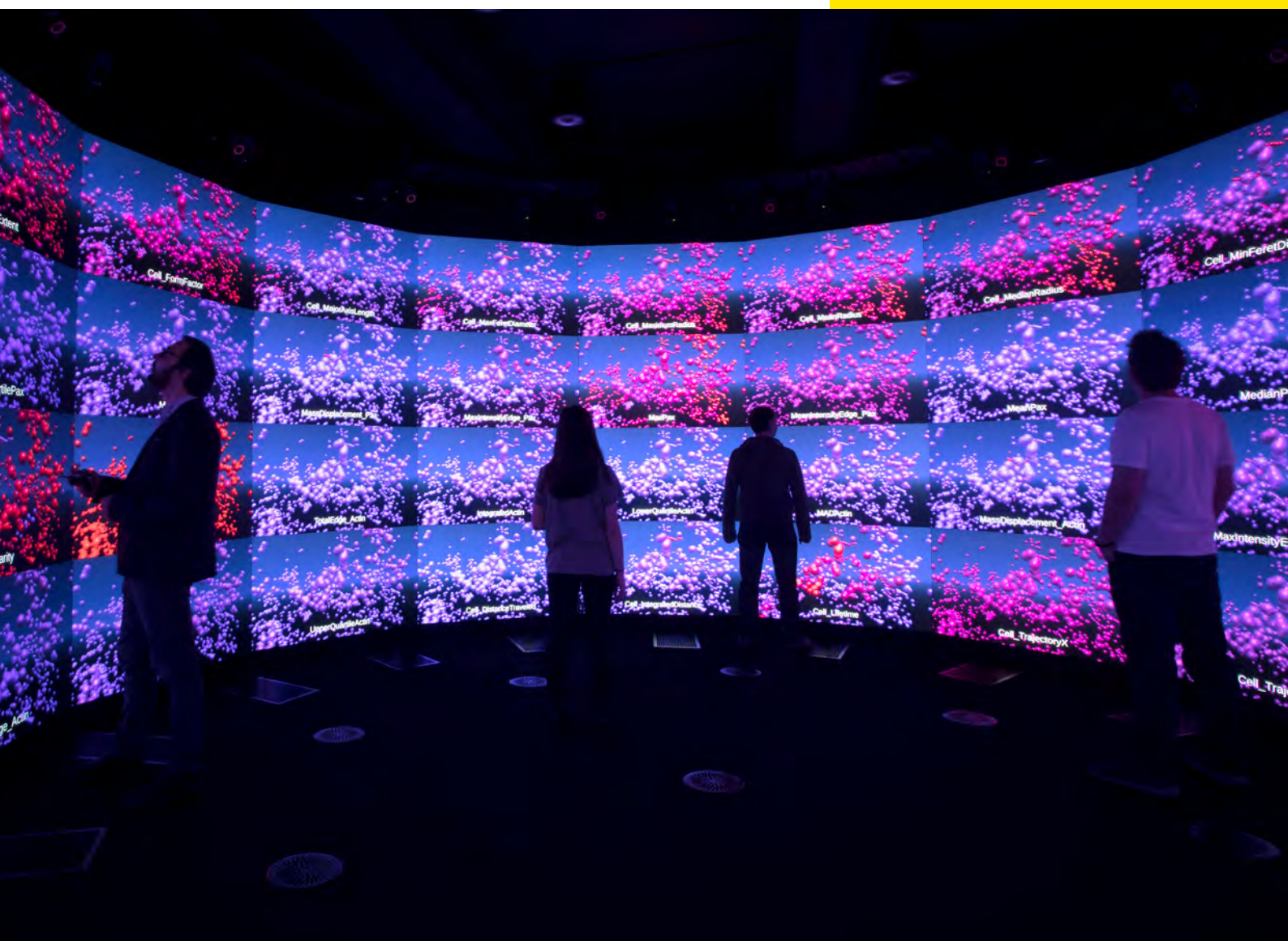Centre for Big Data Research in Health

Annual Report 2021

UNSW SYDNEY | CENTRE FOR BIG DATA RESEARCH IN HEALTH

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Director's message

I would like to focus my message this year on the achievements of the teachers in our Centre. COVID-19 had a very dramatic impact on how we delivered our teaching in both 2020 and 2021. I would very much like to thank all of our staff who flexibly and successfully delivered their teaching through periods of rapid transitions to online-only learning, as well as managing the personal challenges posed by lockdowns and border closures.

It is a strength of our Centre that all staff are encouraged and enabled to contribute to teaching activities. This ensures that our teaching is informed by our research and deploys the latest tools and methods. It also presents opportunities to strengthen the foundations of our knowledge, improve our communication skills, and amplify the impact of our work.

2021 was the fourth year of operation of the Centre's Master of Science in Health Data Science program and I would like to congratulate our completing students and wish them every success in their new careers as Health Data Scientists. We had 17 graduates in 2021, our largest cohort yet: **Kieran Dang, Rory Denham, Liam Ephraims, Manxi Lu, Zhisheng Sa, Danielle Shala, Benson Zhong, Renquan Huang, Calum Nicholson, Thu Vuong, Peiwen Jiang, Murray Keogh, Collin Sakal, Xiaoqian Wang, Weiran Yu, Anqi Luo and Siqi Yang**.

Our teaching efforts also encompass supervision of higher degree by research students, who contribute so much to the culture of enquiry and excellence within the Centre. I warmly congratulate our three 2021 PhD graduates, **Dr Heidi Welberry, Dr Sanja Lujic** and **Dr Georgina Kennedy** and wish them all the best as they forge their post-doctoral pathways. Professor Sallie Pearson's excellence in PhD supervision was recognised by a UNSW Faculty of Medicine and Health award.

Our work in teaching is only set to grow in 2022, with the inauguration of our new Medical Honours Program in Clinical AI (led by Associate Professor Blanca Gallego Luxan), the first of its kind in Australia.

I believe that we have now reached a point that we can be confident that the Centre is making a real impact through increasing Australian health workforce capacity in health data science, machine learning and AI. I would again like to offer my warmest thanks to all of the Centre staff who have made this happen, lately in trying times!

Louisa Jorm
Professor, Faculty of Medicine
Director, Centre for Big Data Research in Health

Research highlights

2021

New website to predict IVF Success

February 2021 saw the launch of *Your IVFSuccess*, a website developed by CBDRH's National Perinatal Epidemiology and Statistics Unit (NPESU). *YourIVFSuccess* enables women and families to calculate their chances of having a baby if they undertake In-vitro Fertility (IVF) treatment, and to compare the services offered by IVF clinics across Australia. *YourIVFSuccess* is funded by the federal government.

> **YourIVFSuccess website: https://yourivfsuccess.com.au**
>
> **Full story: https://newsroom.unsw.edu.au/news/health/new-website-predict-ivf-success**

How long before Australia is fully vaccinated against COVID-19?

In February 2021, CBDRH researcher Dr Mark Hanly told Guardian Australia that his modelling results showed that mass COVID-19 vaccination hubs may be necessary to augment vaccine rollout through GP clinics and pharmacies. The research influenced the public debate, and by the time it was published online in July 2021, mass vaccination hubs were up and running in major states.

> **Full story: https://www.theguardian.com/news/datablog/2021/apr/08/how-long-before-australia-is-fully-vaccinated-against-covid**
>
> **Full article: https://pubmed.ncbi.nlm.nih.gov/34284875/**

Centre for Big Data Research in Health

The health system response to COVID-19 will continue long after we reach 80% vaccination coverage

In August 2021, the *Medical Journal of Australia* published a study led by CBDRH researcher Dr Mark Hanly that explored scenarios for easing COVID-19 border restrictions. At that time, Australia's plan to transition the national COVID-19 response was to relax international border restrictions once 70% of eligible adults were vaccinated, with further easing once 80% coverage was achieved. The modelling results highlighted the continued potential for disruptive outbreaks if international borders reopen while highly transmissible strains are circulating, which has been confirmed by the experiences of the subsequent Omicron waves of infection.

Full story: https://www.theguardian.com/australia-news/2021/oct/18/australia-could-see-covid-surge-from-new-variants-even-after-80-vaccination-when-border-reopens

Full article: https://www.mja.com.au/journal/2021/health-system-response-covid-19-will-continue-long-after-we-reach-80-vaccination

Identifying preventable risk factors for hospitalised asthma in young Aboriginal children: a whole-population cohort study

Australia has one of the highest rates of asthma worldwide. Indigenous children have a particularly high burden of risk determinants for asthma, yet little is known about the asthma risk profile in this population.

A study led by CBDRH researcher Dr Bronwyn Brew, and published in *Thorax* in June 2021, aimed to identify and quantify potentially preventable risk factors for hospitalised asthma in Australian Aboriginal children (1-4 years of age). The research found that risk factors for hospitalised asthma included acute respiratory tract infections, socioeconomic disadvantage, maternal smoking, premature birth and low birth weight. The researchers recommended that improving care for pregnant Aboriginal women as well as for Aboriginal infants with acute respiratory tract infections may help reduce the burden of asthma in the Indigenous population.

Full article: https://pubmed.ncbi.nlm.nih.gov/33419952/

Continuity of GP care vital to reducing prescribing of psychotropic medicines in aged care

In July 2021, the Medical Journal of Australia published a study led by VBDRH researcher Dr Heidi Welberry that explored prescribing of psychotropic medicines in people with dementia entering residential aged care. The research found that people with dementia who saw a different GP when they entered residential care were more likely to be prescribed antipsychotics or benzodiazepines. They were also more likely to receive an increase in the mean number of dispensed medications. The research team concluded that continuity of GP care for people with dementia when they enter residential aged care facilities could reduce inappropriate prescribing, particular of psychotropics.

Full story: https://insightplus.mja.com.au/2021/26/antipsychotics-in-aged-care-continuity-of-gp-care-vital/

Full article: https://www.mja.com.au/journal/2021/215/3/psychotropic-medicine-prescribing-and-polypharmacy-people-dementia-entering

Sex differences in emergency medical services management of patients with myocardial infarction: analysis of routinely collected data for over 110,000 patients

Emergency medical services (EMS) activation is an integral component in managing patients with myocardial infarction (MI). EMS play a crucial role in early MI symptom recognition, prompt transport to percutaneous coronary intervention centres and timely administration of management.

In November 2021, the American *Heart Journal* published a study led by CBDRH researcher Dr Benjumin Hsu that examined sex differences in prehospital EMS care of patients hospitalized with MI using data from a retrospective population-based cohort study of linked health administrative data. The research found that among 110,000 patients transported by ambulance and subsequently admitted to hospital with MI, women were less likely than men to receive MI-specific management during ambulance transport. The researchers concluded that better EMS identification of MI in both women and men has the potential to decrease time to treatment and improve patient outcomes.

Full article: https://www.sciencedirect.com/science/article/pii/S0002870321001885?via%3Dihub

Antibiotic resistance is a global health challenge that can't be ignored

Inappropriate prescribing of antibiotics is a global public health challenge and a major driver of antimicrobial resistance (AMR). AMR occurs when bacteria change over time and no longer respond to medicines, making infections harder to treat. This can lead to the spread of disease, severe illness and death.

During the COVID-19 pandemic, a team of researchers from CBDRH (led by Dr Malcolm Gillies) and the Murdoch Children's Research Institute examined the impact of COVID-19 restrictions on antibiotic dispensing in Australia. Nationwide restrictions, which were introduced from March 2020 included stay-at-home orders, travel restrictions, school and childcare closures and restrictions on gatherings.

The study – published in the British Journal of Clinical Pharmacology – revealed a 36 per cent drop in antibiotic dispensing rates following the COVID-19 restrictions despite stable rates of GP consultations. The research highlighted the potential to reduce inappropriate prescribing for respiratory viral infections and thereby to combat AMR.

Full story: https://newsroom.unsw.edu.au/news/health/antibiotic-resistance-global-health-challenge-cant-be-ignored

IVF success rates have improved in the last decade, especially in older women: report

IVF success rates have improved significantly over the last 10 years, a new report published by CBDRH's National Perinatal Epidemiology and Statistics Unit (NPESU in September 2021 has shown. The live birth rate per initiated IVF cycle in women using their own eggs has increased by 18% overall, with even steeper improvements in older age groups.

The ANZARD report is funded by the Fertility Society of Australia and New Zealand (FSANZ) and contains data from all 95 IVF clinics operating in the two countries.

Full story: https://cbdrh.med.unsw.edu.au/news/ivf-success-rates-have-improved-last-decade-especially-older-women-report

Risk of heart attacks no higher when using quit smoking medicine varenicline instead of nicotine patches

In November 2021, *JAMA Network Open* published a study, led by Dr Alys Havard from CBDRH and the National Drug and Alcohol Research Centre, that included all adults in NSW who received a prescription quit smoking medicine between 2011 and 2015. The research found, when comparing varenicline and Nicotine Replacement Therapy (NRT) patches as a prescribed quit-smoking pharmacotherapy, that there was no difference in the risk of major cardiovascular events like heart attack and stroke.

Full story: https://cbdrh.med.unsw.edu.au/node/305301695

Full story: https://www.smh.com.au/national/quit-smoking-pills-do-not-increase-risk-of-heart-attack-stroke-20211129-p59cz9.html

Full article: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2786678

Centre overview

"Big data" refers to datasets whose size or complexity is beyond the ability of traditional methods and tools to capture, store, manage, and analyse. Big data in health and medicine are generated through operating the health system (e.g. medical service claims), clinical care (e.g. hospital records, primary care records), laboratories (e.g. imaging data, pathology records, genetic testing) and research studies (e.g. clinical trials, observational studies), to support disease prevention, control (e.g. disease notifications) and survivorship, and by individuals themselves (e.g. "life logging"). This type of 'real-world' data is growing rapidly and will continue to expand exponentially for the foreseeable future.

There is enormous potential to inform improvements in the effectiveness, safety and efficiency of health care by bringing these data together and using them for research to understand the determinants of disease risk, target therapies to those who will benefit most, compare the effectiveness of alternative preventative and therapeutic interventions, and model the health and economic impacts of interventions and policies. Recognising this potential, research that will lead to "better models of care and services that improve outcomes, reduce disparities, increase efficiency and provide greater value" is listed first among the new national research priorities for health[1]. Moreover, it is estimated that effective use of big data could also deliver reductions to national health care expenditure of around 8 percent[2] which would translate to more than $11 billion annually in Australia.

The Centre for Big Data Research in Health (CBDRH) is a world-first research centre that is focused on delivering this value. The Centre supports UNSW Medicine's Thematic Research model in which key research themes (Neuroscience, mental health and addiction; Infectious disease, immunity and inflammation; Cancer; Non-

communicable diseases) are supported by cross-cutting enabling capabilities including 'Big data in health'.

Vision
The power of "big data" is harnessed to transform the prevention and management of disease, and the delivery of health services.

Mission
To maximise the productive use of all possible sources of health big data in order to enhance the health and well being of Australians and the global community.

Values

· **Excellence:** Our research is scientifically rigorous and of high quality

· **Innovation:** We use creative and novel approaches in study design, analysis techniques and reporting

· **Impact:** Our high impact research benefits population health and the health care system

· **Leadership:** We are influential in the health data science field and aim to be regarded as a world leader

· **Collaboration:** We develop and maintain open and respectful relationships with research partners, the community, and each other

Functions

· Foster and develop innovation in health data science

· Undertake high impact, high-quality and multi-disciplinary health and medical research using big data

· Facilitate the rdapid translation of research findings into health improvements and better value in health care

1 http://www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Pages/ThePriorities.aspx

2 Manyika J, Chui M, Brown B, et al. Big data: The next frontier for innovation, competition, and productivity. San Francisco: McKinsey Global Institute, 2011.

Centre for Big Data Research in Health

• Build multi-disciplinary capacity in health research using big data

• Promote public, clinical and policy awareness of the health and societal benefits of research using big data

Research Units
While the Centre has broad expertise that spans multiple health domains and the capability to address any health issue that can be informed through research using large-scale electronic data, it has a longstanding reputation as world leaders in thematic areas that correspond to its four internal research units:

• *Health Services and Outcomes Unit:* undertakes research to identify variations and disparities in the use, outcomes and costs of health services, investigates the factors that drive these, and evaluates the outcomes of health policies and programs.

• *National Perinatal Epidemiology and Statistics:* conducts national epidemiological, health services, policy and health economic research in reproductive, perinatal and maternal health.

• *Cancer Epidemiology Research Unit:* performs genetic epidemiology and population-based health record linkage studies aimed at understanding the causes and consequences of cancer.

• *Medicines Policy Research Unit:* conducts research regarding the judicious use, safety, costs and cost-effectiveness of prescribed medicines.

• *Clinical Analytics and Machine Learning Research Unit:* design, develop and evaluate technology that supports evidence-based decision making by patients and clinicians.

Centre for Big Data Research in Health

Staff
list 2021

Dr Alys Havard
Senior Research Fellow

Dr Amy Gibson
Research Fellow

Dr Andrea Schaffer
Senior Research Fellow

Mr Andrew Blance
Senior Lecturer

Dr Benjamin Daniels
Research Fellow

Dr Benjumin Hsu
Research Fellow

A/Prof Blanca Gallego Luxan
Unit Head

Dr Bronwyn Brew Haasdyk
Senior Research Fellow

A/Prof Christos Venetis
Associate Professor

A/Prof Claire Vajdic
Scientia Fellow & Unit Head

Dr Danielle Tran
Research Fellow

Ms Elena Keller
Research Associate

Ms Evelyn Karantonis
Data Management Officer

A/Prof Georgina Chambers
Scientia Fellow & Unit Director

Ms Hina Salimuddin
Data Management Officer

Dr Heidi Welberry
Research Fellow

Dr Hon Hwang
Research Fellow (until August)

A/Prof Helga Zoega
Scientia Fellow

Ms Jade Newman
ANZARD Data Manager

Dr Jon Brett
Research Fellow

Dr Juan Quiroz Aguilera
Research Fellow

Dr Juliana de Oliveira Costa
Research Associate

Dr Kalinda Griffiths
Scientia Fellow

Dr Kylie-ann Mallitt
Research Fellow (until Sept)

Professor Louisa Jorm
Director

Ms Louise Francis
Centre Manager

Dr Marina van Leeuwen
Research Fellow (until March)

Dr Mark Hanly
Lecturer

Dr Malcolm Gillies
Senior Biostatistician

Dr Md Shawon
Research Associate

Ms Melisa Litchfield
Data Manager

Dr Michael Falster
Research Fellow

Mr Michael Johnston
Research Officer

Ms Michele Partridge
Administrative Officer

Ms Milica Ognjenovic
Data Management Officer

Ms Natasha Donnolley
Project Manager

Dr Nicholas Kuo
Research Fellow

Dr Oscar Perez Concha
Lecturer

Mr Phi Bang Nguyen
Project Manager

Ms Prudence Creighton
Statistician

Dr Repon Paul
Research Fellow

Professor Sallie Pearson
Unit Head

Ms Sanja Lujic
Lecturer

Dr Sebastiano Barbieri
Senior Research Fellow

Dr Sharon Chow
Coordinator (ANZNN)

Dr Stephanie Choi
Research Fellow

Dr Sophy Shih
Senior Research Fellow

Dr Xian Zhang
Research Fellow

Dr Xingzhong Jin
Research Fellow

Centre for Big Data Research in Health

Research Students 2021

Claudia Bruno
Topic: Evaluating the safety of medicines during pregnancy using big data
Joint Supervisors: A/Prof Helga Zoega, Dr Alys Havard
Co-Supervisor(s): Prof Sallie Pearson

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Ximena Camacho
Topic: Leveraging real-world data to assess medicines safety in Australia
Joint Supervisors: Prof Sallie Pearson, Dr Andrea Schaffer
Co-Supervisor(s): Prof David Henry

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Oisin Fitzgerald
Topic: Patient phenotyping to support new care pathways
Joint Supervisors: Professor Louisa Jorm, Dr Oscar Perez Concha
Co-Supervisor(s): Lachlan Rudd (eHealth NSW), Dr Alejandro Metke Jimenez (CSIRO)
Funding source: iPhD Industry Scholarship

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Michael Hennessy
Topic: Cataract Surgery in NSW and relationship to health status
Primary Supervisor: Professor Minas Coroneo
Secondary Supervisor(s): Dr Ian Harris, Professor Louisa Jorm

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Elena Keller
Topic: Using behavioural economics to inform decision making in fertility treatment
Joint Supervisor(s): Professor Georgina Chambers, Professor Andreas Ortmann

Secondary Supervisor: Professor Louisa Jorm

Georgina Kennedy (PhD Submitted)
Topic: Automation of patient trajectory management at St Vincent's Hospital, Sydney
Primary Supervisor: A/Professor Blanca Gallego Luxan
Co-Supervisor: Mark Dras

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Damian Kotevski
Topic: Using machine learning to understand and improve care and outcomes for head and neck cancer patients
Joint Supervisors: A/Professor Robert Smee, A/Professor Claire Vajdic
Co-Supervisor: Dr Matthew Field
Funding source: Prince of Wales Hospital

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Leibo Liu
Topic: Extracting value from unstructured health data
Joint Supervisors: Professor Louisa Jorm, Dr Oscar Perez Concha
Co-Supervisor(s): Dr Anthony Nguyen, Vicki Bennett
Funding source: iPhD Scholarship

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Jessie Liu
Topic: AI techniques to support the conduct of pragmatic clinical trials using Electronic Medical Records
Joint Supervisor(s): A/Prof Blanca Gallego Luxan, Dr Sebastiano Barbieri

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Sanja Lujic (PhD Submitted)
Topic: Comborbidity and Multiborbidity in New South Wales: Prevalence, Trajectories and Implications for Healthcare Utilization and Costs

Primary Supervisor: Professor Louisa Jorm

Secondary Supervisor(s): Professor Judy Simpson

Matthew Miller

Topic: The application of machine learning with spatial statistics to a prehospital critical care environment

Primary Supervisor: A/Professor Blanca Gallego Luxan

Secondary Supervisor: Professor Louisa Jorm

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Michael Odutola

Topic: Lifestyle, occupational and genetic risk factors for follicular lymphoma in Australia
Primary Supervisor: A/Professor Claire Vajdic
Co-Supervisor: Dr Marina van Leeuwen

Funding source: University International Postgraduate Award (UIPA)

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Michael Piza

Topic: The impact of major social disruptions on cancer care trajectories: the effect of the 2019 novel Corona virus disease pandemic (COVID19) on disease and care trajectories of people treated for haematological and non-small cell lung cancers

Joint Supervisor(s): Prof Claire Vajdic, Dr Mark Hanly

Co-Supervisor: Dr Ian Olver

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Smriti Raichand

Topic: Antidepressants use during pregnancy and their effects on mother and child
Primary Supervisor: Dr Alys Havard
Secondary Supervisor(s): Professor Sallie Pearson, Professor Nick Buckley

Funding source(s): Australian Postgraduate Award (APA), NHMRC Centre for Research Excellence Medicines and Ageing Top-up Scholarship

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Oluwadamisola Sotade

Topic: Using machine learning algorithms to predict the surgical outcomes of Australians with multimorbidity
Joint Supervisors: Professor Louisa Jorm, Dr Michael Falster
Co-Supervisor: Professor Sallie Pearson

Funding source: Scientia Scholarship

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Monica Tang

Topic: Assessing and Optimising Anti-Cancer Drug Utilisation
Primary Supervisor: Professor Sallie-Anne Pearson
Co-Supervisor(s): Dr Andrea Schaffer, Professor John Simes, Chee Lee

Funding source(s): NHMRC Postgraduate Scholarship, NBCF Scholarship

Skye Trudgett

Topic: Evaluation of national-wide programs for high-risk young people, including a focus on Indigenous data sovereignty

Joint Supervisors: Professor A Shakeshaft and Dr Kalinda Griffiths
Co-Supervisor(s): Dr Timothy Dobbins and Professor Robert Sanson-Fisher

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Bianca Varney

Topic: Evaluating the safety of medicines during pregnancy using big data

Joint Supervisor(s): A/Prof Helga Zoega, Dr Alys Havard

Co-Supervisor: Prof Sallie Pearson

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Heidi Welberry (PhD Submitted)

Topic: Using big data to understand health care trajectories for older Australians at risk of dementia
Primary Supervisor: Professor Louisa Jorm
Co-Supervisor(s): Scientia Professor Henry Brodaty, Dr Benjumin Hsu, Dr Sebastiano Barbieri

Funding source: NHMRC Dementia Team Grant

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Brooke Wilson

Topic: Understanding the utility of chemotherapy and targeted treatments for cancer in high as well as low and middle-income countries

Joint Supervisors: Professor M Barton, Professor S Pearson

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Elliot (Jie) Zhu

Topic: Enabling Personalised Cohort Studies from Large Repositories of Clinical Practice Data
Primary Supervisor(s): A/Professor Blanca Gallego Luxan

Co-Supervisor: Ian Marschner

5 Research Funding 2021

New Grants awarded – 2021

1. **Gallego Luxan B**. Hospital EMR data as a National Data Asset for Research. *ARDC Public Sector to Research Sector Bridges Program* 2021-2023 ($500,000).

2. **Gallego Luxan B**, Yu J. Cardiovascular Analytics and Innovation (CVAI) data repository: A big data resource for machine learning-enabled research and health systems quality improvement. *UNSW Medicine Seed grant (CVMM Theme)* 2021-2022 ($150,000).

3. **Gallego Luxan B, Jorm L,** Ooi SY, Yu J, Lovell N, Lupton D, **Quiroz J**. CardiacAI: Deep learning to predict and prevent secondary cardiovascular events. *MRFF Cardiovascular Health Mission* 2021-2024 ($545,000).

4. **Havard A, Zoega H, Pearson S.** Are nicotine replacement therapy and varenicline safe and effective for women trying to quit smoking during pregnancy. *NHMRC Ideas Grant* 2021-2024 ($904,422).

5. Gibson P, Karmaus W, Mattes J, **Brew B**, Collison A, Holliday E, Jensen M. Bushfire smoke exposure during pregnancy and epigenetic changes in offspring**.** *NHMRC Ideas Grant* 2021-2024 ($1,707,000).

6. Almqvist C, **Brew B,** Silverman M**.** Epidemiological aspects of food allergy and mental health in children and parents. *Astma och Allergi Forbundet Project Grant*, *Sweden* 2021-2024 ($550,000).

7. MacInnis, Laaksonen, Sinclair, Smith-Warner, **Vajdic CM**, Wang. Population-level relevance of preventable risk factors on the burden of cancer. *World Cancer Research Fund – International Regular Grant Programme* 2022-2024 (£299,073).

8. Karapetis, Brown, Kichenadasse, Pratt, Scott, **Vajdic CM**, Waddell, Corsini, Thomas, Brown, Karanth, Trzaskowski, Greenberg. Shining light into the 'unknown' on Indigenous and non-Indigenous Australians with cancer of unknown primary. *MRFF* 2022-2025 ($2,401,509).

9. **Havard A**, Degenhardt L, Farrell M, Shakeshaft A, Jones N, Gisev N, Bharat C, **Pearson SA**. Co-creating evidence from the Alcohol and Other Drug Register. *NSW Ministry of Health* commissioned project ($30,000).

10. **Zoega H, Pearson SA, Schaffer A**, Larsson H. ManagemenT of chronIc cardioMetabolic diseasE and treatment diScontinuity in adult ADHD PAtieNts (TIMESPAN): Australia. *NHMRC-EU Collaborative Research Grant Scheme* 2021-2026 ($499,613).

11. Larsson H……. **Zoega H, Pearson SA, Schaffer A**. ManagemenT of chronIc cardioMetabolic diseasE and treatment diScontinuity in adult ADHD PAtieNts (TIMESPAN). *EU Horizon 2020 - Research and Innovation Framework Programme* 2021-2026 (EUR 5,999,986).

12. **Daniels B**. Leveraging big data for real-world evidence generation: Impact of multi-medicine use on bowel cancer treatment and survivorship outcomes. *ECF Cancer Institute NSW* 2022-2025 ($345,000).

13. **Falster M**. Using big data to inform post-hospital treatment decisions with cardiovascular medicines: variation, adherence and outcomes of care. *Future Leader Fellowship, Heart Foundation* 2022-2025 ($529,000).

14. **Havard A, Zoega H, Tran DT**, Furu K, Parkin L. Are nicotine replacement therapy and varenicline safe and effective for women trying to quit smoking during pregnancy? *NHMRC Ideas Grant* 2022-2025 ($904,422).

15. **Paul R.** Monozygotic Twining after ART. *Ferring Research Award* 2022 ($50,000).

16. **Chambers GM.** FSANZ – Australian and New Zealand Assisted Reproduction Database (ANZARD). *UNSW ANZARD Contract* 2022-2024 (undisclosed).

17. **Chambers GM.** ICMART – Develop programming code and perform analysis of the annual ART data collected. *International Committee for Monitoring Assisted Reproductive Technologies* 2022-2025 ($132,730).

18. **Chambers GM**. Contract for data collection, analysis and reporting services. *Victorian Assisted Reproductive Technology Authority (VARTA)* 2021-2023 ($113,626).

19. **Jorm LR, Quiroz J**, Sharma A, Bednarz T, **Hanly M, Welberry H, Kuo N**. Hospital trajectories for 15 million Australians. *NHMRC Ideas Grant* 2022-2025 ($655,935).

20. Brown A, Hermes A, Pratt G, **Griffiths K,** Mann G, Easteal S, Llamas B, Baynam G, Huebner S, MacArthur D. Respecting the Gift – Empowering Indigenous Communities in Genomic Medicine. *NHMRC Synergy Grant* 2022-2026 ($5,000,000).

ONGOING GRANTS

1. **Pearson S**, Pratt N, Preen D, Buckley N, Degenhardt L, van Gool K, Vajdic C, **Jorm L**, Wilson A, Henry D. Centre for Research Excellence in Medicines Intelligence. *NHMRC Centres for Research Excellence* 2020-2025 ($2,500,000).

2. **Jorm L**, Arnott C, Barbieri S, Brennan P, Rodgers A, Woodward M, Poppe K, Gandomkar Z, Gallego Luxan B, Douglas K. Novel deep learning methods for large-scale cardiovascular risk screening using Australian digital health data. *MRFF Cardiovascular Mission* 2020-2022 ($1,467,000).

3. **Vajdic C,** Neideck G, von Sanden N, Betbeder-Matibet L, Hurley R, Green D, McNeil K, Penna T, Smith M, **Jorm L.** The LINked Data Asset for Australian Health Research (LINDAHR). *Australian Research Data Commons (ARDC) National Collaborative Research Infrastructure Strategy* 2021-2023 ($522,726).

4. **Chambers GM,** Halliday J, McLachlan R, O'Bryan MK**.** Men and infertility over the lifecourse (MAIL). *Medical Research Future Fund (MRFF)* 2020-2024 ($4,600,000).

5. Peiris D, Elshaug A, **Jorm LR**, Jan S, Billot L, **Pearson S**, Schierhout G, Huckel-Schneider C, Landon BE**.** Development and evaluation of regional health care alliances to improve health system performance in New South Wales - Patient Centred Co-commissioning Groups. *NHMRC Partnership Project* 2020-2025 ($956,151).

6. **Brew B,** Lundholm C, Gong T, Andresson A, Talley N, Lehto K. Exploring the genetic mechanisms of asthma and gastroesophageal reflux comorbidity in adults. *Hjärt Lungfonden Project Grant, Sweden* 2020-2021 ($150,000).

7. **Pearson S**, Solomon B, McArthur G, Fox S, Desai J, IJzerman M, Zhang Y, Gibbs P, Degeling K, Franchini F. Predicting the population health economic Impact of current and new Cancer Treatments (PRIMCAT). *MRFF Targeted Health Sydney and Community Organisation Research Grant* 2020-2023 ($335,688).

8. **Barbieri S.** The Health Gym: An Open Platform with Health-Related Benchmark Problems for the Development of Reinforcement Learning Algorithms. *Wellcome Trust* 2020-2021 ($98,386).

9. **Schaffer A**. Disentangling the interrelationship between multimordidity, multimedicine use, and cardiovascular *NHMRC Ideas Grant* 2021-2023 ($480,979).

10. Teede H, Arnott L, Baber R, Boyle J, Byles J, **Chambers G**, Clifton V, D'Antione H, Frayne J, Glover K, Hickey M, Hart R, Hyett J, Loxton D, Makrides M, Mishra G, Nippita T, Perz J, Walker S. Australian Health research Alliance (AHRA) National Women's Health Research, Translation and Impact Network (WHRTN). *MRFF Emerging Priorities and Consumer Driven Research Initiative* 2020-2025 ($5,000,000).

11. Trollor J, Agar, Cvejic, Currow, Strutt, **Vajdic C**, Chye, Srasuebkul, Weise, Reppermund S, Szanto, Harlum, Tuffrey-Wijne. 2020-22. Improving palliative care services for people with an intellectual disability. *NHMRC Public Health and Chronic Disease Grant Program* 2020-2022 ($1,140,915).

12. Stephenson, Ritter, **Vajdic C**, Engelmann. Realising big data's potential to address social and health inequalities. *Australian Research Council Discovery Project Grant (DP200100062)* 2020-22 ($300,515).

13. Trollor J, Reppermund S, Sachdev P, Brodaty H, Christensen H, Vajdic C, Srasuebkul, Watkins, Dowse, Fisher, Katz, Baldry, Dean K, Dobbins T, Butler, Harris, Sowmya, Mohammadi. An interdisciplinary data platform to make neuropsychiatric and disability population-based research accessible and efficient. *UNSW Sydney Research Infrastructure Scheme* 2020-2022 ($150,763).

14. **Camacho X**. Leveraging big data to assess medicines safety in Australia. *NHMRC Postgraduate Scholarship* 2021-2023 ($91,538).

15. **Jorm L,** Baily M, Boyle D, Churches T, Herbert S, Neal B, Neideck G, Palmer L, Preen D, Smith M. E-Research Institutional Cloud Architecture (ERICA): secure cloud computing for sensitive microdata. *ARDC Platforms Projects* 2020-2022 ($2,015,000).

16. **Gallego Luxan B**. Learning what works and for which patients: efficient framework and novel technologies for precision comparative effectiveness research. *NHMRC Ideas Grant* 2020-2023 ($587,183).

17. **Falster M0.** Same patient, same care: is out funding of hospitals promoting inequities in care and outcomes? *NHMRC Ideas Grant* 2020-2022 ($566,781).

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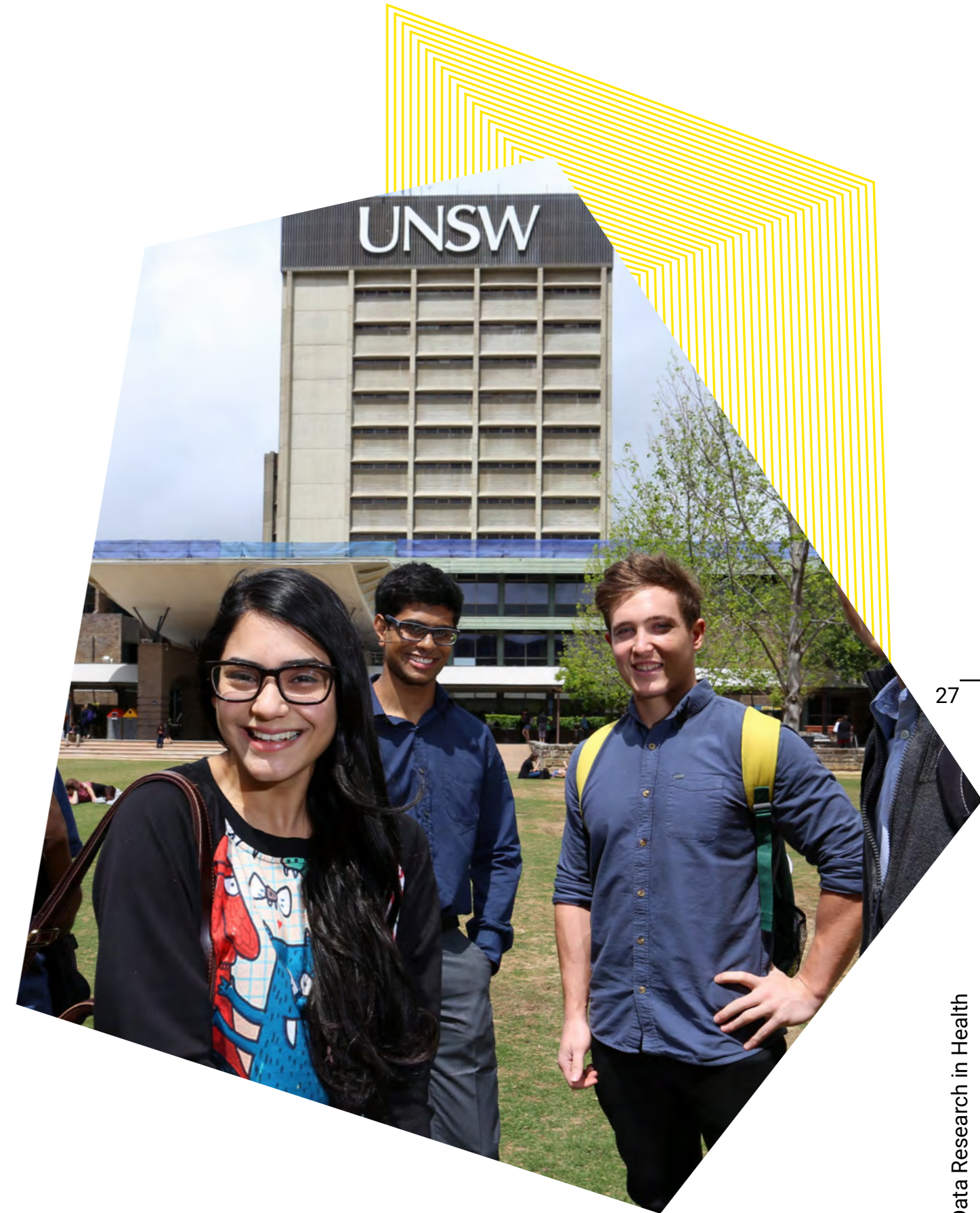
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LETTER TO EDITORS

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6. **de Oliveira Costa J, Bruno C**, Baranwal N, Gisev N, Dobbins TA, …et al. Variations in Long-term Opioid Therapy Definitions: A Systematic Review of Observational Studies Using Routinely Collected Data (2000-2019). *Br J Clin Pharmacol*. 2021 Oct;87(10):3706-3720. doi: 10.1111/bcp.14798.

7. Di Filippo D, Wanniarachchi T, Wei D, Yang J, McSweeney A, **Havard A**, … et al. The diagnostic indicators of Gestational Diabetes Mellitus from second trimester to birth: a systematic review. *Clin Diabetes Endocrino.l* 2021 Oct 11;7(1):19. doi: 10.1186/s40842-021-00126-7.

REPORTS

1. Transplantation Society of Australia and New Zealand (TSANZ) Clinical Guidelines for Organ Transplantation from Deceased Donors Working Group (including **Vajdic CM**). *Risk of donor-derived malignancy* in TSANZ Clinical Guidelines 2021.

2. **Pearson S**, Henry D. Patterns of community medicine use during the COVID-19 epidemic. Report to the National COVID-19 Clinical Evidence Taskforce March 2021.

3. **de Oliveira Costa J**, Gianacas C, Chidwick K, Osman R, Beard F, Gonzalez-Chica D, Thistlethwaite J, MacIntyre R, Hughes C, **Havard A**. MedicineInsight report: Vaccination coverage in the Australian general practice setting based on MedicineInsight data. NPS MedicineWise: Sydney May 2021.
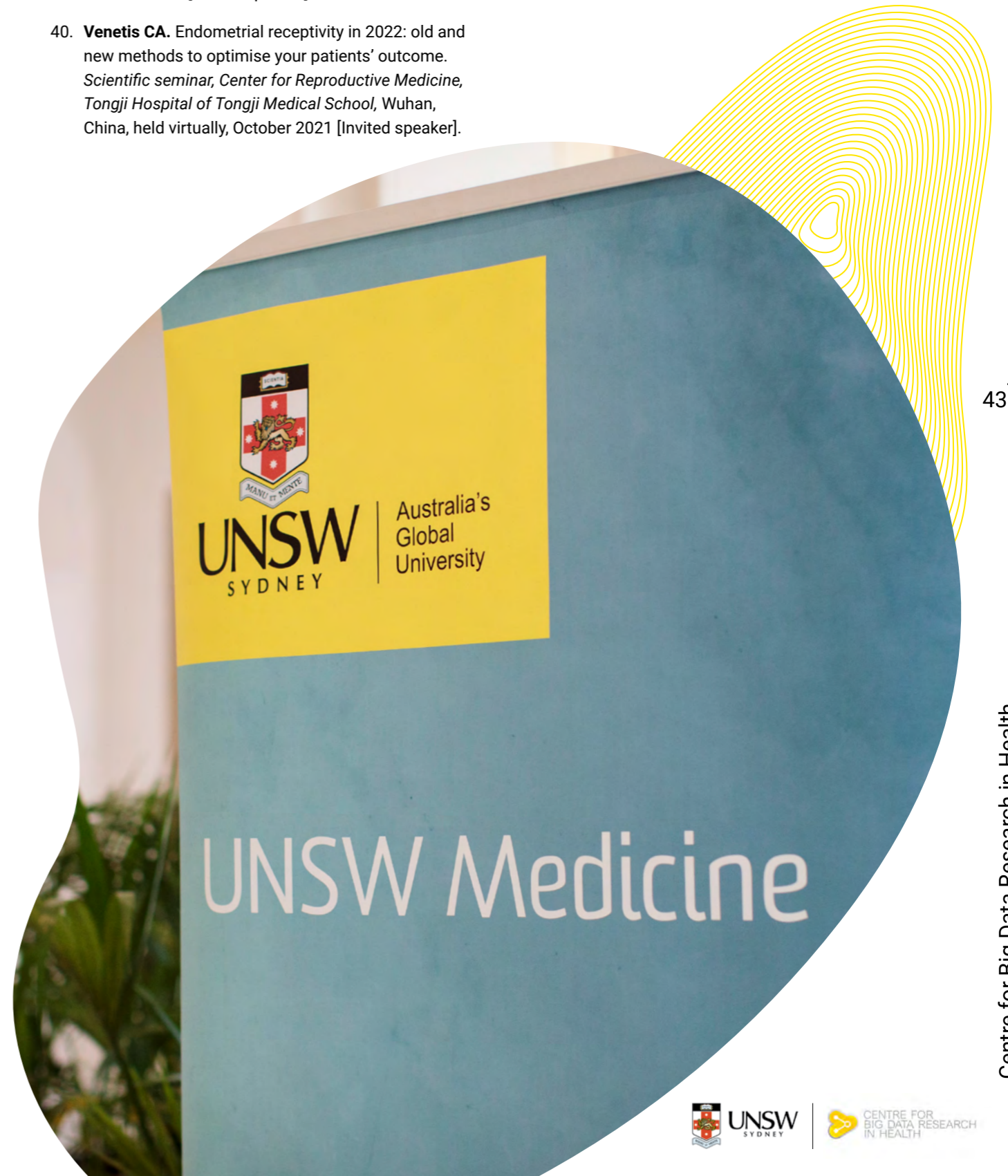
7 Invited conference presentations 2021

1. **Jorm LR.** Using big data and machine learning to inform cardiovascular care. *Amgen Cardiovascular Academy*, held virtually, July 2021 [Invited speaker].

2. **Jorm LR.** Using big data and machine learning to inform cardiovascular care. *29th Annual St Vincent's Campus Research Symposium*, held virtually, October 2021 [Invited speaker].

3. **Jorm LR.** The role of AI and machine learning in clinical trials. *Australian Clinical Trials Alliance Annual Scientific Meeting*, held virtually, November 2021 [Invited speaker].

4. **Jorm LR.** Ethnic bias in data linkage. Pre-Conference Workshop. *Australian Association of Gerontology Conference*, held virtually, November 2021 [Invited speaker and panellist].

5. **Jorm LR.** Health of our digital child. *The Royal Society of NSW and Learned Academies Forum: Power and peril of the digital age*, held virtually, November 2021 [Invited plenary speaker and panellist].

6. **Brew BK.** Addressing challenges in life course epidemiology -established and novel approaches using big data and twin/family studies. *World Congress of Epidemiology*, Melbourne, held virtually October 2021 [Invited speaker].

7. **Chambers GM.** Prioritising Women's Health and Careers in Covid Recovery and Beyond. *Advancing Women in Healthcare Leadership and Women's health Research Translation and Impact Network*, October 2021 [Invited panel member].

8. **Chambers GM**. Rio de Janeiro. Funding Fertility in Low and Middle Income Countries – a cost or an investment? *25th Brazilian Congress on Assisted Reproduction*, November 2021 [Invited speaker].

9. **Chambers GM**. Socioeconomic Factors and Affordability in fertility care. *International Federation of Gynecology and Obstetrics (FIGO) World Congress*, 2021 [Invited speaker].

10. **de Oliveira Costa, J.** Adherence to HIV Therapy: Yesterday's problem? *HSRAANZ Webinar Series*, July 2021 [Invited speaker].

11. **Donnolley, N**. *Metrics for models of care in Australia – discussion of best measures and metrics going forward. International Normal Labour and Birth Research Conference*, held virtually, 2021 [Invited speaker].

12. **Gallego Luxan B.** Deep learning for making predictions and inference from clinical data. *Victor Chang Cardiac Research Institute Seminar Series*, May 2021 [Invited speaker].

13. **Gallego Luxan B.** Bridging the AI chasm in medical applications. *Annual Scientific Meeting of the Cardiac Society of Australia and New Zealand (CSANZ)*, August 2021 [Invited speaker].

14. **Gallego Luxan B.** Machine Learning for target trials supporting real-world evidence. *St Vincent's Hospital Clinical Pharmacology and Toxicology Therapeutics Centre Seminar Series*, October 2021 [Invited speaker].

15. **Havard, A.** Use, safety and effectiveness of quit smoking medicines during pregnancy. *National Drug and Alcohol Research Centre webinar series*, 2021 [Invited speaker].

16. **Havard A**, McRobbie H. Tobacco Endgame. *UNSW Sydney's Centre for Ideas International Conversations Series,* Sydney, 2021 [Invited speaker].

17. **Pearson S**. Moving the dial: Measuring QUM at scale. *National Medicines Symposium*, 2021 [Keynote presentation].

18. **Pearson S**. Quantifying opioid use and use and harms using population-based administrative data: Hindrance or help? *17th International Forum for Back and Neck Pain Research Conference*, held virtually, 2021 [Invited speaker].

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19. **Schaffer A, Pearson SA**. Pharmacoepidemiological methods for measuring medication adherence. *2021 National Stroke Quality Improvement Virtual Workshop*, November 2021 [Invited speaker].

20. **Schaffer A. Prescribed medicine use in a nationwide sample of Australian children: extent of off-label use.** *ICPE Paediatric Special Interest Group*, November 2021 **[Invited speaker].**

21. **Tang M, Pearson SA**. Big Data Research for Cancer: Potential and Pitfalls. *Randwick Precinct Cancer Roundtable – Big Data; Translational Cancer Research Network,* May 2021 [Invited speaker].

22. **Vajdic CM**. Integrating cohort studies and population-based data to improve cancer prevention and cancer care. *Clinical Oncology Society of Australia Annual Scientific Meeting*, Melbourne, November 2021 [Invited plenary].

23. **Zoega H.** The Use of Big Data Analytics in Guiding Clinical Decision-making and Public Health Initiatives from a Nordic perspective. *Croucher conference: Advance Big Data Research for Improving Health, Hong Kong*, November 2021 [Invited speaker].

24. **Venetis CA.** COVID-19 & Vaccines: Fertility and Pregnancy, *Merck Australia*, held virtually, March 2021 [Invited speaker].

25. **Venetis CA.** Biosimilar recombinant follitropin alfa preparations versus the reference product in couples undergoing assisted reproductive technology treatment: A systematic review and meta-analysis. Satellite Symposium. *Meet the Experts Merck Global, Annual Conference of ASPIRE 2021*, held virtually, May 2021 [Invited speaker].

26. **Venetis CA.** The role of the endometrium in recurrent implantation failure: Interventions aiming at increasing pregnancy rates. *6th Annual Conference of the Greek Society of Fertility and Sterility*, held virtually, May 2021 [Invited speaker].

27. **Venetis CA.** Adjuvant technologies and IVF. *2nd Online Congress on Future Innovations for Embryologists*, held virtually, June 2021 [Invited speaker].

28. **Venetis CA.** Biosimilar recombinant follitropin alfa preparations versus the reference product in couples undergoing assisted reproductive technology treatment: A systematic review and meta-analysis" που δόθηκε στα πλαίσια του συνεδρίου. Key Aspects in Reproductive Medicine. *Merck Russia*, Russia, held virtually, June 2021 [Invited speaker].

29. **Venetis CA.** Biosimilar recombinant follitropin alfa preparations versus the reference product in couples undergoing assisted reproductive technology treatment: A systematic review and meta-analysis. *Annual Conference of the European Society for Human Reproduction and Embryology (ESHRE),* held virtually, June 2021 [Invited speaker].

30. **Venetis CA.** Big data (base) in Reproductive Medicine. *Annual Conference of the European Society for Human Reproduction and Embryology (ESHRE),* held virtually, June 2021 [Invited speaker].

31. **Venetis CA.** Dissociation of follicular endometrial events: To freeze or not to freeze? *Annual Conference of the European Society for Human Reproduction and Embryology (ESHRE),* held virtually, June 2021 [Invited speaker].

32. **Venetis CA.** Pro-FET: The Future of IVF. *Annual Conference of the European Society for Human Reproduction and Embryology (ESHRE)*, held virtually, June 2021 [Invited speaker].

33. **Venetis CA.** When RCTs alone are not enough: The case of follitropin alfa vs. biosimilars. *Annual Conference of the European Society for Human Reproduction and Embryology (ESHRE),* held virtually, June 2021 [Invited speaker].

34. **Venetis CA.** Recurrent Implantation Failure and reduced ovarian reserve. *EXPO 2021 - All About Fertility,* held virtually, June 2021 [Invited speaker].

35. **Venetis CA.** Recent Advances and Trends in Ovarian stimulation. *4th Biennial Meeting of Indonesia Association for IVF 2021 in conjunction with 3rd Asian Society for Fertility Preservation (PERFITRI - ASFP)*, Indonesia, held virtually, September 2021 [Invited speaker].

36. **Venetis CA.** Randomized clinical trials and real clinical practice; what we know and don't know about follitropin alpha? *Merck Symposium in the Annual Conference of the Russian Association of Reproductive Medicine*, held virtually, September 2021[Invited speaker].

37. **Venetis CA.** Interpreting serum progesterone concentrations during ovarian stimulation for ART: lessons from reproductive physiology. *Annual Conference of the American Society of Reproductive Medicine (ASRM)*, Baltimore, held virtually, October 2021 [Invited speaker].

38. **Venetis CA.** How to incorporate progesterone measurements to your ART program and when to recommend FET. *Annual Conference of the American Society of Reproductive Medicine (ASRM)*, Baltimore, held virtually, October 2021 [Invited speaker].

39. **Venetis CA.** How to write a paper. *7th Annual Meeting of Reproductive Medicine Society, Chinese Medical Doctor Association (CMDA),* held virtually, October 2021 [Invited speaker].

40. **Venetis CA.** Endometrial receptivity in 2022: old and new methods to optimise your patients' outcome. *Scientific seminar, Center for Reproductive Medicine, Tongji Hospital of Tongji Medical School,* Wuhan, China, held virtually, October 2021 [Invited speaker].

41. **Venetis CA.** Is universal frozen embryo transfer the future of IVF. *FertiVision 2021, Indian Fertility Society*, held virtually, December 2021 [Invited speaker].

42. **Venetis CA.** How to write a paper. *Annual Conference of the Chinese Society of Reproductive Medicine*, China, held virtually, December 2021 [Invited speaker].