting them the ability to efficiently report against the [joint statement](#) while seamlessly integrating statement indicators. As such, the Lumos team have plans to invest in expanding the Regional Health dashboard statewide to support PHN/LHD joint planning and regional needs assessments. The ultimate vision is a centralised hub that houses all pertinent information necessary for service planning ‘a one stop shop for completing a community needs assessment’. This centralisation promises to dramatically reduce the time and effort traditionally spent on data collection, refinement, and subsequent analysis.

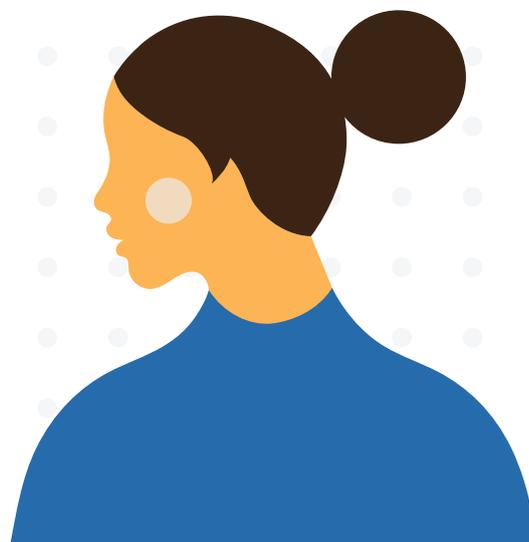
Figure 12. Concept Regional Health dashboard



Feedback from the users indicates a growing degree of satisfaction. Given the varying levels of analytics capacity and capability at PHNs, the development of these dashboards has been warmly received by stakeholders. Looking ahead, the Lumos team has made provisions in the future strategic plan for additional data and analytics capability for PHNs and LHDs. The goal is to maximise the potential of data, dashboards, and reports, making them invaluable assets for local planning and the execution of delivery projects and initiatives.

Multi-model training and communication could support uptake and value capture.

- Better training on how to read the report and digest the information which can be used at the practice level



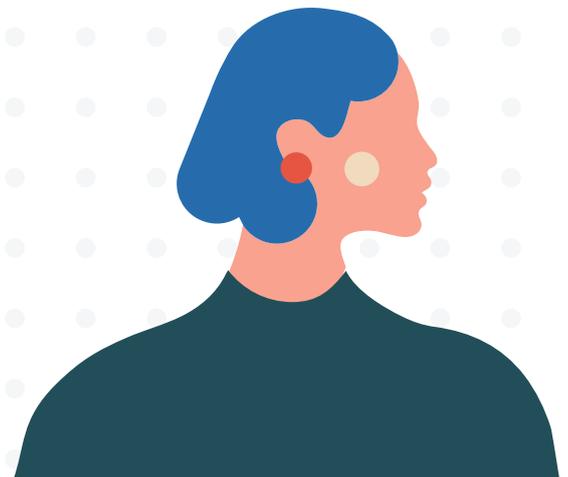
Stakeholders have become more proficient using Lumos and data outputs for service planning and improvement.

Practices have been actively utilising Lumos for their quality improvement initiatives, with a primary goal of securing the Quality Improvement Practice Incentive Payment (QI PIP). This is further supported by the findings from the GP survey, where question 6 indicated that a significant number of respondents (70%) either agree or strongly agree with the statement: “The information in the practice report has changed -or has the potential to inform changes - to improve my practice.”

Furthermore, PHNs have taken a proactive role in this development, championing this approach within their regions. Many have been working actively with individual practices to understand and apply data from their practice insight reports. In some instances, PHNs are conducting additional analysis, which has fostered a collaborative environment and encouraged practices to contribute to, and co-design, individual strategies for efficient implementation.

The quote below is indicative of the enthusiasm for conducting additional analysis over and above the Lumos report:

- Our practice has found great benefit from our Lumos reports -we look closely at our results, especially the hospital visits & we aim to reduce them by concentrating on the different areas reflected -it gives us goals e.g., reducing COPD presentations by 25% before the next report is published.



Examples where reports have been effectively utilised include:

Individual Practice Change:

A metro PHN working with local practices that are geographically close to acute emergency departments to extend opening hours. Insight reports identified potentially preventable ED presentations in the area due to limited access to primary care.

Identification of Quality Improvement (QI) initiatives:

Lumos reports have been effective in enabling the identification and planning for practice quality improvement programs. Initiatives documented during consultation related to improvements in cancer screening, winter support, and Chronic Obstructive Pulmonary Disease (COPD). The Lumos reports are also being used as evidence for the QI PIP at some practices.

Evaluation:

Lumos is being considered as a pivotal tool for the evaluation of the South Western Sydney PHN initiative, My Care Partners. This innovative program has been introduced specifically for general practices within the South Western Sydney region. The primary objective of My Care Partners is to incorporate eligible general practices into a comprehensive medical neighbourhood. This network aims to provide augmented care to patients who have chronic and complex conditions, particularly those who are at a heightened risk of recurring hospitalisations. The program is currently in its intervention phase, with evaluation scheduled for 2024.

Service planning:

While Lumos does not encompass all the required data necessary for service design, it offers critical directional guidance, enabling comprehensive service mapping. One PHN was able to identify a key at risk patient cohort (individuals aged between 45-55 who use insulin) where critical service coverage gaps existed.

Lumos data was also pivotal in the selection of sites for Urgent Care Services.

State-wide programs:

Lumos reports and dashboards are also enabling several statewide initiatives. In particular, the Statewide Initiative for Diabetes Management. The initiative has been developed collaboratively in consultation with patients, clinicians, researchers, districts, and networks, as well as PHNs, ACCHOs, and Non-Government Organisations (NGOs), with working groups effectively using Lumos reports and outputs for planning and reporting.

LHDs were noted to be actively recruiting practices participating in this initiative to Lumos so that Lumos can be used to underpin the evaluation of the diabetes initiative at both the LHD and state level.

Collaborative Commissioning:

Lumos reports and dashboards have been utilised by Collaborative Commissioning teams to identify specific patient cohorts, particularly those with COPD and CHF (chronic heart failure). The ability to track patient engagement levels within the healthcare system, monitor readmission rates, and assess service usage allowed teams to pinpoint existing gaps in the service provision. The team aims to leverage these insights and translate them into the financial costs associated with these service gaps.

Another Collaborative Commissioning team used Insights reports and needs assessment to identify areas for improved after-hours services and is working towards developing and implementing viable solutions for local practices.

Insight reports generated from Lumos data identified the improved patient outcomes for individuals who receive their initial diabetes diagnosis in a GP setting (see Figure 13).

This diagnostic journey, when mapped from start to finish, provides compelling evidence supporting the foundational premise of diabetes management: the necessity of diagnosis and care occurring within primary care, as illustrated here. It was noted during consultation that the PHN level report on diabetes will aim to become a recurrent showcase.

Figure 13: Diabetes First Record Factsheet Insight

	People with diagnosis first recorded at the GP	People with diagnosis first recorded in hospital
Where diabetes diagnosis is first recorded varies by people's characteristics, such as remoteness of residence	Over half in cities or regional centres.	Up to two thirds living in remote and very remote area.
Proactive care in the community was more common for people who had their first recorded diabetes diagnosis in the GP record	On average over the 2-years: 50% have antidiabetic medications prescribed. More likely to have GP management plans and reviews. More likely to have blood pressure, cholesterol and HbA1c recorded.	On average over the 2-years, 27% have antidiabetic medications prescribed.
Presentation to hospital was less common among people who had their first recorded diabetes diagnosis in the GP record	On average over the 2-years: • 16 GP visits • 2 ED presentations • 2 Hospital admissions • 8 Outpatient services.	On average over the 2-years: • 10 GP visits • 2 ED presentations • 4 Hospital admissions • 12 Outpatient services.
Mortality was lower for people who had their first reported diagnosis in the GP record	4% mortality across the study period.	6% mortality across the study period.

Domain 4

Delivery of Value

High quality, policy relevant and system-wide transformational insights

Overarching goal: delivery of support to value based healthcare is demonstrated.

OVERVIEW

Lumos serves as a catalyst for shaping, implementing, and assessing models designed to advance high value health care. The significance of Lumos lies in its capacity to drive transformative changes at both the policy and system levels, underpinned by its unique evidence foundation. While Lumos has only recently achieved scale, its emerging potential to contribute value in terms of decision-making and investment is already evident.

This large-scale retrospective and structured data, linked across health services, has value for developing policy and for planning, funding, managing, and evaluating health services.

Assessing the delivery of value was guided by the following sub-evaluation questions:

-  Have there been any insights? Are they policy ready?
-  Do policy makers and decision makers know about the insights?
-  Are insights being used to underpin and support Value Based Healthcare?
-  What is the value to the Commonwealth? What is the value to NSW? What is sustainable as business-as-usual?



Emerging



Progressing



Evolving



Mature

KEY FINDINGS

Lumos is providing valuable information and evidence to support decision-making in health service provision

The Lumos linked primary and acute data is supporting decision making at multiple levels, including:

- Supporting regional health service planning and implementation by providing a resource for information about local needs and priorities as well as a data source for timely evaluation.
- Informing statewide priorities by providing an evidence base to support decision making, policy, and planning.
- Informing national strategic priorities by enabling trials and exemplars of national priorities in a single jurisdiction.
- Meeting national strategic information priorities through being a successful jurisdictional exemplar, enabling progress on minimum national data to follow patient journeys through health services.

Lumos is helping to inform NSW state planning for urgent care services

Statistics reveal that approximately one in three cases presented at Australian emergency departments could be more effectively managed within the community.² To address this issue, two vital initiatives are currently in progress in Australia, aiming to alleviate the strain on emergency departments:

1. The Australian Government is funding the establishment 50 Urgent Care Clinics, 13 of which will be in NSW, over the next three years.³ These clinics will be integrated into existing primary care facilities, offering an alternative to emergency department visits for certain healthcare needs.
2. In a more immediate timeframe, the NSW Government is actively working to establish 25 Urgent Care Services (UCS) across NSW, in collaboration with PHNs.⁴ This effort is set to take shape over the next 12 months.

The investment in UCSs present a novel approach to addressing emergency department pressures representing a significant policy shift, emphasising system-wide reform, and the value of collaboration and shared responsibility across various healthcare settings.

Given the innovative nature of these approaches, it is essential to demonstrate that UCS implementation results in improved and timely access to quality urgent care in the community, while achieving high-quality health outcomes and reducing the burden on emergency departments. This necessitates the monitoring of linked primary and acute care data to gauge the realisation of these benefits and identify any unforeseen adverse effects.

Planning for NSW UCSs using Lumos

Notably, Lumos data has played a pivotal role in the mobilisation of UCS models in NSW. The presence and utility of Lumos has provided significant benefit and a substantial head start in terms of effort, time, value, and determining the UCSs program scope and operations. The use of Lumos data to plan the NSW UCSs eliminated the requirement to navigate important data privacy, security and technical strategies that would have otherwise been required. Lumos data were recognised by stakeholders as instrumental in providing valuable insights for identifying patient volumes and service gaps at each UCS location, which in turn resulted in significant cost savings during the UCS placement selection process.

A dashboard derived from the Lumos data has been developed to support PHNs and LHDs in visualising key aspects such as ED demand, the optimal placement of UCS units, and the projected benefit-to-cost ratio of services, both at an individual and network level. Lumos data are enabling forecasting and monitoring of presentations to both UCS and ED, capturing various parameters, including the presenting issue and time of day, as well as patient and system outcomes, such as subsequent care requirements and the cost of care. An illustrative example based on sample data is depicted in Figure 14.

Figure 14. Example business case output

Case for change

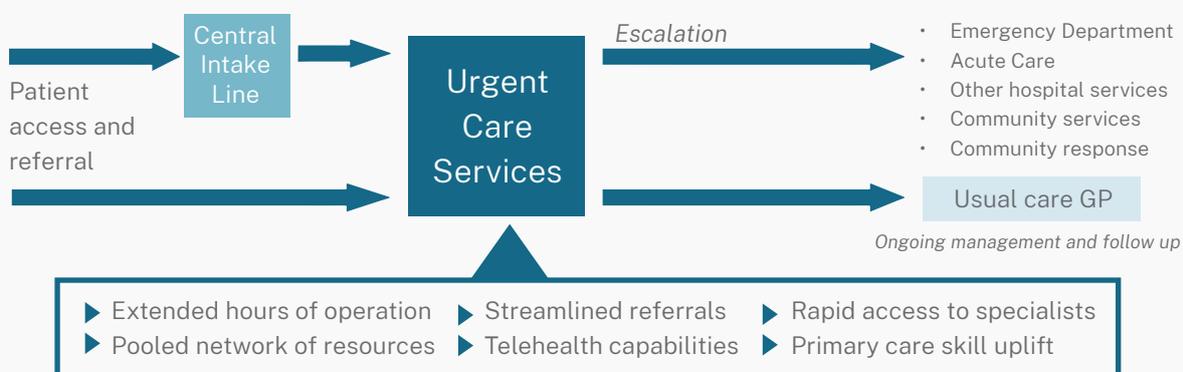
15% increase in ED presentations during FY16-FY19, almost double the population growth

30% determined to be low or semi-urgent (Triage category 4 or 5)

3 Year Targets

- 15% reduction in triage Category 4 and 5 ED presentations through referral to the value based urgent care pathway
- 15% reduction in hospital admissions for people with low acuity conditions
- 15% reduction in representations to ED and/or urgent care due to more coordinated patient management and follow-up care

Urgent Care Services model of care to reduce the number of low acuity conditions requiring “urgent” treatment presenting to EDs by providing sustainable alternative local patient-centred urgent care



Evaluating UCSs

Lumos data is an integral component of the UCS rollout in NSW, with participation in Lumos becoming a mandatory requirement for UCS candidate practices.

Lumos is poised to be the most effective tool for evaluating the impact of UCSs on emergency department presentations and overall patient flow within the community.

The communication of the value of Lumos through public media outlets has driven further interest and engagement

NSW Health Award

In November 2022, the Lumos program was a winner in the 24th Annual NSW Health Awards in the Health Research and Innovation Category. The NSW Health Awards celebrate excellence in the delivery of public services to the NSW community. Winning the award acknowledged Lumos' successes as a unique and significant innovation in NSW Health. The award specifically recognised how Lumos makes data available to drive multiple areas across the NSW [Health Future Health Strategy](#). These include (with related Future Health key objectives):

- Lumos data can inform GP, LHD clinician, patient and consumer-led co-design and evaluation of health initiatives (1.1, 1.4).
- Lumos reporting can improve health literacy of both the system and for specific conditions (1.3.).
- Analysis of Lumos data and insights underpins system, safety and quality improvement efforts and future planning (2.1, 2.5), including for regional, rural and priority populations (2.4.).
- By design, Lumos is a tool that integrates and makes accessible health service data (2.3, 5.3.).
- The asset provides the largest cross-sector linked health data tool in Australia to enable population health analyses (3.1, 3.6).
- Lumos partners with LHDs, PHNs and academia to power research and innovation for translation into the health system (5.1).
- Lumos underpins analyses of value-based healthcare (6.1) and enables monitoring against related performance targets (6.3).

Lumos article in Pulse+IT – March 2023.

An article titled 'Over 600 general practices sign up for NSW Health's Lumos data linkage program' was published by Pulse+IT Website on 9 March 2023.

The article provided commentary on the Lumos program, quoting Dr Charlotte Hesper, Principal GP, Glebe Family Medical Practice in Sydney, as a Lumos user, as well as a speaker at the Australian Health Week Session in the week commencing 15 March 2023. The article highlighted:

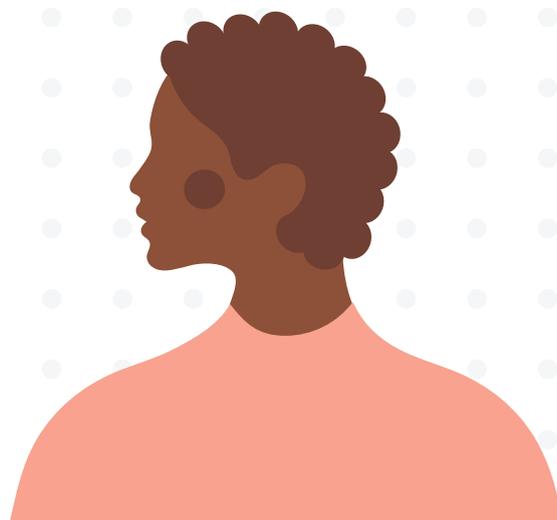
- Over 630 general practices in NSW have joined the Lumos data linkage and analytics program, making it the largest collaboration between the NSW Ministry of Health, PHNs and general practices.
- Lumos is Australia's first state-wide linked primary-acute care data asset, extracting de-identified data from general practices and linking it to patient records from acute and other health services to gain comprehensive insights into patient pathways.
- Lumos aims to guide system redesign, enhance patient outcomes, and improve patient experiences. Lumos has revealed significant differences in patient care, outcomes, and hospitalisation rates between individuals whose diabetes was first recorded in general practice versus those in hospital records.
- The Lumos program facilitates data-driven planning, integrates healthcare across the continuum, and enables reflective practice to enhance the quality of healthcare data and records.
- Lumos data is stored in a highly secure cloud solution called SAPHE and is available for planning, monitoring, funding, and evaluation of health services. Data extraction software and processes ensure patient privacy and data security.

Lumos in the Australian and the Medical Republic.

In December 2022, the Australian and the Medical Republic published an article calling for better follow-ups of patients following discharge from hospital. The article highlighted the Lumos findings that a GP visit shortly after an unplanned hospital discharge significantly reduces the risk of readmission. Furthermore, the article highlighted the clear benefit to the health care system of patients attending a high connectivity practice (practices that demonstrate higher continuity of care). Patients at a high connectivity practice had a 10% lower chance of an emergency department presentation and a 12% lower chance of an unplanned hospital admission. The analysis showed that there was a \$1.60 healthcare system benefit for every \$1 spent in high connectivity practices.

“The Lumos data is demonstrating the value of having one doctor who has knowledge of everything about you, really significantly improves your likelihood of living longer and decreases your likelihood of needing to go into hospital.”

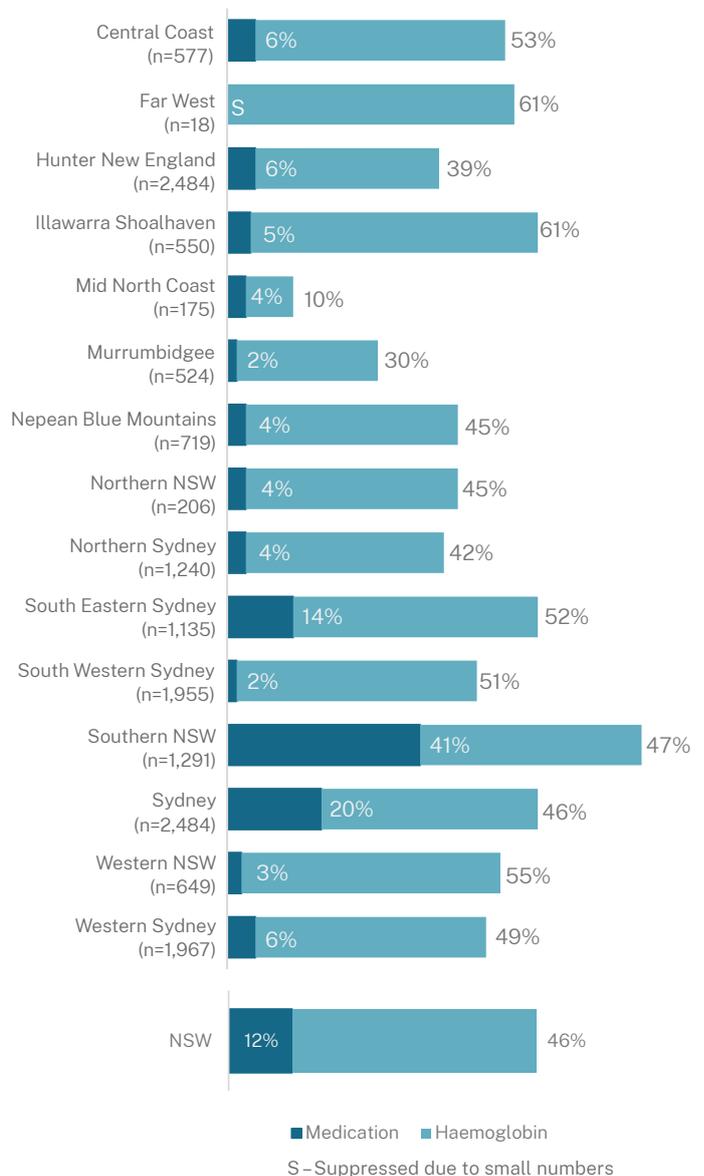
Dr Charlotte Hesper
Principal GP,
Glebe Family Medical Practice Sydney



Lumos has been used to highlight variation in statewide clinical practice

The Agency for Clinical Information used Lumos data to conduct a study on treatment pathways for women with heavy menstrual bleeding in NSW.⁵ Women hospitalised with heavy menstrual bleeding were identified in admitted patient data and a one-year look back period was applied to describe treatment received in general practices and/or non-admitted patient clinics prior to hospitalisation. The study found that there is variation across LHDs in the treatment received for heavy menstrual bleeding prior to hospitalisation. For women who consulted a doctor at a general practice in the year prior to hospitalisation, prescription rates for medication that can be used to treat heavy menstrual bleeding ranged from 2% to 41% across LHDs and haemoglobin testing rates ranged from 10% to 61% across LHDs (Figure 15). Exploration of the reasons for the variations identified may help to improve treatment pathways for heavy menstrual bleeding.

Figure 15. Medication prescription rates and haemoglobin testing rates for women who consulted a doctor at a general practice in the 12 months prior to hospitalisation for heavy menstrual bleeding, by local health district, NSW 2011-2018



INSIGHT: Lumos provides evidence that aged care residents use all services more frequently

In NSW, older people aged 65 years and over constitute 17% of the population. The majority of older individuals in NSW reside in the community, while approximately 4.4% are residents of aged care facilities. The recent Lumos analysis of: aged care residents and health services usage, provides valuable insights into the utilisation of health services by aged care residents compared to older people living in the community, as described below and illustrated in Figure 16.

Hospital and ambulance usage:

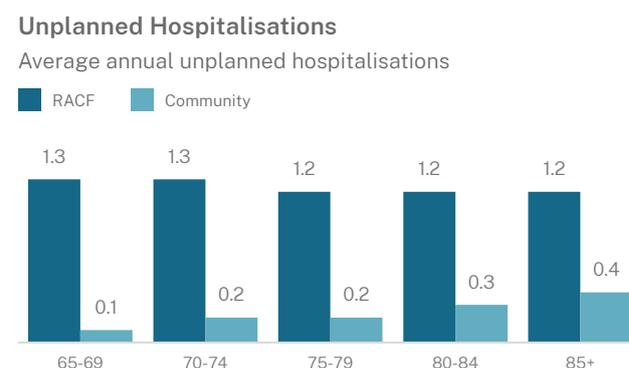
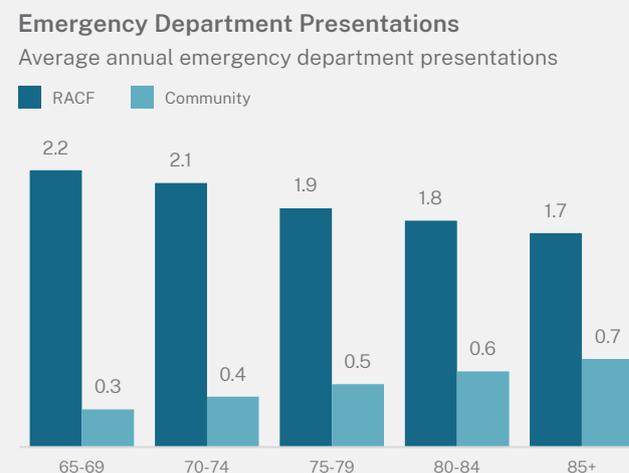
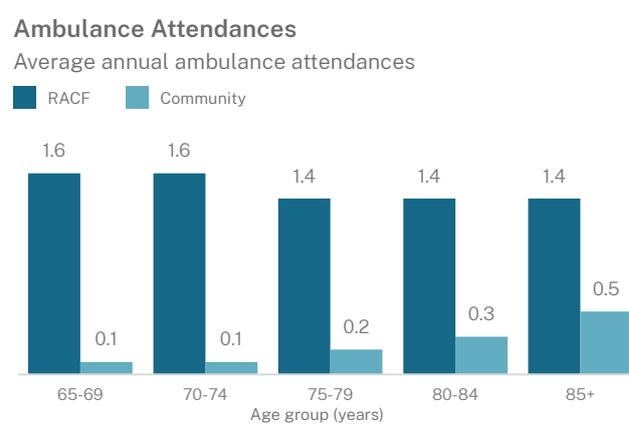
Aged care residents use hospitals and ambulances more frequently than older individuals in the community. Over the period from July 2016 to June 2021, aged care residents aged 65 years and over had significantly higher rates of:

- Ambulance usage (7 times higher)
- Emergency department presentations (4 times higher)
- Unplanned hospital admissions (6 times higher)
- A higher proportion of preventable hospital admissions (12% compared to 7% in the community)

Unplanned hospitalisations: Mental disorders, particularly dementia, are a more common reason for unplanned hospitalisation among aged care residents compared to older people in the community. In contrast, circulatory diseases are the primary reason for those living in the community presenting to hospital.

Primary Care Usage: Aged care residents utilise primary care services more frequently than older individuals in the community. On average, aged care residents aged 65 years and over saw a general practitioner over 16 times a year, while less than a quarter of community-dwelling individuals in the same age group saw a GP with such frequency.

Figure 16. Acute care use by age group for people living in the community compared to those living in a RACF

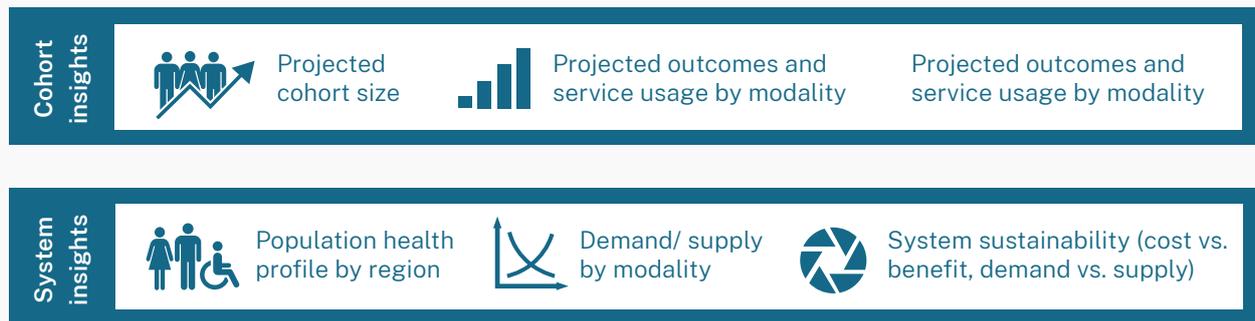


Lumos is contributing to continuously improving patient outcomes

Health service providers are, or aspire to be, continuously improving the way they provide effective value-based care to patients. The Lumos data is helping to explore interventions and quality improvement at the interface of primary and acute care across general practice, PHN, and the LHD levels.

Example: Regional data: evidence-based support for innovative care pathways through linked data

Collaborative Commissioning is a flagship program in NSW Health’s value-based health care portfolio. It aims to support local partnerships across care settings – primary and acute – to design and implement outcome focused care pathways for local high priority cohorts that reduce acute demand, through more appropriate care in the community setting. Lumos data is used to construct a representative local population for each partnership. Individual patient pathways are simulated over time and aggregated to provide insights for the cohort and at a system-wide level.



Lumos is a catalyst for collaborative research-based healthcare innovation

Stakeholders identified that Lumos is a catalyst for healthcare innovation bolstered by research capability and to drive advances in improved patient care through better data and analytics.

Cardiovascular risk prediction

- The Western Sydney PHN and the University of NSW have engaged in a partnership to use advanced research and analytic techniques to improve primary care in Western Sydney to deliver better patient outcomes through early intervention in the community setting. The project's objective is to predict the risk of cardiovascular disease (CVD) events using the Lumos dataset, focusing on individuals aged 30-74 years. The cohort consists of individuals with no prior history of cardiovascular disease. GP data and hospital records are utilised for this analysis, to track outcomes related to cardiovascular events. The predictors include various factors such as demographics, medications, chronic diseases, measurements, and pathology. The intent of the project is to develop and implement an algorithm for identifying and flagging patients, that can be used to provide feedback to GPs for patient care improvement.
- The algorithm developed in the initial phase has good predictive value and the next phase of the program will look at translating this into practice as well as expanding to other chronic health conditions.
- The partnership between Western Sydney PHN and the University of NSW has embedded a research and analytics rigor to more effectively focus on the primary purpose of Lumos, which is the improvement of health service delivery.

Type 2 Diabetes in Central and Eastern Sydney

- A second partnership has also been established between the Central and Eastern Sydney Primary and Community Health cohort/resource (CES-P&CH) (comprising Sydney Local Health District (SLHD), South Eastern Sydney Local Health District (SESLHD), Central and Eastern Sydney Primary Health Network (CESPHN)) and UNSW Centre for Primary Health Care and Equity (CPHCE).
- Health service providers in Central and Eastern Sydney (CES) identified the need to better understand the patterns of care and outcomes for individuals with diabetes residing in CES. The project aims to characterise type 2 diabetes mellitus (T2DM) patients in CES attending Lumos general practice clinics and hospitals, to better understand the delivery of T2DM care in the region, and to evaluate the quality of care and patient outcomes.

Looking to the future: Lumos, a blueprint for a national model

- There is a compelling case for value to both state and Commonwealth jurisdictions in being able to follow patient journeys across Australian health systems.
- The Lumos program's value to the Commonwealth lies in its role as a model for national health service data sharing. Better health data has long been an aspiration of Australian state and federal governments. The critical importance of better data is recognised; it is essential for improving population health planning, service delivery, and patient outcomes. It addresses various use cases, from practice-level to national strategic priorities, fostering continuous improvement.
- The unique contribution of Lumos is widely acknowledged, and there is growing interest in replicating its value in other jurisdictions and nationally. An action from the September 2022 Health Ministers Meeting (HMM) was a request for the Health Chief Executives Forum (HCEF), led by NSW, to develop options for establishing national ongoing data to follow patient journeys in both primary care and state health systems. At the HMM in February 2023, a national hub and spoke model received in-principle approval as the preferred option for sharing health service data to understand patient journeys across primary and acute healthcare systems, based on the Lumos program. Funding from the National Cost Shared Budget was approved by HCEF and HMM in October 2023 to run a design and scoping phase. This work will commence in March 2024 with delivery of a blueprint for national data sharing at the end of 2025.
- The approach ensures that local and regional differences are respected while identifying adaptable strategies for better outcomes. This model capitalises on existing local data sharing projects, supporting collaboration, data extraction, and reporting efficiencies.
- Lessons from the mature Lumos program can guide the design of spokes, while also providing useful insight to the Commonwealth hub design focusing on governance, infrastructure, privacy, data standardisation, and multi-way data sharing. Ultimately, the Lumos program sets the stage for a cohesive, data-driven, and improved healthcare system at the national level.

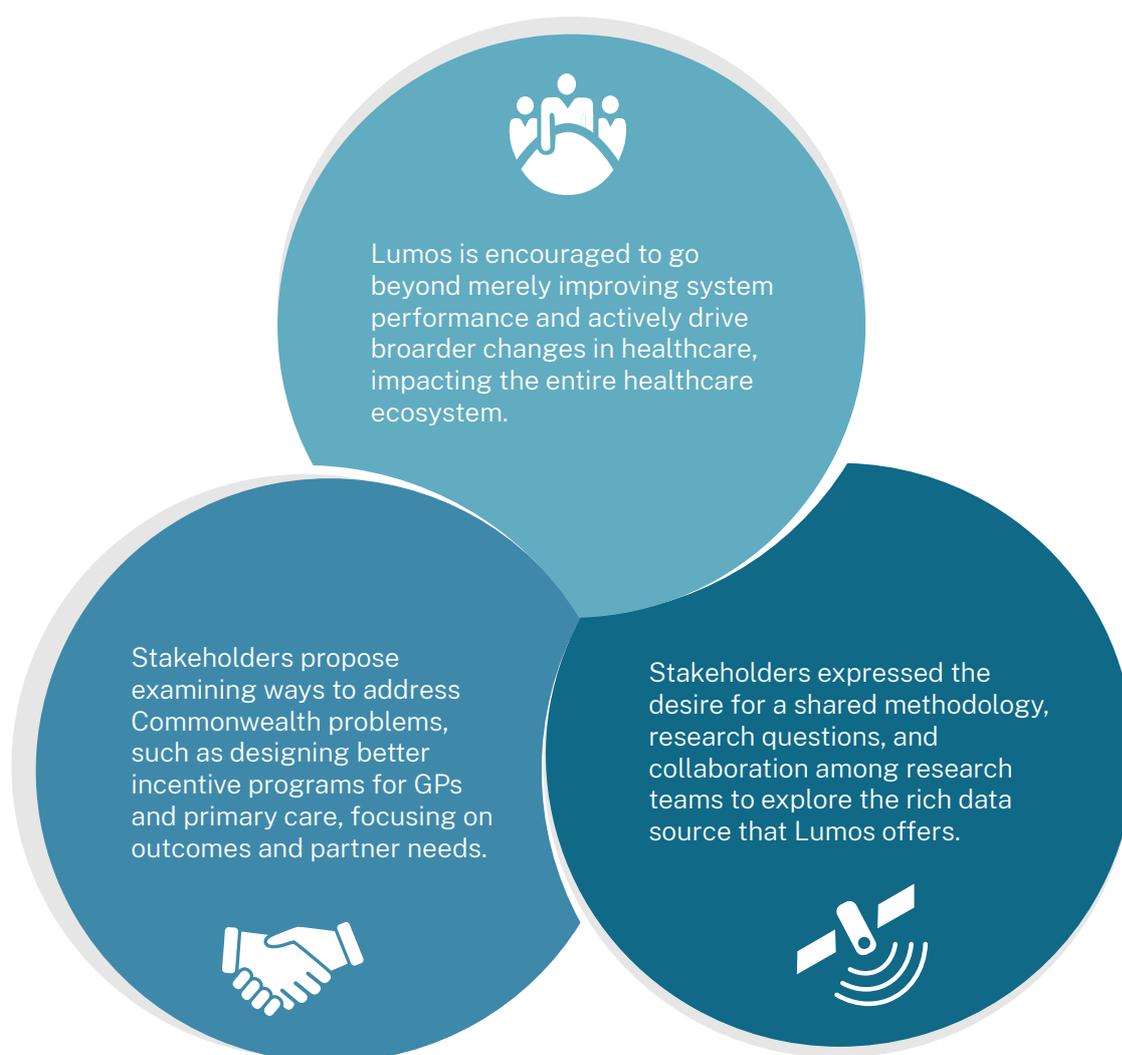
Commonwealth stakeholders agree the national value of Lumos

- 'Lumos (or similar) is a critical piece of digital infrastructure contributing to the full continuum of health information for the Australian system.'
 - Lumos has the potential to provide valuable information and evidence to monitor and evaluate the national MyMedicare initiative in the local NSW context. MyMedicare is a new voluntary patient registration model. It aims to formalise the relationship between patients, their general practice, general practitioner and primary care teams.
-

The future of Lumos in a business as usual context

Throughout the evaluation stakeholders highlighted the significant value that Lumos brings across the healthcare continuum, from data-driven decision-making to national healthcare reform efforts. Suggestions to further harness this value and drive broader healthcare changes were captured and are illustrated in Figure 17.

Figure 17. Lumos in a business as usual environment





Appendices

Appendix 1:

Stakeholder consultation list

Organisation

Aboriginal Community Controlled Health Organisation representative

Aboriginal Health and Medical Research Council NSW

Agency of Clinical Innovation (ACI)

Australian Government Department of Health and Aged Care: Primary Care Division

Australian Institute of Health and Welfare (AIHW)

Central and Eastern Sydney Primary Health Network (CESPHN)

Centre for Aboriginal Health (NSW Ministry of Health)

Centre for Health Record Linkage (NSW Ministry of Health)

Consumer Representatives

Government Relations Branch (NSW Ministry of Health)

Hunter New England and Central Coast Primary Health Network (HNECCPHN)

Hunter New England Local Health District (HNELHD)

Integrated Care and Collaborative Commissioning (NSW Ministry of Health)

Mental Health (InforMH) (NSW Ministry of Health)

Murrumbidgee Local Health District (MLHD)

Nepean Blue Mountains Primary Health Network (NBMPHN)

North Coast Primary Health Network (NCPHN)

Northern Sydney Local Health District (NSLHD)

Northern Sydney Primary Health Network (NSPHN)

NSW Branch Australian Medical Association members

Royal Australian College of General Practitioners (RACGP) members

South Eastern NSW Primary Health Network (SENSWPHN)

South Western Sydney Primary Health Network (SWSPHN)

Strategic Reform Branch (NSW Ministry of Health)

System Purchasing Branch (NSW Ministry of Health)

University of New South Wales

Western NSW Local Health District (WNSWLHD)

Western NSW Primary Health Network (WNSWPHN)

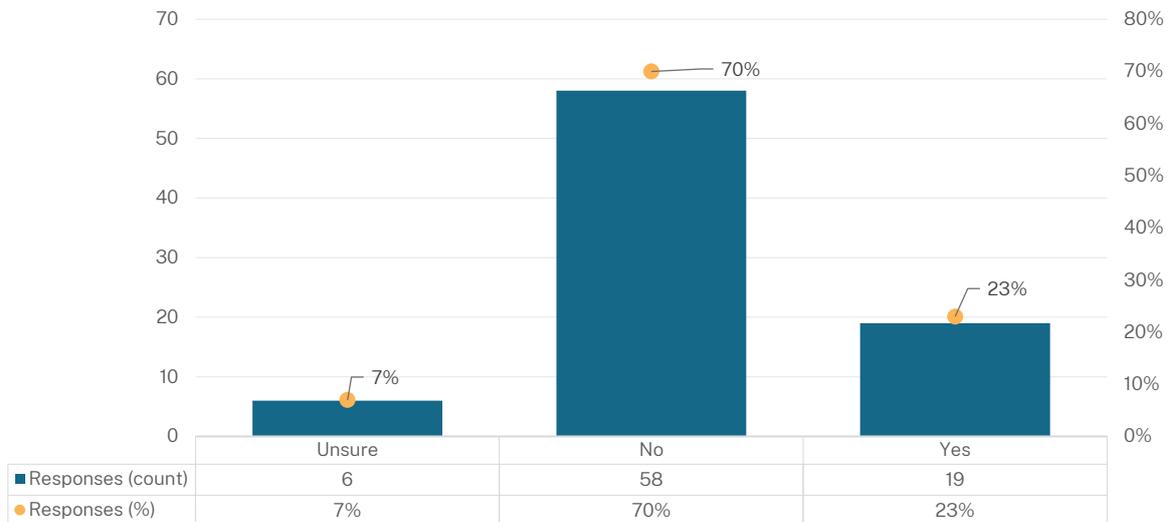
Western Sydney Primary Health Network (WSPHN)

Appendix 2: GP survey

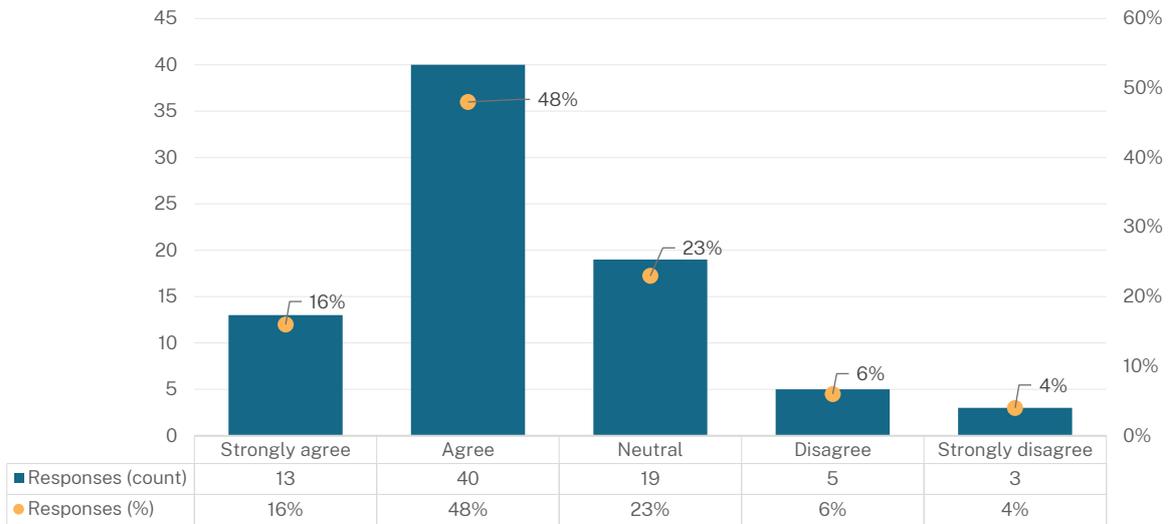
Question 1) What is your Primary Health Network?

Primary Health Network (PHN) region	Number of responses
Hunter New England Central Coast PHN (HNECCPHN)	13
Western Sydney PHN (WSPHN)	13
Northern Sydney PHN (NSPHN)	11
Central and Eastern Sydney PHN (CESPHN)	10
Nepean Blue Mountains PHN (NBMPHN)	10
South Western Sydney PHN (SWSPHN)	10
Murrumbidgee PHN (MPHN)	8
South-Eastern New South Wales PHN (SENSWPHN)	5
Western New South Wales PHN (WNSWPHN)	3
North Coast PHN (NCPHN)	0
Total	83

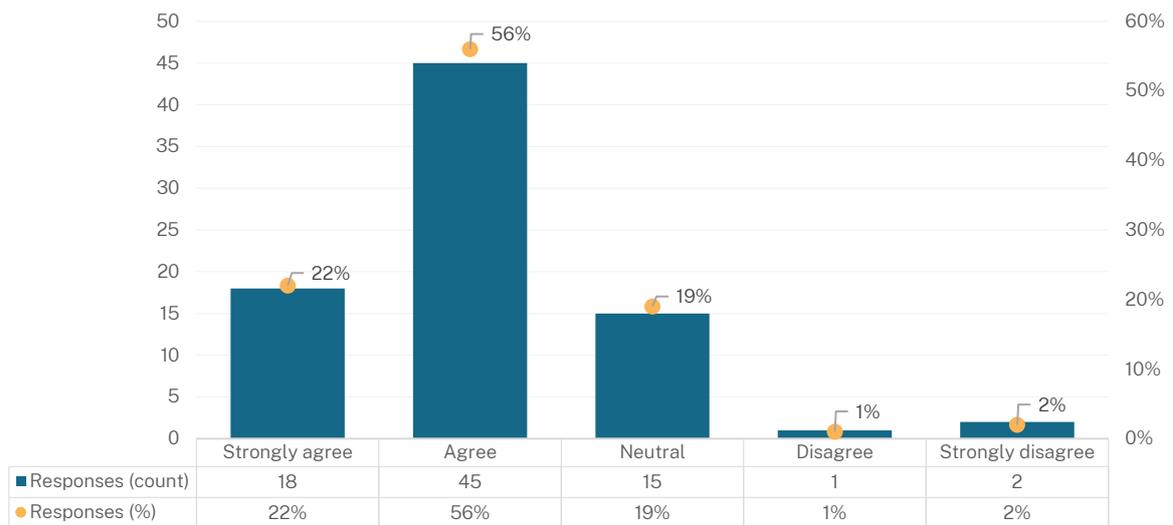
Question 2) Is this the first time you are receiving a Lumos Practice Report (sample pictured below)?



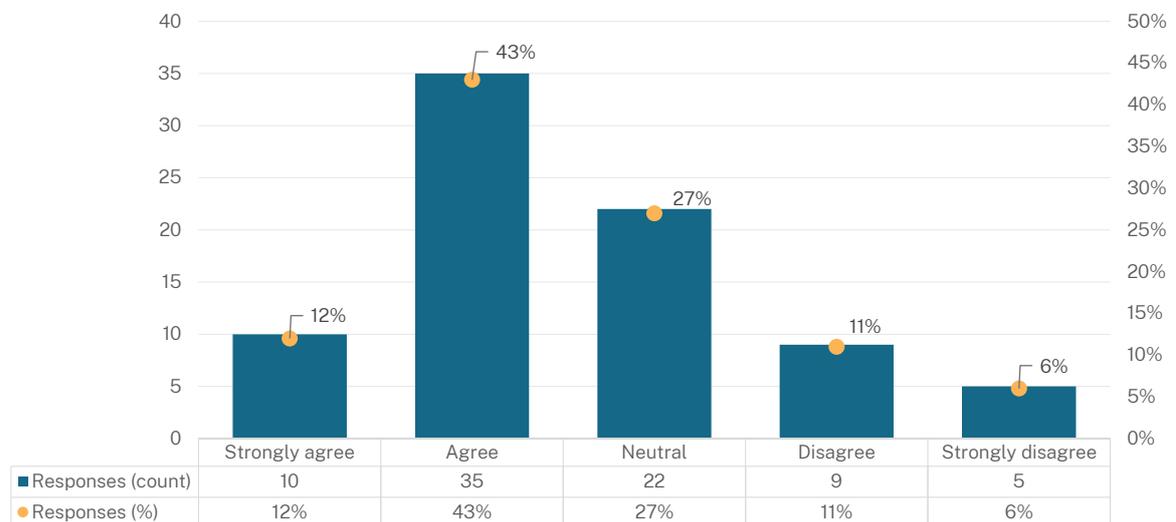
Question 3) The information in the report is easy to digest.



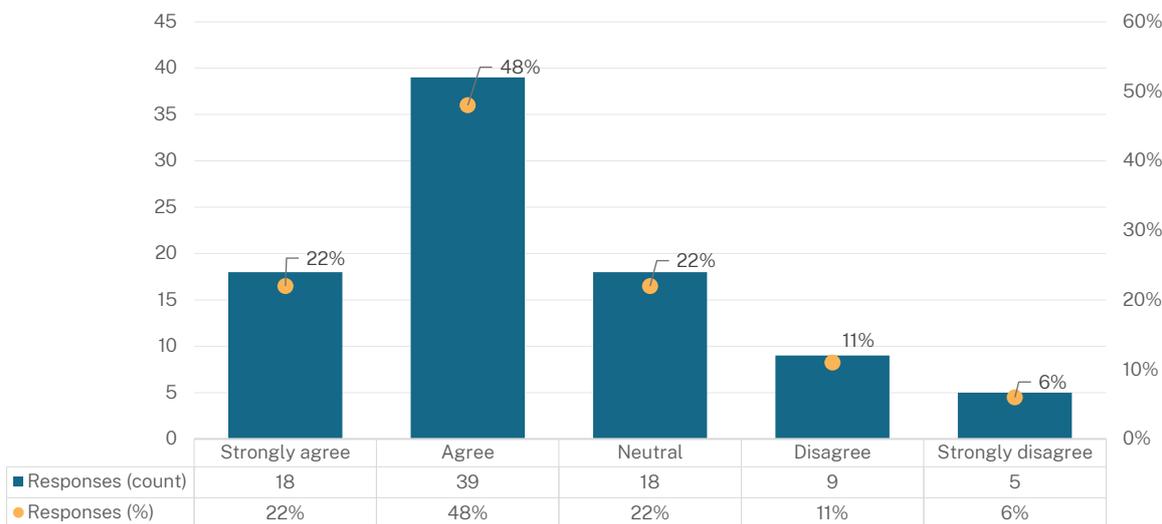
Question 4) The information in the report is relevant to my practice in terms of content.



Question 5) The information in the report is relevant to my practice in terms of timeliness.



Question 6) The information in the practice report has changed -or has the potential to inform changes -to improve my practice?



Question 7) Do you have any other comments about the Lumos practice reports?

Responses

Good information but reports are quite out of date by time we receive them

Great process but should eventually lead to allowing access to all the information about each of the people who have registered under My Medicare to be made automatically and instantly available to their doctor. More valuable to have this information in real time.

I am not sure if my practice has received a Lumos report. I cannot open the one attached to review so not able to comment but would be interested to see what format they take.

I feel that Lumos has capacity to be a great report for looking at changes in practice data / data linkage-needs to be automated, easy to read. However also need useable quality improvement interventions that are developed by GPs and assistance from PHN to deliver these-including staffing as there is no point in collecting data with no support for practice change. Also needs to be more clarity around use of data and who has ownership eg practices vs Lumos vs PHN as I think this is something many GPs are not sure about. Lumos is a mysterious organisation and it is not clear to me as a GP who owns it or manages it, as there is not enough information on the website to understand mechanism. Also as a GP researcher, the process for applying for data and use of data is not transparent and the data needs to be accessible for use to maximise the value from Lumos. In the past I have asked directly how to access this and been told was not able to access/ there was no process for accessing data. There needs to be a clear process/ cost/ application process on the website for use in research. I would recommend also listing all research projects using Lumos data on the website so consumers and GPs can see what data is being used for, and list their ethics committee approval.

I believe the purpose of collection is bias towards the hospital and implies an onus on General practice to improve systems that are not contextualized in the true landscape of the healthcare setting -comparators and benchmarks for similarly sized, resourced general practices and taking into account patient factors, provider and hospital factors-more granular data extraction. There is no data on hospitalizations insight and variables and so patient journey is being tracked in very unrefined datapoints to inform a biased outcome. When we sign on we need full disclosure on the intended use of this data-short, long and medium term and how it relates to the long term strategic health investment . It gives an oversimplification of the broad categories without a recommendation for resources , services that can facilitate quality improvement and measurable outcomes. Largely lacks real transparency on the quality, integrity on data sets and parameters on these measures in data extraction.

I don't recall seeing this report at this present time, so i am unable to comment

I have only ever seen one report and that was in 2020

I would like Lumos to improve the range of patients. Data about other shared care arrangements (eg. Antenatal shared care or diabetes shared care) would be more relevant to my patient base than ED admissions.

It can be difficult to identify trends with so few data points / reports and to know how we are tracking over time, as well as knowing how to translate the data into practical changes in our practices

It is a good benchmark for performance of the practice and directly links to PIP QI. I appreciate the visual representation of data, it is user friendly.

It was so comprehensive

It would be easier if the name of the report is more consistent. I saved those reports. I need to know which report I am opening. eg. "Aug 2023 Lumos report" etc. Sometimes the report was named after the reporting month, sometimes the month the data pertain to, which can be very confusing.

It's a great way to keep track of our practices good and not so good areas, compared to MPHN and other PHNs. It's a great way to capture all information and review areas for improvement.

Lumos reports are a great snap shot of the practice in comparison to the rest of the region, we use these to create PDSAs for QI work

may be create a website to see live view

Often there are scenarios which hinders use of the information in the practice report. Eg we are a practice that has a lot of non-regular patients as we are located within a shopping centre, so it is hard to reflect all of what is happening with our patients in these datasets or it skews the data for our regular patients.

Our practice has found great benefit from our Lumos reports -we look closely at our results, especially the hospital visits & we aim to reduce them by concentrating on the different areas reflected -it gives us goals eg. reducing COPD presentations by 25% before the next report is published

Report is meaningless to us if data from Northern Beaches Hospital not included. This needs to be rectified for the report to be useful to us.

Thank you for providing this information. and thank you to the PHN (PHN representative) for providing valuable insight and talking me through the report

The ED avoidance one conflates triage 4 and 5 ED presentations with GP appropriate presentations which is not correct and then has prompts around GP service provision when there is little evidence to support this idea.

The information is 12 months old before it is received. Interesting how many patients self refer to hospital. We will refer patients only if we can not manage them in the surgery.

The practice support staff that discuss the Lumos report are great. They help me understand much better than if I got the report alone

The report is from the previous year so it is not giving up to date information. It is interesting to read and with future changes happening with MyMedicare it could be more relevant to use.

The report is great, it just comes too late. So yes, it has an amazing potential to make a change or to inform changes, you're just going blind until quite a time later to see if it did or not...

The report is too big too messy to be directly relevant. A more nuanced Gp directed summary would be useful.

The reports give a good reflection of the current healthcare crisis, mainly being there are not enough GP's available and patients are seeking treatment from emergency departments.

The statistics provided in the reports are easy to infer relevant information from that is applicable to our practice. The clinical staff look forward to receiving the reports, as well as a summary of my insights that I believe can help our practice address the specific needs of our patient population more effectively.

The volume of the information is overwhelming and there are sections I don't see value in - particularly around outpatient services and hospital admissions. The timeliness of the report remains an issue. Data from 12 months ago doesn't reflect our current patient base or workforce.

This is an excellent facility that I value highly as clinical lead GP at my practice.

This report is hard to read and effectively identify patients actually impacted by hospital visits. How do we identify the patient cohort or diagnosis affecting reason for visit. Also discharges are not always received from the hospital

Too much information. Would be better to simplify the report and only have the information we can do something about

Too wordy, confusing and I'm not sure what I am meant to do with it

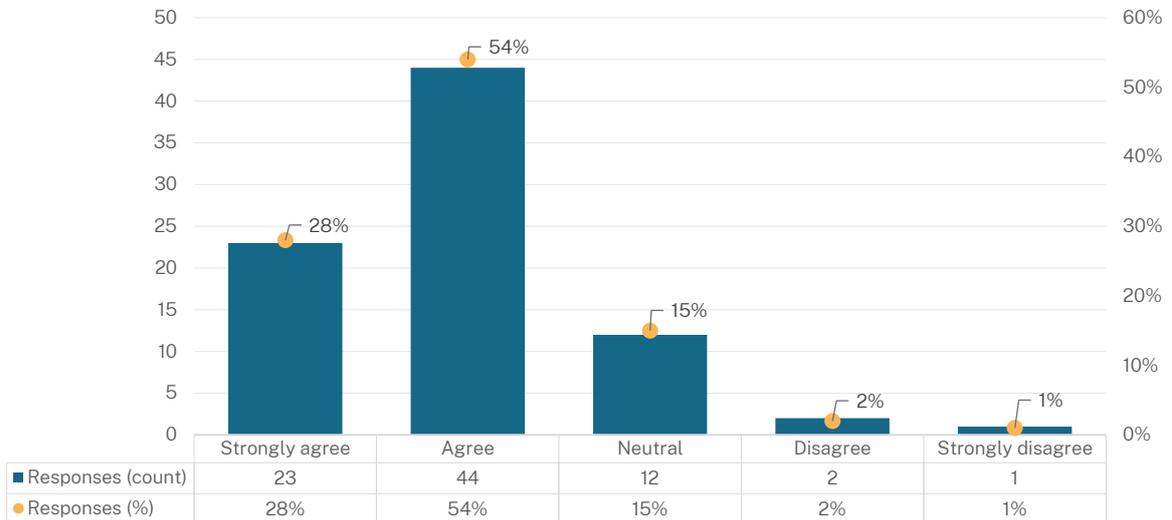
Very helpful in providing information about the practice

Very new to it so it may take some time to fully understand its usefulness

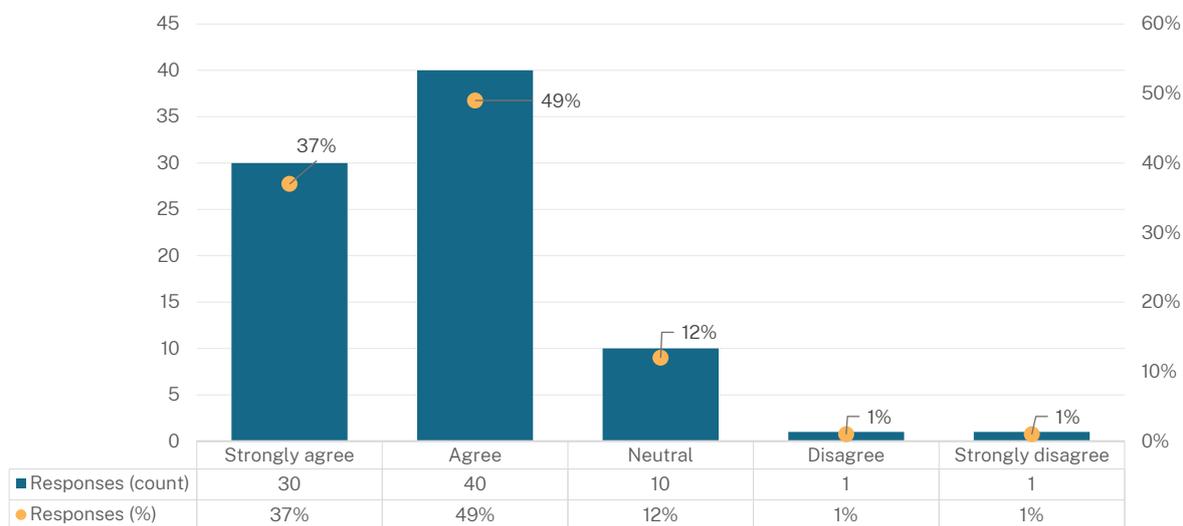
We love this report as it gives us perspective on our patients who are ending up in hospital. We use it to develop our internal QI projects.

Would be better to get them more often with a shorter lead time - 6 months behind is not massively useful, though I understand why the massive amount of data takes so long to accumulate & match.

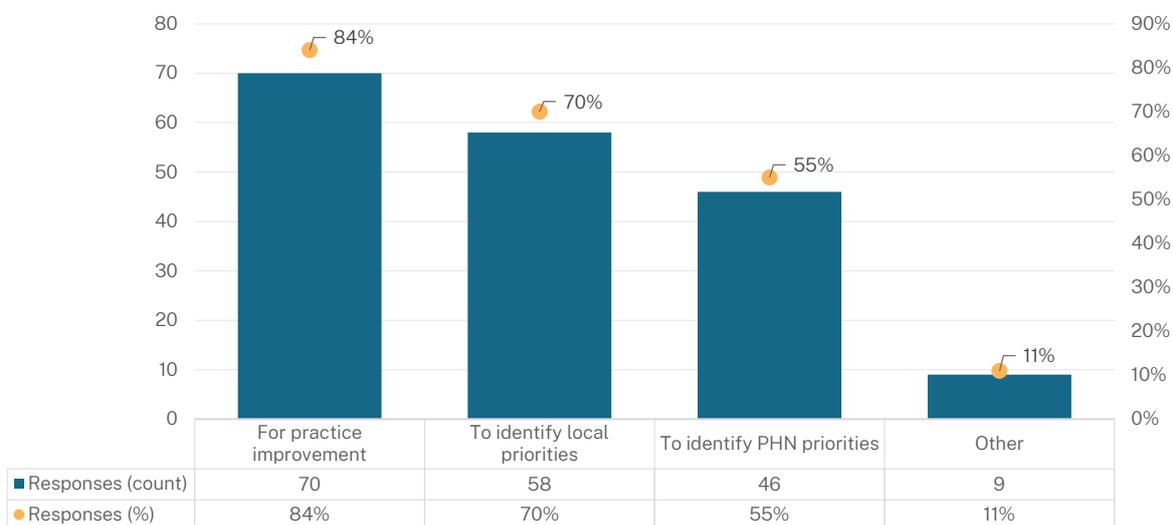
Question 8) I am confident in the program's privacy measures and security measures.



Question 9) Access to comprehensive information about the patient journey is important for health care delivery.



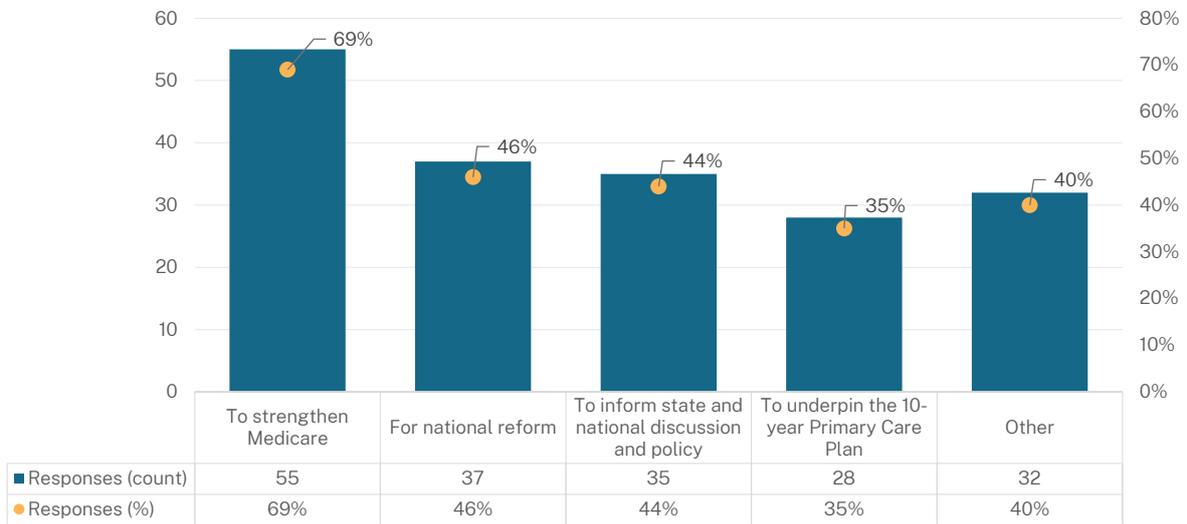
Question 10) How would you like to see the Lumos data being used across the profession?



Other responses

- In real time for patient management
- research regarding quality improvement initiatives in LHDs as well as GP
- Research
- to assist Practice Nurse performance improvement and Best Practice
- To identify Patient outcomes and understand their health journey
- To inform Medicare rebates to encourage evidence based care
- To systematically compensate for health inequalities and link into closing the gap
- Identify why patients refer to hospital and not to send patient home to “make figures look good”
- CALD provisions chronic disease management and to resource with funding underperforming parts of the system to improve competencies to a desired level of satisfactory performance that is punitive but strength based

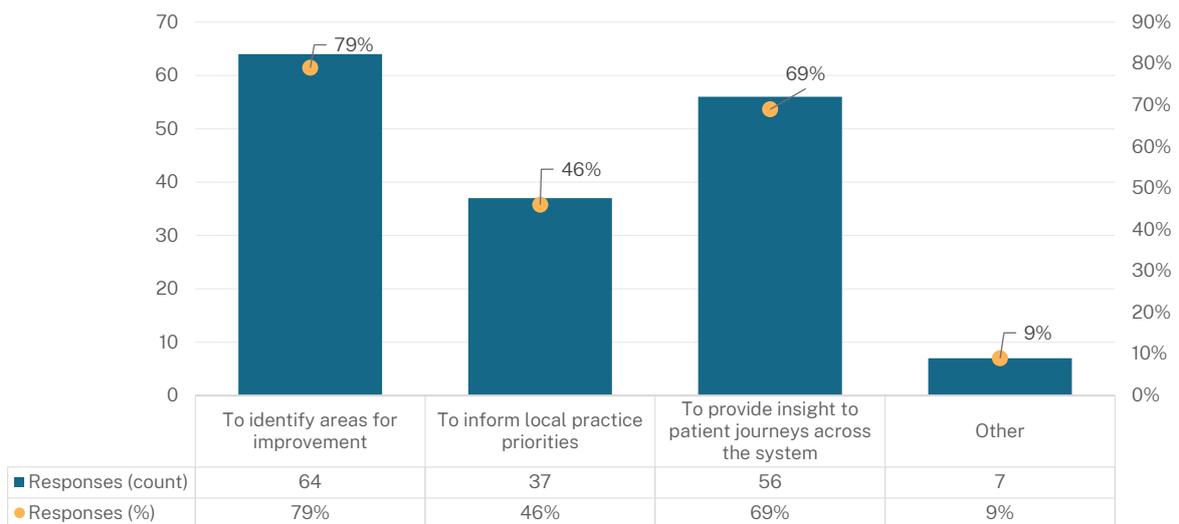
Question 11) How would you like to see the Lumos data being used at the system level.



Other responses

- Also need to use to feedback to hospitals / LHDs as lots of the need is in poor access to hospitals
- Research
- To identify Patient outcomes and understand their health journey
- To highlight health inequities, social determinants investment that extend beyond tertiary level health spend

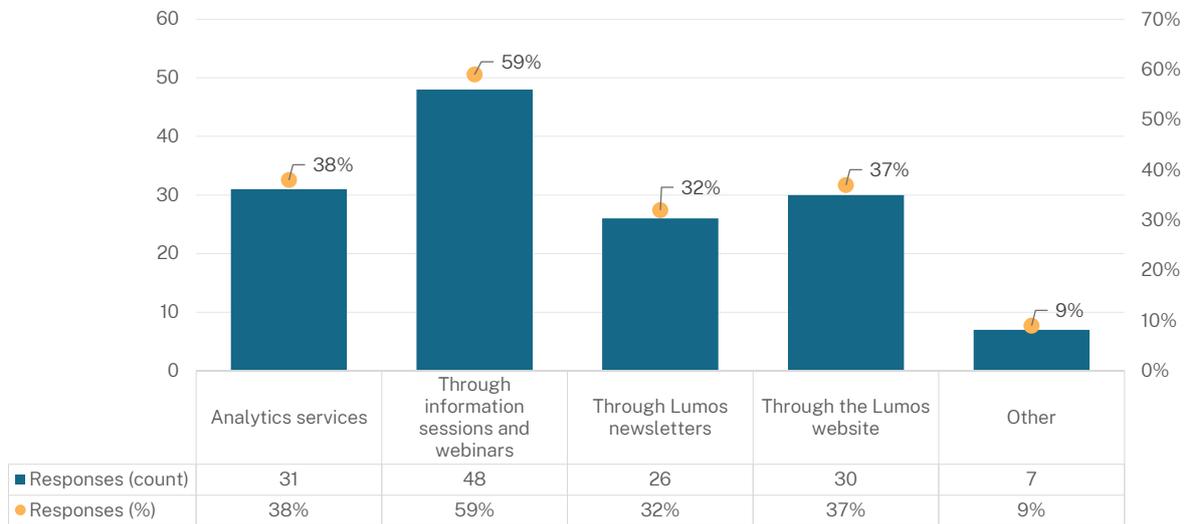
Question 12) What was the motivation for you to engage your practice in the Lumos program?



Other responses

- To identify Patient outcomes and understand their health journey
- We are a NSW Health Agency already delivering primary care under a single-employer, whole-of-healthcare model
- To demonstrate that linkage is possible
- To hold my local health district accountable as a whole and identify gaps and inform appropriate spend and enrich patient centered care approached

Question 13) How do we make the unique insights from Lumos more accessible?



Other responses

- Better training on how to read the report and digest the information which can be used at the practice level
- PHN staff visits at our practice
- Through education of users on data science to user level value so the improvements come through a whole of system, user insight driven and not top down ideas that lack on the ground translational applications.
- Need a lot of work in this area. It is not clear from the website what processes are required to access data and that it is accessible . Need clear data governance committee and clear process for accessing data that is online, also as above clear information about the projects underway

Question 14) Do you have any other comments or feedback about the Lumos Program?

Responses

A report on data over 12 months old is of limited usefulness

Being able to manipulate local data would be interesting

- General comments is that there has been little transparency about Lumos and not enough information available online to understand project.
- Also need to consider other projects that are also using GP data and that now competitive market for GP data. Need to be clear and consider security and hackability.
- I feel that many GPs think the PHN is collecting their data and using it for their own needs with little benefit for the practices individually. No use in collecting data for quality improvement without providing support for support for quality improvement eg staff time, funding for programs within PHNs, and support from PHN staff.
- Practices are generously contributing data, and there is some risk to doing this, eg some patients do not support.
- Need to be clear that the data is not being used for commercial purposes and has clear data management committees and that are only released eg with ethics approval for research.

Get Northern Beaches Hospital to upload data

I like it

I think the same technology should be used for other issues and populations including women and babies who are discharged from LHD services around birth. This population has very poor data infrastructure.

I would like the patients who refer back to ED/hospital to be followed. Why did they represent? We have patients that we send to ED and the patient is not admitted or not treated correctly. The patient is forced to represent. The cynic in me says that admissions are based on how the numbers look in reports and not in patients best interests.

LOVE the Lumos reports -hope they keep coming

Thank you for providing this information, about our practice and thank you to the PHN (PHN Representative) for providing valuable insight and talking us through the report.

The LUMOS program is, in my opinion, very helpful, and I hope practices will continue to receive the reports.

There needs to reports on data validation, reporting on how bias is being mitigated, whistle blower mechanisms, regular ethics reviews and reporting, independent review reporting, standardization across networks and states and compliance reporting.

Yes -why don't all of us know about this , in my practice and via the RACGP/ AMA / OzDoc magazine which we all read / Medical Republic magazine which many of us read?

Appendix 3: Lumos data representativeness

Lumos Data - Measure of representativeness April 2023

PHN	PHN Name	Practices (Apr 23)	Total Practices (NHSD)	% Practices	Persons (Apr 23)	Population (NSW DPE)	% Pop.	5 year age groups Female	5 year age groups Males	IRSAD	ARIA	Avg
101	CESPHN	116	513	22.6%	1,303,542	1,621,213	80.4%	92.7%	96.4%	88.4%	98.0%	93.9%
102	NSPHN	58	259	22.4%	779,603	958,699	81.3%	88.9%	93.0%	77.7%	97.7%	89.3%
103	WSPHN	78	309	25.2%	800,030	1,053,375	75.9%	96.3%	97.7%	82.5%	99.5%	94.0%
104	NBMPHN	30	118	25.4%	257,375	384,871	66.9%	94.5%	95.4%	80.7%	98.1%	92.2%
105	SWSPHN	140	355	39.4%	1,031,937	1,061,200	97.2%	95.1%	96.5%	85.6%	98.1%	93.8%
106	SENSWPHN	34	193	17.6%	281,114	656,042	42.9%	92.5%	95.0%	83.2%	93.7%	91.1%
107	WNSWPHN	25	113	22.1%	190,239	312,136	60.9%	91.7%	94.1%	77.1%	86.9%	87.4%
108	HNECCPHN	103	385	26.8%	775,056	1,315,635	58.9%	94.0%	95.8%	93.3%	98.3%	95.3%
109	NCPHN	19	174	10.9%	184,770	540,855	34.2%	88.1%	92.4%	61.9%	91.7%	83.5%
110	MPHN	25	83	30.1%	136,297	246,738	55.2%	90.9%	92.6%	73.9%	90.1%	86.9%
NSW TOTAL		628	2,502	25.1%	5,150,764	8,150,764	63.7%	93.7%	95.8%	86.9%	87.6%	91.0%

Note: This table includes practices that had contributed data to Lumos in time for the most recent linkage (April 2023), which is less the total number of practices enrolled in October 2023.

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