Contents

Application summary

Application title
Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days

Grant reference	311222/Z/24/Z
Lead applicant name	Prof Lisa Hui
Scheme name	Climate Impacts Award
Round	Climate Impacts Award - 2023/24

Proposed duration of funding (months)
36

Proposed start date	01 January 2025

Name of administering organisation If your application is successful, this is the organisation that will be responsible for administering the award.
University of Melbourne

Lead applicant's address at administering organisation If your application is successful, we will use this address in your award letter.	
Department/Division	
Organisation	University of Melbourne
Street	
City/Town	Melbourne
Postcode/Zipcode	3010
Country	Australia

Research subject area
Population and Public Health

Proposal summary

Proposal summary
Pregnant women and children face a disproportionate burden from climate hazards and disasters. The critical "first 2000 days" of life, encompassing fetal and early childhood development, are particularly sensitive to environmental stressors. Australia is particularly vulnerable to global warming as the driest inhabited continent in the world, and already faces mounting threats from extreme heat and bushfires. To address this, we will establish the “Climate Health Impacts Laboratory for the first 2000 days” (CHIL2000). By linking population-based Australian health, geospatial and climate data, this initiative will provide a unique resource for evidence-based research and policy in maternal and child health. This project is a collaborative effort between government, a transdisciplinary research team including health, climate science and data science experts, and healthcare consumers. It will enable precise measurement of climate health impacts over time and space at a state-wide level, development of novel climate indicators, microsimulation of interventions and policy scenarios, and real-word piloting of interventions using existing government healthcare improvement frameworks.

Is this or a similar application for funding currently under consideration elsewhere?	No

Provide the names of any funders and any expected decision dates.

The proposal

The proposal

Any attachments uploaded will be included at the end of this pdf

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Describe the steps needed beyond this funding to achieve the impact from this proposal.

Partnerships

Strengthening partnerships with government

Our applicant team has established collaborations with SCV and DoH as a solid foundation for this grant proposal. We will need to continue stakeholder engagement from these government entities to achieve this impact. We aim to maintain this through our ongoing roles in advisory committees for Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM) and SCV, and through seconded positions working in clinical improvement and research priorities.

Forging new partnerships with non-health government stakeholders

This grant presents an opportunity to implement a comprehensive sector-wide approach by incorporating non-health climate health experts into our team, essential for increasing our collective capacity. We aim to promote a more inclusive and extensive dialogue on climate health involving experts from the Department of Environment, Land, Water and Planning, Bureau of Meteorology, Environmental Protection Agency, the Commonwealth Scientific and Industrial Research Organisation, and the Australian Urban Research Infrastructure Network (AURIN).

Improving the value of the Generation V birth cohort

A key element of our work plan is the integration of geospatial and climate change data with the processes of a whole-of-state birth cohort study called Generation Victoria (GenV). This integration ensures our research contributes to understanding the long-term effects of climate change hazard exposures, extending the impact of our work beyond its initial three-year duration by contributing to the prospective research to be conducted with this consented research population.

Skills and engagement of the research workforce

Research training

To further enhance the project's reach and sustainability, we will maintain our commitment to formal and informal mentorship for students and staff. This includes engaging master's and PhD students in projects that leverage the generated datasets, and training new consumer advocates to providing ongoing input into the project.

Stakeholder engagement

We also plan to conduct regular information sessions for the staff of Safer Care Victoria, the University of Melbourne, and other stakeholders to share the novel techniques developed through our research and to support transdisciplinary communication. We will also engage with the Royal Australian and New Zealand College of Obstetricians and Gynaecologists and the National Preterm Birth Prevention Alliance for national reach to maternity and newborn clinicians (see uploaded letters of support from these not-for-profit organizations).

Open science

Open access climate science outputs

Our workflows, data models, and analytical tools in geospatial and climate change research will be made available in open-source repositories, ensuring their accessibility and utility for the wider research community. This approach not only facilitates further research but also fosters a collaborative ecosystem that amplifies the impact of our findings across disciplines and sectors.

Improving efficiencies and accessibility of linked health data

The linked health datasets that will remain within the Department of Health secure data environment will be available to external researchers through data requests to the Victorian Agency for Health Information. While these data requests are subject to the approval of the custodians, CCOPMM and Department of Health, we are confident that they will be a frequently accessed resource for researchers and improve research efficiencies.

Outline plans for how your research project will influence policy and practice.

The Government policy environment

In 2022, the Lancet MJA Countdown called out the shortcomings in Australia's response to climate change, exposing the absence of a national health and climate action plan. The Australian Government subsequently released a National Health and Climate Strategy in 2023, promising an "all-of-government" approach to facilitate health-climate risk assessment and health adaptation planning. At a state level, the Victoria Government also released its own Health and Climate Change Adaptation Plan.

We plan to present Victoria as a case study in understanding the health effects of climate change in Australia, with relevance for other settings globally.

We aim to advance the following strategic actions in Victoria's Adaption Plan.

- Engage public and stakeholders on climate resilience and health
- Improve the evidence base and monitoring of climate related health impacts
- Transform the health asset base for improved climate resilience
- Develop options to secure climate-resilient health infrastructure
- Support embedding of place-based adaptation in Whole of Victorian Government efforts by leveraging the Department of Health and Department of Families, Fairness and Housing’s roles in precinct and public health and wellbeing planning

Engagement with government

By collaborating with Victoria's healthcare improvement agency (Safer Care Victoria), other government bodies, and a multidisciplinary research team, we will ensure that our findings directly influence policy and healthcare service enhancements. Our applicant and collaborator teams include the principal figures in clinical quality improvement across the maternal and child health sector.

Consumer engagement

Our applicant and collaborator teams includes investigators with extensive expertise in consumer engagement in the maternal and child health sector. Collaborator Bronwyn Hogan is the consumer co-lead at the Safer Care Victoria Maternity and Newborn Learning Health Network. As a rural resident of Victoria, she has directly experienced the devastating impacts of climate hazards and she represents the community demand for progress in this field. Employing the government's proven 'Plan-Do-Study-Act' framework for implementionwill ensure a rapid translation of research findings into policy and practice.

Advancing the field of climate science

Our climate scientists will create national and international knowledge impact with this project. Dr. Negin Nazarian's leadership at the Australian Research Council Centre of Excellence for Climate Extremes, combined with A/Prof Mavoa's partnerships with the Victorian Environmental Protection Agency, amplifies the potential reach and influence of our research. This collaboration bridges climate science with health adaptation policies, equipping our team to tackle the complex effects of climate change on health. This interdisciplinary strategy is all conducted with a commitment to open science, so that our advances can be adopted in settings around the world.

Clinical translation

Our team comprises clinicians who are international leaders in their fields. This project presents an opportunity for them to deepen their understanding of climate change's impacts on maternal and child health, advocate their findings to their respective specialist organizations, and drive policy and clinical guideline recommendations. Professional societies and other drivers of clinical care standards will benefit from our robust consumer network, and remain key stakeholders providing ongoing input into the policy initiatives.

What are your plans for public engagement? Explain how they are integrated within the research

design and across the life cycle of your research. State how they will inform, shape and impact your research.

Our project embraces a comprehensive understanding of 'consumer engagement', recognizing that healthcare consumers and the ‘next users’ of our research in health services and policy arms as essential stakeholders in our research.

1. Advisory committee

Our advisory committee will be led by the public engagement leaders in our team, co-applicant A/Prof Boland, and collaborators Ms Hogan, Dr. Sheehan, and Prof Hiscock. We will ensure that we meet the standards of the Evaluation Framework for Community Advisory Committees developed by the **Health Issues Centre**, the peak consumer health agency in Victoria.

- As the **consumer** co-chair of SCVs Maternity and Newborn Learning Health Network, Ms. Hogan is ideally placed to participate in the co-design and co-production of our research outputs. She has a background in community services and health promotion as well as a lived experience of maternity care, that strengthens her effectiveness as a positive advocate for change. Furthermore, as a resident of the Mallee country, she will contribute an essential rural perspective to our research and policy outputs.
- A/Prof Penny Sheehan is the clinical co-chair of the Maternity and Newborn Learning Health Network with over 20 years of experience in safety and quality in public maternity services. Her role as an obstetrician and health services leader in Victoria will facilitate engagement of the **maternity sector**, enabling rapid translation of research into policy and practice.
- A/Prof Boland will be the public engagement champion for the **newborn health sector**. She is an international leader in consumer partnerships as an executive member of the International Perinatal Research Partnership James Lind Alliance, Priority Setting Partnership for the most preterm infants. As a member of the Centre of Research Excellence in Newborn Medicine at the MCRI, she has extensive experience working with local consumer advisory committees.

Professor Hiscock is a paediatrician and Leader of the Health Services and Economics group at MCRI. She has a proven track record in consumer engagement in **child health** research, as a recipient of the Minister's Award for Partnerships with Families and Communities. She is a founding member and chief medical officer for **Matterworks**, a digital health communication group that specializes in disseminating health information to young people and their communities through culturally relevant mediums.

2. Capacity building

We will provide training for the research team and consumer partners using resources developed by the **Health Issues Centre**, which was funded by Safer Care Victoria to support consumer engagement in healthcare.

3. Community consultation

We will employ a range of methods to consult the community, including in-person and online workshops, surveys, and Q&A sessions to gather input on research questions, candidate policy proposals for the simulation and health economics analysis, and communication of findings.

4. Dissemination

We will engage Matterworks to design the public health messages that arise from our work. We have the resources of the Safer Care Victoria communications team to disseminate research outputs and policy papers as needed.

Does your proposal involve human participants or human biological material?

No - does not involve human participants and/or human biological material

Details of study design for research involving human participants

Describe the study design.

Outline your strategy for recruitment and describe the inclusion/exclusion criteria for study participants (if applicable).

How have you involved patients, participants, patient advocacy groups or communities in developing this proposal? What ongoing involvement will they have in the research?

Describe the oversight arrangements for the study. For example, the membership and composition of the Steering Committee and Data Monitoring Board.

Who has, or will, review the ethics of the project and when? Detail any other regulatory approvals you have, or will try to get. We reserve the right to see relevant approval documents at any point during the grant and after it has ended. This is in accordance with our research involving human participants policy.

Will you be using facilities, staff or patients within the National Health Service (NHS) in the UK?	

Have you completed a Schedule of Events Cost Attribution Tool (SoECAT)?	

Upload the study information page and the summary page of your signed off SoECAT form as a single PDF.

Any attachments uploaded will be included at the end of this pdf

Explain why you could not complete a Schedule of Cost Attribution Tool.

Which organisations have agreed to act as the formal sponsors for your project?

Confirm you have, or you will try to get, appropriate informed consent to use any potentially commercially exploitable results from tissues or samples derived from human participants. Where data has the potential to be used beyond its initial purpose or beyond the end of the study, include details for how the consent will be managed.

Does your proposal involve a clinical trial?	

Confirm that the trial will be registered on one of the following: • International Standard Randomised Controlled Trial Number Register (ISRCTN)

- ClinicalTrials.gov
- another register listed on the WHO International Clinical Trials Registry Platform (ICTRP).

Is the proposed clinical trial covered by The Medicines for Human Use (Clinical Trials) Regulations in the UK?	

Describe the oversight arrangements for the clinical trial (e.g. membership of Trial Steering Committee, Data Monitoring Board etc.)

Are you applying with coapplicants?	Yes

Team composition and management

Applicant team member roles

Lead applicant Lisa Hui is the coordinating principal investigator who will establish overarching goals and directions for the project, and ensure the project meets its objectives and milestones. She will be responsible for: engagement and communication with collaborators and external stakeholders; research integrity, employment matters, allocation of resources, and compliance. As a maternal fetal medicine clinician, she will lead the maternal and perinatal outcomes and outputs on stillbirths, congenital anomalies and maternal outcomes.
Suzanne Mavoa is the geospatial science lead who will direct the development of novel geospatial measures linking geospatial and health data. Kerry Nice is a climate modelling and artificial intelligence expert, who will work with Negin Nazarian on the development of novel climate change indicators and modelling techniques. They will work together on integrating climate indicators for overlay on the health datasets.
Melvin Marzan is an epidemiologist and biostatistician. He will work with both environmental and health epidemiology sub-groups to advise on the data analysis plans and support geospatial indicator development. He will also liaise between study team and the Department of Health collaborators.
David Burgner is a paediatrician and epidemiologist. He will lead the data analysis plan and supervise the analysis of the childhood outcomes. He will be responsible for stakeholder engagement with the paediatric healthcare providers, nationally and internationally.
Rosmarie Boland is a neonatal nurse and perinatal epidemiologist. She will be the newborn health lead and consumer engagement champion. She will supervise analysis of preterm birth and other newborn outcomes, and engage with stakeholders in neonatal health. She will also be a consumer engagement champion.
Merilyn Riley is a health information management expert with decades of experience working with government and hospital data collection. She will supervise data quality assessment, data extraction, coding and linkage of the health data, and have a special focus leading the congenital anomaly analysis.

Team structure

Leader
Prof Lisa Hui will be the team leader
Sub-leads
There will be a health sub-team lead by **Lisa Hui** (Hui, Marzan, Burgner, Boland, Riley), a climate / geospatial team led by **Suzanne Mavoa** (Mavoa, Marzan, Nice, Negin, and collaborator Sun). The engagement lead **Rosemarie Boland** will work with Safer Care Victoria collaborator Bronwyn Hogan, and the consumer advisors from other relevant bodies (e.g. Newborn Medicine Centre for Research

Excellence, Stillbirth Centre for Research Excellence and the National Preterm Birth Prevention Alliance).

Communication

Regular meetings of the sub-groups will be held discuss progress against milestones, with monthly updates to be shared among the entire team. The project coordinator will manage the communications among the team, in close liaison with the lead and subleads.
The team will use online communication platforms such as Microsoft 365 to communicate. Any conflicts will be managed according to the University of Melbourne processes, with the study lead acting as a mediator where necessary.
Annual performance development reviews will be held, to allow feedback and set goals and expectations for the team members. Team members will have access to ongoing training and development opportunities.

Outputs management and sharing

Provide an outputs management plan

This project will result in 7 outputs

1. A **health database** of linked anonymised participant level data from the Victorian Perinatal Data Collection system, Victorian Congenital Anomaly Register and administrative datasets from the Dept of Health. This dataset will be stored at the Department of Health and will be made available for ethically-approved research through the Victorian Agency for Health Information (VAHI) Data Request Hub as soon as practicable after completion of linkage.
2. The **geospatial datasets** will be stored at the University of Melbourne and the Murdoch Children's Research Institute. The consolidated datasets will be made available immediately on repositories such ashttps://zenodo.org/, subject to any licencing restrictions from the data sources,
3. **Linked dataset of health and geospatial data** (outputs 1 and 2 above) will be stored in the Centre for Victorian Data Linkage at the Department of Health, under the custodianship of CCOPMM and Department of Health. External researchers may request data for ethically-approved research through the Victorian Agency for Health Information (VAHI) Data Request Hub.
4. Data analysis **methods and simulation models** will be made available via GitHub immediately upon completion.
5. Novel **climate change indicators** stored at the climate scientists' academic institutions (University of Melbourne, Murdoch Children's Research Institute and University of New South Wales) will be published open access via a Creative Commons licence (attribution) and uploaded to GitHub.
6. **Briefing reports** will be presented to Safer Care Victoria and the Department of Health, to be publicly released at the Department's discretion. Separate plain English summaries suitable for publication on Safer Care Victoria's website will be created in consultation with SCV's communication team.
7. **Ethically-approved research publications** and conference presentations will disseminate our findings to the research community. We will submit our manuscripts to journals that have open access publishing agreements with the University of Melbourne or deposited in the institutional repository, Minerva Access.

- **Metadata:** We will provide accompanying metadata for all data uploaded to repositories according to international standards (e.g. the Dublin Core standard, EU's INSPIRE framework for spatial data). This will include descriptive, structural, and administrative metadata as appropriate.
- **Visibility:** Our project will be registered as an observational study with the Australian and New Zealand Clinical Trials Registry. Data requests will be directed to the Victorian Agency for Health Information Data Request Hub. The environmental datasets will be described in scientific presentations, conference proceedings and the project internet page.
- **Standard restrictions to data sharing:** All data containing records from CCOPMM datasets must have the approval of CCOPMM before release for research. All manuscripts using Department of Health data must be approved by the Department before submission for publication.
- **Resources:** We have budgeted for a research assistant whose position description will include data management.
- **Intellectual property (IP) outputs:** IP outputs such as the novel climate change indicators, will be made available under a Creative Commons licence to maximise the research impact. Contact person: Mathhew Gotch, Team Leader, Post-Award, International Grants, University

of Melbourne; email: Ric-international@unimelb.edu.au

Select the approach you will use to maximise the impact of your significant research outputs to improve health and benefit the wider research community.
Make research outputs available for access and re-use

Collaborations

Are any collaborations essential for this proposal?	Yes

List any key collaborators (name and organisation) and provide a very brief outline of their role in the proposed research.		
Name	**Organisation**	**Outline of role in proposed research (50 words maximum)**
Karrie Long	Chief Nursing and Midwifery Officer, Safer Care Victoria	High level support for research partnership with SCV, facilitate access to health data and secondment of researchers to SCV; co-design of research outputs and policies for simulation modelling; formulation and implementation of health policy for the maternity sector; approval of public communications and publications; engagement with non-health sector leaders within Victorian government
Prof Mark Umstad	Chair, Consultative Council on Obstetric and Paediatric Mortality and Morbidty	Approve access to Victorian Perinatal Data Collection and Congenital Anomalies Register for seconded researchers, co-design of research outputs and policies for simulation modelling; formulation and implementation of health policy for the maternity sector; approval of public communications and publications; internal stakeholder engagement within the Consultative Councils Unit, Safer Care Victoria and Department of Health
Dr Jake Valentine	Senior Project Officer - Health Intelligence, Safety Insights Program, Safer Care Victoria	Facilitate access to perinatal and health datasets, subject matter expert on Victorian Perinatal Data Collection; advise on health data governance and security, liaison with the Centre for Victorian Data Linkage and Victorian Agency for Health Information
Penelope Sheehan	Clinician co-lead of the Safer Care Victoria Maternity and Newborn Learning Health Network	Engagement and liaison with SCV Maternity and Newborn Learning Health Network (which brings together consumers, researchers and clinicians to improve healthcare safety and evidence-based guidelines); input on priority health indicators, proposed policy interventions for simulation model, communication of outcomes to policy makers and consumers; engagement of SCV consumer networks
Bronwyn Hogan	Consumer co-lead of the	Engagement and liaison with SCV

List any key collaborators (name and organisation) and provide a very brief outline of their role in the proposed research.		
Name	**Organisation**	**Outline of role in proposed research (50 words maximum)**
	Safer Care Victoria Maternity and Newborn Learning Health Network	Maternity and Newborn Learning Health Network (which brings together consumers, researchers and clinicians to improve healthcare safety and evidence-based guidelines); input on priority health indicators, proposed policy interventions for simulation model, communication of outcomes to policy makers and consumers; engagement of SCV consumer networks; consumer advisor on rural issues
Prof Harriet Hiscock	Group Leader of the Health Services group at the Murdoch Children's Research Institute, Chief Health Officer for Matterworks	Input into candidate policy interventions to mitigate climate impacts on child health, subject matter expert in paediatric mental health; Translation and communication of outputs through chief health officer role for Matter Works (a digital communication business that aims to improve health literacy)
A/Prof Chayn Sun	School of Science, Royal Melbourne Institute of Technology	Technical expert and developer of the heat vulnerability index, collaboration on geospatial calculations/analyses, subject matter expert in geospatial pipelines and open source data/dashboards
Xinyang Hua	Melbourne School of Population and Global Health, University of Melbourne	Early career researcher in health economics contributing to cost analyses of climate change impacts on maternal and childhood health; cost benefit analyses for policy scenarios in the microsimulation models
Prof Kim Dalziel	Chair of Health Economics, Melbourne School of Population and Global Health, University of Melbourne	Senior health economist; supervising and advising on health economics analysis for the simulation steps of CHIL2000

I confirm that the collaborators named above have agreed to be involved, as described, in the proposed research and are willing for their details to be included as part of this application.
Yes

Location of activity

Will the funded activity take place at more than one location?	Yes

Country	**Organisation**	**Percentage Split**
Australia	University of Melbourne	84
Australia	Murdoch Childrens Research Institute	9
Australia	Safer Care Victoria	0
Australia	Centre for Victorian Data Linkage	0
Australia	University of New South Wales	3
Australia	La Trobe University	4

Will the project be based in one of the following Wellcome Trust supported facilities: • the Wellcome Trust Sanger Institute • a Wellcome Trust Centre • an Africa and Asia Programme • the Francis Crick Institute?	No

Will you require funds to be awarded directly to more than one location?	No

Explain why you need these funds to be awarded directly to more than one location.

For each location, enter the country, organisation and the value and currency of funds.			
Country	**Organisation**	**Value of funds**	**Currency**

Research involving animals

Does your proposal involve the use of animals or animal tissue?
No - does not involve animals or animal tissue

Explain why animal use is necessary and the choice of species to be used.

Enter the animal species and total numbers needed (this may differ from the number to be bought, maintained).		
Animal species	**Strain (if appropriate)**	**Total number needed to carry out proposed work**

Provide a justification of the proposed sample size and details of planned statistical analyses. Include power calculations if appropriate. Describe experimental design, including any plans to reduce bias such as blinding or randomisation.

Any attachments uploaded will be included at the end of this pdf

Does your proposal include procedures to be carried out on animals in the UK which require a Home Office licence? The organisation must ensure that research involving the use of animals complies at all times with UK laws and regulations.	

Is there a current Home Office Personal Project Licence (PPL) that authorizes the proposed procedures to be carried out in the UK?	

Provide the name of the licence holder.

Detail your plans and timelines for getting the appropriate licence.

If your proposal involves the use of animals, what would be the severity of the procedures? You can find guidance on assessing the severity of a procedure on the Home Office website.

Provide details of any moderate, severe or non-recovery procedures. Can lower severity procedures be used?

Does your proposal involve the use of animals or animal tissue outside the UK?	

Confirm that the proposed animal work outside of the UK will comply with the principles of UK law. Animal research conducted outside the UK must, as a minimum standard, be carried out in accordance with the principles of UK law and regulation.

If your study does not involve non-human primates, cats, dogs or equines, complete and upload the checklists listed on the NC3Rs website, as appropriate. Upload the checklist(s) as a single pdf.

Any attachments uploaded will be included at the end of this pdf

Explain why animal use is necessary and the choice of species to be used.

Non-human primates

Will you be using primates?

Do the facilities and practices, and the proposed research comply with the principles set out in the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) Guidelines?	

Explain why not

Will it be necessary to transport the non-human primates (for example from breeding facility and within the administering organisation environment)?	

Indicate approximate journey times and the measures that will be taken to minimise the potential stress during transport.

Provide details of the housing for the animals, for example enclosure size, environmental enrichment.

Will single housing of the non-human primates be necessary at any	

time?	

Provide a justification for single housing, its duration, and explain what additional resources you will provide to the animals to minimise the impact on animal welfare.

Describe the experimental procedures involved and how any pain, suffering, distress or lasting harm will be minimised. Have the procedures been recently reviewed by the Named Veterinary Surgeon (NVS), Named Animal Care and Welfare Officer (NACWO) and Animal Welfare and Ethical Review Body (AWERB)?

Will any of the experimental procedures involve food or water restriction?	

Justify why this is necessary and outline what alternatives have been considered.

Will any of the experimental procedures involve restraint?	

What alternatives have been considered? Describe the nature of the restraint, its duration and frequency, and what will be done to avoid distress.

What prior experience and training in non-human primate use, care and welfare will you require of the staff named in the application? What are you doing to support professional development in these areas?

Will any of the staff involved require specific training for any of the procedures concerned?	

Provide details of the training needed and where it will be undertaken.

Cats, Dogs and Equidae

Will you be using cats?

Will you be using dogs?

Will you be using equidae?

From where will the animals be sourced?

Will it be necessary to transport the animals?	

Indicate approximate journey times and the measures that will be taken to minimise the potential stress during transport.

Are animals to be imported?	

Where animals are to be imported, what journey times have been agreed with the Home Office? Describe the conditions for the animals at the breeding establishment and how the potential stress during transport will be minimised.

Provide details of the housing for the animals, for example enclosure size, environmental enrichment.

Will single housing of the animals be necessary at any time?	

Provide a justification for single housing, its duration, and explain what additional resources you will provide to the animals to minimise the impact on animal welfare.

Describe the experimental procedures involved and how you will minimise any pain, suffering, distress and/or lasting harm. Have the procedures been recently reviewed by the Named Veterinary Surgeon (NVS), Named Animal Care and Welfare Officer (NACWO) and Animal Welfare and Ethical Review Body (AWERB)?

What adverse effects might the animals experience? List the clinical and other signs that will be monitored, the frequency of monitoring and, if relevant, the humane endpoint criteria established for the study.

Will any of the experimental procedures involve restraint?	

What alternatives have been considered? Describe the nature of the restraint, its duration and frequency, and what will be done to avoid distress.

What prior experience and training in animal use, care and welfare will you require of the staff named in the application? What are you doing to support professional development in these areas?

Will any of the staff involved require specific training for any of the procedures concerned?	

Provide details of the training needed and where it will be undertaken.

Genetically altered animals

Will you be using genetically altered animals?

Risks of research misuse

Confirm that you have considered whether your proposed research could generate outcomes that could be misused for harmful purposes.
Yes

Have you identified any tangible risks of this type?	No

Briefly describe these risks. Explain how you and your organisation will manage them.

Freedom to operate/conflicts of interest

Describe any freedom to operate or other intellectual property related issues that might affect your ability to carry out the proposed research or to use, share or commercialise the research outputs. Explain how you will address these.
Not applicable

Describe any conflicts of interest which might affect your ability to do the proposed research or to share or commercialise the research outputs.
Not applicable

Lead applicant details

Lead applicant details	
Full Name	Lisa Hui
Department	Obstetrics, Gynaecology and Newborn Health
Organisation	University of Melbourne

ORCID iD	
ORCID iD	0000-0002-9720-3562

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
01 January 2024		Professor	University of Melbourne
01 January 2016	31 December 2023	Associate Professor	University of Melbourne

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
01 January 2010	31 March 2013	MB/PhD	PhD	University of Sydney
01 January 2000	31 December 2008	Other postgraduate degree or qualification	Specialist qualification in Obstetrics and Gynaecology	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
01 January 1990	31 December 1995	Primary Medical Qualification (BM;MBChB;MBBS;MD)	Bachelor of Medicine, Bachelor of Surgery	University of Sydney

Career breaks Have you taken any breaks from research that you wish us to take into consideration? This can include periods of parental or long-term sick leave, caring responsibilities, part-time work, secondments, volunteering or time spent in clinical training or different sectors. You can also include any periods where you were unable to work because of the COVID-19 pandemic.	

Provide details
13/04/2013 - 31/12/2015 Part-time work only (0.6 full time equivalent)

Salary funding sources		
Salary source	**Percentage contribution to**	**Type of contract (for example,**

	salary	fixed term, tenure-track or permanent).
Medical Research Futures Fund	50	Competitive Investigator grant
Mercy Hospital for Women	50	Salaried senior medical Officer

Are you a healthcare professional?	Yes

What is your healthcare profession?
Medical graduate

Are you clinically active?	Yes

What is your specialty?
Maternal and Fetal Medicine

Specify

Do you wish to do this grant part time? If you wish to do this grant part-time, either from the start or part way through the grant, your administering organisation must employ you on a part-time basis during that time.	Yes

Current and recent research funding (including Wellcome grants)

Research funding as lead applicant/ fellowship recipient in past 5 years

- 2023 Dame Kate Campbell Fellowship, University of Melbourne Faculty of Medicine, Dentistry and Health Sciences; provides safety net research salary support for 2 years if no external funding received after the end of current government emerging leader fellowship which ends 31 Dec 2025 (i.e 0.5 FTE research salary and ongoing appointment guaranteed for 2026 and 2027) [% time spent on this research - NA]
- 2022 Norman Beischer Medical Research Foundation: “Education, Serology and Evaluation to prevent congenital cytomegalovirus infection”, AUD600,000; 100%, lead applicant; 01/01/2022 to 31/12/2024 [% time spent on this research in 2024 - **10%**]
- 2022 Safer Care Victoria research fellowship; “Exploring the impact of COVID-19 on maternal and newborn health in Victoria” AUD 49,000; 100%; lead applicant; co-applicant: Melvin Marzan; 01/07/2023- 30/06/2024 [% time spent on this research in 2024 - **10%**]
- 2021 Norman Beischer Medical Research Fund Innovation Grant; “ Collaborative Maternity and Newborn Dashboard for the COVID19 pandemic; AUD 50,000; 100%, lead applicant; co-applicants Melvin Barrientos Marzan, Daniel L. Rolnik, Stephanie Potenza, Natasha Pritchard, Joanne M. Said, Kirsten R Palmer, Clare L. Whitehead, Penelope M. Sheehan, Jolyon Ford, Ben W. Mol, Susan P. Walker; 01/01/2021 to 31/12/2021 [% time spent on this research in 2024 - NA completed project]
- 2021 University of Melbourne Department O&G Innovation Grant; “Prevention of fetal cytomegalovirus infection after maternal infection: developing novel therapeutic approaches using primary trophoblast and placental explant cultures”; AUD20,000; 100%, lead applicant;

co-applicants: Natalie Hannan; 01/01/2021-31/12/2023 [% time spent on this research in 2024 - NA completed project]

- 2020 Norman Beischer Medical Research Fund "Collaborative Maternity and Newborn Dashboard for the COVID19 pandemic"; AUD50,000; 100%, lead applicant; 01/01/2020-31/12/2020 [% time spent on this research in 2024 - NA completed project]
- 2021 University of Melbourne Dept of O&G Innovation Grant; "Co-designing Family Planning Services at Northern Health"; AUD25,000; 100%, lead applicant; co-applicants: Eleanor Johnson, Kate Chaouki, Jeanie Henderson; 100%; 01/01/2021-13/12/2021 [% time spent on this research in 2024 - NA]
- 2021 Emerging Leader 2 Clinical Investigator Fellowship; Medical Research Futures Fund; "Closing the critical knowledge gaps in perinatal genomics"; AUD1,281,125; 100%, lead applicant; 01/01/2021 to 31/12/2025 [% time spent on this research in 2024 - **research salary support for 0. 5FTE**, time is spend on other specific projects included here]
- 2021 Strategic Grant for Outstanding Women; Melbourne Medical School; AUD56,000; 100%, lead applicant; 01/01/2021/31/12/2024 [% time spent on this research in 2024 - NA]
- 2020 Medicine, Dentistry & Health Sciences (MDHS) Faculty Research Fellowship; University of Melbourne; AUD77,604; 100%, lead applicant; 01/01/2020 to 31/12/2020 [% time spent on this research in 2024 - NA completed project]
- 2020 National Health and Medical Research Council Cohort Study Grant; "Childhood Outcomes of fetal genomic variants: The PrenatAL Microarray (PALM) cohort study"; AUD727,858; 100%, lead applicant; other applicants – Jane Halliday, David Amor, Sharon Lewis, Sue Walker; 01/01/2020-30/06/2024 [% time spent on this research in 2024 - **10%**]
- 2020 Norman Beischer Medical Research Fund; "Collaborative Maternity and Newborn Dashboard for the COVID19 pandemic"; AUD50,000; 100%; lead applicant; 01/01/2020-13/12/2020 [% time spent on this research in 2024 - NA completed project]
- 2020 University of Melbourne Dept of O&G Innovation Grant; "Collaborative Maternity and Newborn Dashboard for the COVID19 pandemic'; AUD20,000; 100%, lead applicant; 01/01/2020-31/12/2020 [% time spent on this research in 2024 - NA completed project]
- 2020. Ferring COVID-19 Investigational Grant in Reproductive Medicine and Maternal Health; "Coronavirus Health Outcomes in Pregnancy and Newborns (CHOPAN): a national registry for Australia"; AUD15,000; 100%; lead applicant; 01/01/2020-31/12/2020 [% time spent on this research in 2024 - NA completed project]
- 2020 Northern Foundation - Northern Centre for Health Education and Research Reproductive Health Biobank, directed private philanthropic equipment grant; AUD51,230; 100%, lead applicant; 01/01/2020-31/12/2020 [% time spent on this research in 2024 - NA completed project]
- 2020. Norman Beischer Medical Research Fund Innovation grant; "Single cell RNA sequencing of amniotic fluid: a novel approach to understanding fetal development"; AUD56,489; 100%, lead applicant; co-applicants: Natalie Hannan, Alicia Oshlack, Bhupinder Pal; 01/01/2020-31/12/2021 [% time spent on this research in 2024 - NA completed project]
- 2019 Northern Health; "Northern Centre for Health Education and Research Reproductive Health Biobank"; AUD408,730; 50%, co-lead applicant; co-applicant: Natalie Hannan; 01/01/2019-31/21/2024 [% time spent on this research in 2024 - **5%**]
- 2019 Melbourne Academic Centre for Health; Northern Centre for Health Education and Research Reproductive Health Biobank equipment grant; AUD50,000; 100%, lead applicant; 01/01/2019-31/12/2019 [% time spent on this research in 2024 - NA completed project]

Research funding as a co-applicant (no salary contributions or research costs received) in past 5 years

- 2024-2026 University of Melbourne Hallmark Research Initiative "Reproductive Justice" $450,000 (CIA Louise Keogh) [% time spent on this research in 2024 - NA not yet commenced, anticipate **5%**]
- 2024 Cooperative Research Centres Projects - StrepSure™: An ultrasensitive rapid biosensor for protecting newborns from GBS - $7.6 million (2024-2026). Consortium of Royal Melbourne

Institute of Technology, Atomo Diagnostics, Rhinostics LLC, CSIRO-Data61, Northern Health [% time spent on this research in 2024 - NA not yet commenced, anticipate **5%**]

- 2022 - 2027 MRFF Mitochondrial Donation Pilot Program (CI-Y) - The mitoHOPE (Healthy Outcomes Pilot and Evaluation) Program - $15,000,000 (CIA Prof John Carroll) [% time spent on this research in 2024 - **5%**]
- 2022 - 2026 NHMRC cohort study grant (CI-I) - Whole-of-population CRISPR point-of-care testing for congenital cytomegalovirus to prevent hearing and neurodevelopment disabilities through a public health approach - $2,058,920.60 (CIA A/Professor Valerie Sung) [% time spent on this research in 2024 - 0%]
- 2022 - 2024 Cerebral Palsy Alliance (CI-B) - Evaluating patient and GP knowledge of congenital CMV prevention behaviours before and after the launch of a GP eLearning module - $48,400 (CIA Dr Hayley Smithers-Sheedy) [% time spent on this research in 2024 - **2%**]
- 2021 - 2023 Australian Research Council Partnership Grant (CI-C) - Ethical, Social and Regulatory Issues in Advanced Prenatal Testing - $571,076 (CIA Prof Catherine Mills, Partner - Illumina) [% time spent on this research in 2024 - **3%**]

Intended time allocation for Wellcome Trust award

My current research fellowships and projects grants list above occupy 0.5 FTE of my total working time (50%), with the other 0.5 FTE being occupied in a clinical role as a maternal fetal medicine specialist.
If successful, I intend to reduce my clinical load to 0.3 FTE so that I can take on the additional 0.2 FTE for the Wellcome Trust grant and continue my current research commitments at 0.5 FTE.

Describe how the currently active grants listed above relate to this application. If you hold grants related to the topic of this application, explain how these differ and confirm there is no overlap in funding.

None of these grants do not relate to this application.

What percentage of your research time will you spend on this project?

20

Lead applicant research contributions

How have you contributed to the generation of knowledge?

Scholarly Outputs

I have a career total of 123 scholarly publications (67% as first or senior author), and 16 other non-peer reviewed reports written for government or health service leaders. As a clinician researcher, my program responds to emerging clinical priorities and evidence gaps, spanning advances in prenatal genomic testing, congenital cytomegalovirus infection and, most recently, impacts of the COVID-19 pandemic on maternal and newborn outcomes.

My 63 peer-reviewed research papers, reviews, editorials and book chapters in the field of prenatal diagnosis and genomics comprise the largest Australian and second largest global contribution to the scientific literature in this field. My Expertscape ranking places me in the top 0.067% of researchers in the field of Prenatal Diagnosis world-wide. For the topic "*cell-free nucleic acids, pregnancy, prenatal diagnosis*", I am ranked #1 in Asia-Pacific and #2 worldwide (SciVal). My citations are on an increasing trajectory with a current Scopus h-index of 27, which is excellent relative to opportunity (10 years since PhD completion, 4 years full time equivalent salaried research time).

I am the leading researcher on COVID-19 pandemic impacts on the maternity sector in Australia, having established a collaboration of 12 maternity hospitals in Melbourne to monitor the effects of our lockdown on perinatal outcomes.

Top 10 peer-reviewed publications

(IF, impact factor; citations = GoogleScholar)

1. **Hui L**, **Marzan MB**, Rolnik DL, Potenza S, Pritchard N, Said JM, Palmer KR, Whitehead CL, Sheehan PM, Ford J, Mol BW, Walker SP. *Reductions in stillbirths and preterm birth in COVID-19-vaccinated women: a multicenter cohort study of vaccination uptake and perinatal outcomes*. Am J Obstet Gynecol. 2023; doi:10.1016/j.ajog.2022.10.040; IF 9.8; 32 citations

The first Australian study on pregnancy outcomes after COVID-19 vaccination, receiving an Altmetrix score of 682. It was used to support national public health messaging about the benefits and safety of vaccination for pregnant people.

2. **Hui L, Marzan MB**, Potenza S, Rolnik DL, Pritchard N, Said JM, Palmer KR, Whitehead CL, Sheehan PM, Ford J, Mol BW, Walker SP. *Increase in preterm stillbirths in association with reduction in iatrogenic preterm births during COVID-19 lockdown in Australia: a multicenter cohort study*. Am J Obstet Gynecol. 2022; doi: 10.1016/j.ajog.2022.04.022; IF 9.8; 14 citations

This paper alerted our state to the unintended consequences of lockdown in Melbourne, which had one of the longest and most stringent lockdowns in the world. This led to commissioned work for the government examining the contributing factors to these excess stillbirths in 2020.

3. Calvert C, Brockway M, Zoega H… **Hui L**… **Burgner D**, Stock SJ. Azad MB. *Changes in preterm birth and stillbirth during COVID-19 lockdowns in 26 countries*. *Nat Hum Behav;* 2023; doi:10.1038/s41562-023-01522-y; IF 29.9; 42 citations.

I collaborated in this large international study to determine the effect of lockdown conditions on preterm birth and stillbirth, co-led by co-applicant Prof Burgner and international colleagues.

4. **Hui L**, Hutchinson B, Poulton A, Halliday J. *Population-based impact of noninvasive prenatal screening on screening and diagnostic testing for fetal aneuploidy*. Genet Med. 2017; doi: 10.1038/gim.2017.55; IF 8.8; 70 citations

I lead the analysis and writing of this highly cited article in a leading genetics journal presenting population-based data on the dramatic impact of genomic advances on invasive prenatal diagnosis rates.

5. *Lindquist A, ***Hui L**, et al. (*Joint first authors) *State-wide utilization and performance of traditional and cell-free DNA-based prenatal testing pathways: the Victorian Perinatal Record Linkage (PeRL) study*. Ultrasound Obstet Gynecol. 2020. doi: 10.1002/uog.21899.

This linkage study was the first to analyse data from a variety of private and not-for-profit providers of cell-free DNA based aneuploidy screening. This paper influenced national health policy as it was used by the Medical Services Advisory Committee's economic subcommittee to assess an application for public funding for cell-free DNA based screening.
6. **Hui L**, Bianchi DW. *Fetal fraction and noninvasive prenatal testing: What clinicians need to know*. Prenatal Diagnosis. 2020; doi: 10.1002/pd.5620.
This invited review is one of the most cited and downloaded articles in this journal's 40 year history, with > 54,000 downloads and 101 citations in less than 4 years. It demonstrates my international impact in translating research into clinical practice.
7. Cohen PA, Flowers N, Tong S, Hannan N, Pertile MD, **Hui L**. A*bnormal plasma DNA profiles in early ovarian cancer using a non-invasive prenatal testing platform: implications for cancer screening.* BMC Med 2016; doi:10.1186/s12916-016-0667-6; IF 9.3; 90 citations
I lead this novel interdisciplinary project in which we showed that the standard prenatal screening workflow based on DNA sequencing of maternal plasma could also detect ovarian cancer in nonpregnant women. This paper extended my reputation beyond obstetrics into general medicine.
8. **Hui L**, Ellis K, ... and Chitty LS, on behalf of the ISPD Board of Directors. *Position statement from the International Society for Prenatal Diagnosis (ISPD) on the use of non-invasive prenatal testing (NIPT) for the detection of fetal chromosomal conditions in singleton pregnancies*. Prenatal Diagnosis; DOI: 10.1002/pd.6357; IF 3.3; 19 citations
I lead the coordination and writing of this international position statement in my roles as elected member of the Board of Directors. This is a highly influential publication with global reach and impact on clinical standards.
9. Rawlinson WD, Boppana, SB, Fowler, ..., **Hui L,**...& van Zuylen WJ. C*ongenital cytomegalovirus infection in pregnancy and the neonate: consensus recommendations for prevention, diagnosis, and therapy*. The Lancet Infectious Diseases 2017; DOI: 10.1016/S1473-3099(17)30143-3; IF 56.3; 765 citations
This highly cited paper has been the standard reference for international clinical practice for the past 8 years.
10. **Marzan MB**, Johnson E, Moore P, Jiang H, **Hui L**. Changes in the numbers of hospital-based abortions and outpatient early medical abortions in Victoria, 2012-22: a retrospective cohort study. Med J Aust. 2024; doi: 10.5694/mja2.52203; IF 7.7; 1 citation
This state-wide analysis of the trends in abortions in Victoria was conducted in response to a 2023 Australian Senate Inquiry into Universal Access to Reproductive Healthcare and provides the most comprehensive population-based analysis of abortions in Australia in the past decade. It was the topic of an accompanying editorial highlighting the continued disparities in access to abortion in Australia.

How have you contributed to the development of others?

1. Mentorship and student supervision

As an obstetrician and scientist, I believe I have a responsibility to inspire and train the next generation of researchers and contribute to the development of others. I supervise students from the University of Melbourne and La Trobe University, clinical fellows undertaking subspecialist training, and junior doctors pursuing entry into specialist training programs. I contribute to a positive nurturing culture through a support network for early career researchers in our University, as well as formal mentorship programs with the University of Melbourne ("Supporting Women in MDHS") and the International Federation of Placenta Associations. I have mentored my research midwife to develop her own independent research projects, culminating in her receiving a PhD-track scholarship with the Melbourne Academic Centre for Health.
Current research supervisions: 3 PhD students as primary supervisor (these are past mentees who elected to return to work with me); 2 maternal fetal medicine trainees, 3 post-doctoral researchers
Completed primary supervisions: 15 MD, 5 Masters of Genetics Counselling/Masters of Genomics

& Health, and 3 Health Information Management students, 2 post-doctoral researchers.

2. Research group strategic development

I lead highly productive research groups across three locations with a total of 23 direct reports.
I lead the Reproductive Epidemiology group at the Murdoch Children's Research Institute, a research group at the Mercy Hospital for Women campus of the University of Melbourne, and I co-founded a new research group and reproductive health biobank at the Northern Health campus of the University of Melbourne.

3. Collaborations

Two examples of large complex collaborations that I current lead are:

- Childhood Outcomes of Fetal Genomic Variants: this is a NHMRC-funded cohort study involving state-wide health service and academic institution collaborations
- The Collaborative Maternity and Newborn Dashboard for the COVID-19 Pandemic, a 12 hospital collaboration to monitor perinatal outcomes during the pandemic

How have you contributed to the wider research community?

Scientific peer review and journal editor roles

I am a generous and constructive peer reviewer in high demand from many journals, with 304 verifiable peer reviews for 28 journals, including cross disciplinary journals such as the New England Journal of Medicine (IF 176.1), The BMJ (IF 96.2), and the top journals in my subspecialist field. I am currently associate editor, *Prenatal diagnosis* (2019-present) and Editorial Board member, *Ultrasound in Obstetrics and Gynecology (2019- present)*

Current international leaderships

- Elected Board Director, International Society for Prenatal Diagnosis (ISPD)
- ISPD Global Education and Outreach Committee member

Scientific conference involvement

I have delivered more than 100 invited presentations (including 30 international talks), contributed to 18 conferences through organising and scientific committee roles, and chaired sessions at 19 conferences.

Contribution to leadership and culture

My citizenship and contributions to the research community have been recognised by the University of Melbourne by selection for the Academic Women in Leadership course in 2019, awarding of a Strategic Grant for Outstanding Women in 2021, and the Faculty Dame Kate Campbell Fellowship award in 2023.The highly regarded Dame Kate Campbell fellowship is awarded for "*academic merit, research impact, leadership, engagement and adherence to the Faculty's values and strategic priorities*".
I am a member of the University of Melbourne Dept of O&G, Executive committee, and co-chair a newly created academic appointments and promotions subcommittee. In this role, I have led the development of transparent pathways to assess applications for honorary and paid appointments and promotions in our Department. I am also an invited member of the "Elephant Circle", a volunteer group providing peer support and promoting a safe and inclusive working culture in the department of O&G. I am also the Research Lead and the Research Integrity Advisor for Women's and Children's Health at Northern Health.

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Co-production of research outputs with government

- During the pandemic I gathered stakeholders in health service leadership, clinical quality managers, and Safer Care Victoria to establish the Collaborative Maternity and Newborn Dashboard for the COVID-19 Pandemic. I lead the pregnancy section of a report for the Victorian government: "*Changing patterns in health services use and effects of care forgone: Associations between the COVID-19 pandemic restrictions and Victorians' healthcare".* Dr Marzan and I were funded by Safer Care Victoria to produce the *CCOPMM COVID-19 communique. A report on maternal and newborn outcomes during the COVID-19 pandemic. Safer Care Victoria. 2023.*

Translation to clinical practice

- My research is cited in clinical guidance published by the Royal Australian and New Zealand College of Obstetricians and Gynaecologist (RANZCOG), the Commonwealth Government, and the International Society for Prenatal Diagnosis.
- I was the lead writer of the 2019 RANZCOG statement on Prenatal Screening (C-Obs 59) and chair the RANZCOG Statement Development group on fetal anomalies, which will define the new standard of care for Australia and New Zealand.

Contribution to government consultations

My work has been cited in health service and university submissions to government, and I have authored submissions to the *Senate Inquiry into Universal Access to Reproductive Healthcare in 2023*, and the *Commonwealth Government COVID-19 response inquiry* in 2024.
I participate committees to influence decision makers:

- SCV Maternity and Newborn Learning Health Network Data Group
- CCOPMM Research and Reporting subcommittee
- Victorian Dept of Health Genomics Clinical Advisory Group
- CCOPMM Stillbirth subcommittee

Consumer engagement

I have consumer collaborators from CMV Australia with whom I have co-developed consumer and clinician education resources, co-designed qualitative studies of the consumer experience, and convened a national symposium. I work with consumer representatives at Safer Care Victoria, the Mito Foundation, and Through the Unexpected.

Lead applicant research environment

Describe how your research contributes to the strategic aims of your organisation.

- The research proposed in this grant aligns with the strategic goals of the **University of Melbourne Faculty of Medicine, Dentistry, and Health Sciences**, as outlined in its ***Advancing Health 2030*** initiative. This strategic plan emphasizes addressing the pressing challenges of our evolving world, including climate change and its accompanying chronic health impacts, the gaps in our health system thrown into sharp relief by COVID-19, the importance of mental health and well being to social cohesion and the fast paced digital transformation of healthcare and education. The University recognizes the complex nature of these challenges, and the necessity of sustained, interdisciplinary efforts in tackling these problems. Our research embodies this approach through genuine interdisciplinary collaboration involving environmental and climate scientists, maternal and child health clinicians, perinatal epidemiologists, health economists, government and health services stakeholders. The development of our Climate Health Impacts Laboratory for the First 2000 days (CHIL2000) represents a pioneering endeavour in Australia, driving innovation within our sector and facilitating the translation of research findings into actionable policies and practices.
- Moreover, our research aligns with the strategic objectives of our partners in the **Victorian government**, highlighted in the **Health and Human Services Climate Change Adaptation Action Plan 2022-2026**. This plan underscores the importance of enhancing sector capabilities to address climate-related challenges, including expanding surveillance to monitor changing health risks and vulnerabilities, and enhancing communication to support community adaptation efforts. The government recognizes the potential of healthcare professionals to play a more significant role in communicating the health implications of climate change and empowering communities to adopt healthy practices in a changing climate. The government also calls for more efforts to support the mental health of individuals affected by climate change, including the integration of climate change impact indicators into mental health and well-being frameworks.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

- I am committed to creating a culture where people can thrive and achieve excellence. I am a member of our University Department Executive committee, and co-chair the new **Academic Appointments and Promotions Committee**. In this new role, I have led the development of transparent pathways to assess applications for honorary and paid appointments and promotions in our Department. My leadership of the subcommittee aims to bring much needed clarity and accountability to the appointment and renewal process, and help improve engagement with the 120 clinical and academic honorary faculty.
- As group leader of Reproductive Epidemiology at the Murdoch Children's Research Institute, I commissioned a workshop on communication to help my team reconnect after years of hybrid working during the pandemic, which improved our group dynamics and calibrated our working styles.
- I am also a member of the Elephant Circle, a volunteer group providing **peer support and promoting a safe and inclusive working culture** in the Department of O&G. My nomination by my peers to be part of this group demonstrates my reputation as an approachable, fair and compassionate leader who is committed to creating a supportive and respectful academic culture. I participate in panel discussions for the Elephant Circle "*Fireside Chat*" sessions, and

have an open door policy for early career researchers to discuss workplace and culture issues.

- I also help create a safe and inclusive research culture to our health service partners. As the **Research Integrity Advisor and Research Lead in Women and Children's Health** at Northern Health, I play an important role in shaping the culture in this relatively new campus. I am available to address concerns with the ethics and governance of studies conducted in the Department of O&G and I provide support to the Clinical director of Obstetrics and the Divisional Director of Obstetrics and Gynaecology in assessing proposed projects in pregnancy research.
- Over the past 6 years, I have mentored my junior research team members to develop their own independent projects and research interests by assisting with grant applications, funding and sponsorhip. For example, my research midwife at Northern Health was originally employed to recruit patients to research studies. However, her exposure to the clinical service inspired her to embark on her own project to improve abortion care through co-design with consumers. I mentored her through the writing of a competitive grant application, which was successful on the second attempt. I topped up this grant funding through a University of Melbourne internal grant scheme, and then subsequently mentored her to a successful application for a health services research fellowship. She has thrived with this support and has just commenced a prestigious PhD fellowship with the Melbourne Academic Centre for Health. My supporting role in her career trajectory demonstrates my commitment to promoting multidisciplinary research, nurturing the career development of my team members, and improving care for vulnerable and stigmatized populations. I mentored 5 other early career team members in successful competitive project and fellowship grants in 2023.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to do training and continuing professional development. Explain how you will use this time.

We will use this time to support each team member's choice of professional development activity. As the team has a range of career stages, each team member can tailor their program to suit their areas for growth.
Examples of activities offered include:

- Individual professional development with each applicant's choice of online or in person l**eadership and culture development cours**e provided by the Institute of Management. The career stages and needs of the applicants are varied, so we have chosen a provider of leadership and culture training that has been recommended by senior members of the University of Melbourne. Examples of courses (range from 2 days to 5 days each, or delivered online over several months) include Leadership Development Program, Conflict Management, Coaching and Mentoring, Leadership of Projects and Programming, Managing Stress and Resilience, and Influencing and Negotiation Skills.
- Provide time to participate in the **University of Melbourne Supporting Women in MDHS SWiM mentorship program** as mentors or mentees as appropriate to career stage and gender. The Supporting Women in MDHS (SWiM) program aims to promote gender equity and support academic promotion of women in our Faculty. SWiM aims to encourage women to step into leadership roles in their academic careers, as well as strategically prepare them for academic promotion. Academics of any gender identity can participate as mentors. Participation in this program includes attendance at the bi-monthly "Inspiring Stories" SWiM seminar series.
- A choice of one-to-one leadership coaching from a list of recommended providers from the **University of Melbourne Strategic people Initatives**. The types of coaching provided include 360 debriefing/coaching and development planning, leadershi coaching, performance coaching, targeted behavioural coaching and high potential/development coaching.
- Research skills development include short courses at the MCRI Clinical Epidemiology and

Biostatistics Unit

Supporting letter from organisation will be included at the end of this pdf along with any other uploaded files.

Costs requested and justification

Select the currency in which you want to apply.
AUD

Is this your local currency?	Yes

What is your local currency?	

Explain why you are requesting costs in the selected currency and what exchange rate you have used.

Staff Are you requesting staff?	Yes

Staff costs

Cost type	Number of staff requested for	Role	Name (if known)	Basic annual starting salary	Salary grade or scale	Months on project	% time	Total cost on grant (AUD)
Research/ teaching buyout	1	Clinician (Obstetrician) - Scientist	Prof Lisa Hui		E1	36	20	**202,942**

Staff costs								
Cost type	**Number of staff requested for**	**Role**	**Name (if known)**	**Basic annual starting salary**	**Salary grade or scale**	**Months on project**	**% time**	**Total cost on grant (AUD)**
Research/ teaching buyout	1	Biostatistician/Epidemiologist	Dr Melvin Marzan		B1	36	20	**110,904**
Research/ teaching buyout	1	Climate Scientist/Data Scientist	Dr Kerry Nice		C1	36	20	**134,937**
Research/ teaching buyout	1	Perinatal Epidemiologist	Dr Rosemary Bowland		D1	36	20	**162,998**

Staff costs								
Cost type	**Number of staff requested for**	**Role**	**Name (if known)**	**Basic annual starting salary**	**Salary grade or scale**	**Months on project**	**% time**	**Total cost on grant (AUD)**
Research/ teaching buyout	1	Clinician (Paediatrician) - Scientist	Prof David Burgner		E1	36	20	**202,942**
Research/ teaching buyout	1	Geospatial Scientist/Epidemiologist	A/Prof Suzanne Mavoa		D1	36	20	**173,575**
Research/ teaching buyout	1	Climate Scientist/Data Scientist	Dr Negin Nazarian		C2	36	20	**138,941**

Staff costs								
Cost type	**Number of staff requested for**	**Role**	**Name (if known)**	**Basic annual starting salary**	**Salary grade or scale**	**Months on project**	**% time**	**Total cost on grant (AUD)**
Research/ teaching buyout	1	Health Information Specialist	Merilyn Riley		C6	36	20	**150,858**
Salary	1	Data Scientist - Climate Modelling	Vacant		B3	24	100	**383,290**
Salary	1	Epidemiologist - Maternal/ Perinatal	Vacant		B1	30	100	**467,642**

Staff costs								
Cost type	**Number of staff requested for**	**Role**	**Name (if known)**	**Basic annual starting salary**	**Salary grade or scale**	**Months on project**	**% time**	**Total cost on grant (AUD)**
Salary	1	Epidemiologist - Child Health	Vacant		A8	30	100	**425,212**
Salary	1	Geospatial Analyst (Post-Doc)	Vacant		B1	24	100	**357,226**
Salary	1	Project Manager	Vacant		UOM 5.1	34	100	**356,052**

Justification for staff
We calculated the staff costs based on Australian salary standards, using the University of Melbourne's salary calculation tool, and other institution-specific salary scales as appropriate. These calculations include mandatory employment benefits such as leave loading and superannuation contributions.

Lisa Hui (team leader), Melvin Marzan (epidemiologist and biostatistician), Rosmarie Boland (neonatal nurse and perinatal epidemiologist), and Kerry Nice (climate modeler and data scientist), will be compensated through the University of Melbourne. Suzanne Mavoa (geospatial science lead) and David Burgner (paediatrician and epidemiologist) will receive their salaries from the Murdoch Children's Research Institute. Negin Nazarian (climate scientist and data scientist) will be salaried through the University of New South Wales, and Merilyn Riley, a health information management specialist, will be compensated through La Trobe University. The investigators' salaries account for 20% of their total research time dedicated to the project.
The named staff will concentrate on their areas of expertise while supervising newly hired full-time staff. This includes a full-time project manager who will oversee the project in its entirety and coordinate with the Department of Health. Establishing a data governance framework will be a major component of their role. A data scientist will be recruited to assist applicants Nice and Nazarian with climate hazard modelling tasks. A geospatial analyst will support applicants Mavoa and Marzan, along with collaborator Sun, in consolidating and linking geospatial data. The team plans to hire two epidemiologists to carry out disease burden modelling; one will specialize in maternal and perinatal health and the other in child health. These epidemiologists will be seconded to SCV to ensure secure and efficient access to linked health datasets. They will also assist Marzan and collaborators Hua and Daziel in microsimulation modelling and cost-effectiveness analyses. All new hires for the project will be employed by the University of Melbourne.

Adjustment support Are you requesting adjustment support?	No

Adjustment Support
Costs requested from Wellcome (AUD)

Training and continuing professional development Are you requesting training and continuing professional development?	Yes

Training and continuing professional development		
Cost type	**Description**	**Costs requested from Wellcome (AUD)**
Continuing professional development and professional skills training		**15,000**
Research skills training		**15,000**

Justification for training and continuing professional development.

We have requested AUD10,000 p.a. for training and continuing professional development, which amounts to AUD1250 per applicant per year.
There are free professional development opportunities offered by the University of Melbourne and other locations for the research (MCRI, UNSW, La Trobe, Safer Care Victoria) which applicants plan to participate in, including

- mentoring programs
- research supervisor workshops
- respectful graduate supervisor development workshops
- peer support coaching

Paid professional development activities include:

- Courses run by the Institute of Management on leadership and culture (Including their Leadership Development Program $1,936)
- Research skills development in statistical analysis (Short courses at the MCRI Clinical Epidemiology and Biostatistics Unit, e.g Reproducible Data Analysis in STATA $300 for applicant Boland)
- One-to-one focussed coaching with a recommended executive coach from Time to Think

The applicants will be able to select their own preferred continuing professional development activity and use the allocated funds towards those costs.

Materials and consumables Are you requesting materials and consumables?	Yes

Materials and consumables	
Description	**Costs requested from Wellcome (AUD)**
Software Subscription	**50,000**
Laptop Computers with Accessories	**60,000**

Justification for materials and consumables.
We plan to utilize open-source software wherever suitable, and access University of Melbourne resources including computing software (MATLAB, ArcGIS, and PowerBI). However, we have allocated $50,000 for software subscriptions over the next three years as the epidemiologists, biostatisticians, and modelers on our team will require annual licenses for Stata MP for statistical analysis and MPlus for structural equation modeling. They also require the functionality of the paid version of RStudio. We will also subscribe to StatTransfer, facilitating the conversion of various statistical file types into our preferred format. Furthermore, we plan to obtain Tableau licenses for the investigator team, stakeholders, and consumers. This will allow them to access dashboards, and Tableau will also be used to create public facing maps and dashboards. In the second year of the project, our economic modelers will need a license for TreeAge - designed for decision analysis,

allowing users to perform quantitative modelling using decision trees. We have also allocated for the cost of High Performance Computing (HPC) at the University of Melbourne.
We budgetted $60,000 for computers and accessories. Investigators and staff engaged in climate hazard modeling and geospatial data analysis will be equipped with MacBooks featuring advanced specifications, purchased through the University of Melbourne for approximately AUD4,899 each. These high-specification MacBooks are essential for handling the computational intensity of our models. Epidemiologists and disease modellers, who require robust computing capabilities for statistical analysis and epidemiological research, will be provided with laptops valued between $3,200 and $3,500.For the rest of our team members, we will allocate laptops that meet the general requirements set by the University, with prices ranging from $2,800 to $3,200. We will provide docking stations, high-definition large monitors, and computer mouse as requested.

Animals Are you requesting animals?	No

Animals				
Animal species	**Total no. to be bought**	**Total purchase cost**	**Total maintenance and procedures cost**	**Costs requested from Wellcome (AUD)**

Associated animals costs	
Description	**Costs requested from Wellcome (AUD)**

Justification for animal costs.

Equipment Are you requesting equipment?	No

Equipment costs						
Type	**Type of equipment**	**No. of items**	**Cost per item**	**Cost of maintenance contract**	**Contribution from other sources**	**Cost requested from Wellcome (AUD)**

Justification for equipment.

Are you requesting a piece of equipment with a list price of £100,000 or more?	

Access charges Are you requesting access charges?	No

Access charges						
Details of equipment or facility	**Original source of funding**	**Wellcome Trust grant number, if applicable**	**Standard access charge per unit**	**Specify unit**	**No. of units to be used for this project**	**Cost requested from Wellcome (AUD)**

Justification for access charges.

Overheads Are you requesting overheads?	Yes

Overheads	
Description	**Cost requested from Wellcome (AUD)**
University of Melbourne	**530,577**
Murdoch Childrens Research Institute	**56,477**
La Trobe University	**22,629**
University of New South Wales	**20,841**

Justification for overheads.
The University of Melbourne, Murdoch Children's Research Institute, La Trobe University, and University of New South Wales impose a 15% overheads charge on projects to cover indirect costs. Unlike direct costs, which can be attributed to specific research projects or programs, such as equipment purchases or personnel wages, indirect costs encompass a broader spectrum of expenses. These include the maintenance and construction of building and laboratory spaces, salaries for research administration staff, telecommunications and IT infrastructure, and library services. These costs, while not tied directly to any single research initiative, are crucial for creating a conducive environment for scholarly activities. To manage and recover these costs, universities employ methodologies like the Commonwealth Transparent Costing. This approach allows institutions to systematically account for and justify the allocation of these indirect expenditures, ensuring the sustainability of their research infrastructure and capabilities.

Are you based at a UK university and requesting overheads on subcontracted costs?	No

Confirm that the university will not include these subcontracted costs in its annual return for the UK

Charity Research Support Fund.

Travel and subsistence Are you requesting travel and subsistence?	Yes

Travel and subsistence costs			
Type	**Description**	**How much carbon will this offset (in tonnes)?**	**Cost requested from Wellcome (AUD)**
Conference attendance	Conference Attendance Year 1		**30,000**
Conference attendance	Conference Attendance Year 2		**30,000**
Conference attendance	Conference Attendance Year 3		**30,000**

Justification for travel and subsistence costs.

We have requested $30,000 p.a. for conference travel costs to be shared across the entire research team.
This would cover

- four international conferences attendances (AUD18,400) [return economy flight Melbourne to the UK AUD3400 plus AUD 300 per night accommodation for 4 nights AUD1000; plus AUD 150 per diem = $4600 per person)
- eight national conferences (eg. Melbourne-Sydney return airfare AUD400 return plus AUD 250 per night accommodation for 4 nights = AUD1400 each)

This budget will allow all investigators to attend at least one national conference per year to present their work, and to attend at least one international meeting during the 3 year grant period.

Overseas allowances Are you requesting overseas allowances?	No

Overseas allowance costs		
Type	**Description**	**Cost requested from Wellcome (AUD)**

Justification for overseas allowances.

Fieldwork expenses Are you requesting fieldwork expenses?	No

Fieldwork expenses	
Description	**Cost requested from Wellcome (AUD)**

Justification for fieldwork expenses.

Clinical research Are you requesting clinical research?	No

Clinical research costs	
Description	**Cost requested from Wellcome (AUD)**

Justification for clinical research.

Public engagement and patient involvement Are you requesting public engagement and patient involvement?	Yes

Public engagement and patient involvement costs	
Description	**Cost requested from Wellcome (AUD)**
Consumer Engagement Consumable	**90,000**
Communications Strategy Consultant	**60,000**

Justification for public engagement and patient involvement.

The budget will be use to establish and support a Consumer Advisory Panel. Consumer engagement is essential to the project as they are involved in the co-design of the simulation models and invovled in the implementation of pilot interventions. Specific items to be covered include:

- Consumers compensation for their time and expertise, ensuring fair representation and inclusion accordion to Safer Care Victoria guide to consumer remuneration [2023 rates Chair $276 per day and Member $237 per day]
- Annual workshop $10,000 [including facilitator, room hire, parking reimbursements, catering]
- Training and development for the consumers $500 per year x 6 = $3000
- Attendance fees at x 3 per year meetings 3 x $1800 ($300 per day x 6) = $5400
- Development of patient-centered materials, such as social media communcations, online Q&A sessions,
- Conduct of surveys and polls, including translation services $5000

Contract research organisations Are you requesting contract research organisations?	No

Contract research organisations	
Description	**Cost requested from Wellcome (AUD)**

Justification for contract research organisations.

Other Are you requesting other?	Yes

Other costs		
Type	**Description**	**Cost requested from Wellcome (AUD)**
Consultancy fees	Data Linkage Consultant	**120,000**
Consultancy fees	Web Developer	**90,000**
Consultancy fees	Data Science	**100,000**
Consultancy fees	Data Governance	**180,000**
Comp	Data VaLT/Access	**66,000**

Other costs		
Type	**Description**	**Cost requested from Wellcome (AUD)**
uting		

Justification for other.

The budget also allocates funds to consultants across various fields to ensure the project's success. Specifically:

- **Data Linkage Consultant**: $120,000 is allocated for a consultant specializing in data linkage. This expert will assist in setting up our geospatial and climate change indicators to ensure compatibility with our linked health datasets from the Centre for Victorian Data Linkage (CVDL) and the Generation Victoria Birth Cohorts.
- **Full Stack Developer**: We have dedicated $90,000 to hire a full-stack developers and experts who can handle both front-end and back-end development tasks, creating complete web applications from user interface design to server and database management, for our website throughout the project duration.
- **Data Science Consultants**: To support climate modeling and geospatial work, we will spend approximately $100,000 on data science consultants in the first two years of the project.
- **Data Governance Consultant**: An allocation of funds is made for a data governance consultant ($180,000) who will ensure that the data linkage process with the Centre for Victorian Data Linkage aligns with our research objectives. This includes ensuring that data privacy and de-identification processes are followed. This consultant will be based at the Victorian Agency for Health Information.

Additionally, we have budgeted $66,000 for the costs associated with accessing and setting up data linkage access based on the prevailing rate of Centre for Victorian Data Linkage. This setup will include:

- Two CPU cores
- 14GB RAM
- 500GB standard disk
- Access to programming languages and tools such as R, Python, Julia, and Power BI
- Desktop BYO (Bring Your Own) STATA and MS365 license

Summary of costs requested	
	Total (AUD)
Total	**4,834,043**

Any attachments uploaded will be included at the end of this pdf

Full economic costing

Is your organisation based in the UK?	No

Is your organisation calculating the full economic cost of this proposal?	

What is the total full economic cost of your research proposal in sterling (GBP)?	

Coapplicant details and uploaded files

Any documents uploaded as part of the application are included after the coapplicant details.

Coapplicant details

Coapplicant	
Full Name	Melvin Barrientos Marzan
Department	Department of Obstetrics, Gynecology and Newborn Health
Organisation	University of Melbourne
Email Address	melvin.marzan@unimelb.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
08 April 2023		Post Doctoral Research Fellow	University of Melbourne
15 September 2020	08 April 2023	Research Assistant	University of Melbourne
01 February 2019	30 September 2022	PhD Researcher	La Trobe University
11 November 2019	30 August 2020	eHealth Consultant	Asian Development Bank
15 April 2019	30 October 2019	Public Health Officer	Department of Health (Victoria)
08 April 2017	31 January 2019	Monitoring and Evaluation Specialist	Vital Strategies
10 March 2014	11 March 2017	Statistician and Information Management Specialist	United Nations Childrens Fund (UNICEF)
01 August 2013	09 March 2014	Data Analyst	World Health Organization
11 July 2011	30 July 2013	Data Analyst	Department of Health

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
08 February 2019	08 March 2023	Doctor of Philosophy (PhD;Dphil)	Epidemiology, Biostatistics, and Econometrics	La Trobe University

11 August 2011	10 April 2014	Master of Science (MSc)	Epidemiology, Tropical Medicine, Biostatistics	University of the East Ramon Magsaysay Medical Center
02 June 2006	01 May 2010	Bachelor of Science (BSc)	Nursing, Health Sciences	University of the Cordilleras

Career breaks	
Provide details	

Do you wish to undertake this award part time?	Yes

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**

Are you a healthcare professional?	Yes

Indicate your healthcare profession
Nurse

Are you clinically active?	No

What is your specialty? If your specialty is not on the list, select ‘Other’ and specify.

Specify

What percentage of your research time will you spend on this project?
20

How have you contributed to the generation of knowledge?
I am a biostatistician and epidemiologist with broad international experience working with big data. I held data analytics roles in UNICEF and WHO prior to my PhD. At UNICEF, I led the data analytics team that generated the evidence for the First 1000 Days project. I co-led

the study on the economic cost of undernutrition in the Philippines. These led the first 1000 days law in the Philippines, securing multimillion dollar annual funding from the government of the Philippines to improve early childhood health for millions of children.
My PhD in alcohol pricing policies studied the effects of alcohol pricing on social harms in Australia. I applied complex quantitative methods to analyse global and local datasets which resulted in 5 original research papers and has advanced the methodology of my field.
In 2020, during my PhD, I took a part-time research assistant role at the Department of Obstetrics and Gynaecology at the University of Melbourne. In this role, I led the data management and analysis of birth records to monitor the impacts of the COVID-19 pandemic on maternal and perinatal outcomes. In 2023, I added further academic value to this collaboration by expanding the methods to incorporate geospatial modelling.
At 1 year from passing my PhD, I already have 53,263 citations with accelerating research outputs with examples below:

- **MARZAN, M.**, Callinan, S., Livingston, M., Leggat, G., & Jiang, H. (2022). Systematic Review and Dose-Response Meta-Analysis on the Relationship Between Alcohol Consumption and Sickness Absence. Alcohol and alcoholism (Oxford, Oxfordshire), 57(1), 47–57. https://doi.org/10.1093/alcalc/agab008

This is the most extensive systematic review and meta-analysis published to date and the 1st to use dose-response modeling to study the effects of alcohol consumption on sickness absence. I introduced the novel concept of dose-response meta-analysis in the study of alcohol consumption and social harms.

- **MARZAN, M**., Callinan, S., Livingston, M., & Jiang, H. (2022). Alcohol consumption, heavy episodic drinking and the perpetration of antisocial behaviours in Australia. Drug and alcohol dependence, 235, 109432. https://doi.org/10.1016/j.drugalcdep.2022.109432

I used the results from this study to model the impacts of different alcohol pricing policy to social harms in Australia and the results were included in my PhD Supervisor's report presented to the State Government of New South Wales.

- **MARZAN MB**, Callinan S, Livingston M, Jiang H. Dose-response relationship between alcohol consumption and workplace absenteeism in Australia, Drug Alcohol Rev. doi:10.1111/dar.13726

Using a representative Australian survey, this paper assesses the link between alcohol consumption and workplace absences, adding to prior work by analysing interaction effects with sociodemographic and health factors, and identifying impacted subgroups.

- **MARZAN, M.**, Callinan, S., Livingston, M., Leggat, G., & Jiang, H. (2020). Challenges in executing a systematic review and dose–response meta-analysis on the relationship of alcohol consumption and perpetrators' act of assault or violence. In SAGE Research Methods Cases: Medicine and Health. SAGE Publications, Ltd., https://doi.org/10.4135/9781529744576

I identified the limitations and gaps in alcohol epidemiology literature that hinder the clear establishment of a dose-response relationship between alcohol consumption and the perpetration of assault, aggression, and violence.

- **MARZAN, M. B.**, Johnson, E., Moore, P., Jiang, H., & Hui, L. (2024). Changes in the numbers of hospital-based abortions and outpatient early medical abortions in Victoria, 2012-22: a retrospective cohort study. The Medical journal of Australia, 220(3), 145–153. https://doi.org/10.5694/mja2.52203

We found that there has been a consistent rise in the adoption of outpatient early medical abortion in Victoria following the Pharmaceutical Benefits Scheme inclusion of mifepristone-misoprostol, which has been crucial in maintaining abortion access throughout the COVID-19 pandemic. The manuscript was selected for a featured editorial by the MJA.

- Jiang, H., Livingston, M., Room, R., Callinan, S., **MARZAN, M.,** Brennan, A., & Doran, C. (2020). Modelling the effects of alcohol pricing policies on alcohol consumption in subpopulations in Australia. Addiction (Abingdon, England), 115(6),

1038–1049. https://doi.org/10.1111/add.14898

We evaluated complex alcohol pricing policies, providing valuable evidence to guide alcohol pricing policy development both in Australia and globally. It provided key evidence for the implementation of minimum-unit pricing for alcohol in the Northern Territory. I performed data and statistical analysis, interpreted the results, and co-wrote the manuscript.

- Hui, L., **MARZAN, M. B**., Rolnik, D. L., Potenza, S., Pritchard, N., Said, J. M., ... & Walker, S. P. (2023). Reductions in stillbirths and preterm birth in COVID-19–vaccinated women: a multicenter cohort study of vaccination uptake and perinatal outcomes. Am J Obstetrics Gynecol. 228(5), 585.e1–585.e16. https://doi.org/10.1016/j.ajog.2022.10.040

We addressed the public hesitancy around COVID-19 vaccination by leading the first Australian study showing the safety of COVID-19 vaccination during pregnancy. It was published in the highest ranking international obstetric research journal I led the data cleaning and analysis, interpreting the findings, and co-writing of the manuscript.

- Hui, L., **MARZAN, M. B**., Rolnik, D. L., Potenza, S., Pritchard, N., Said, J. M., ... & Walker, S. P. (2022). Increase in preterm stillbirths in association with reduction in iatrogenic preterm births during COVID-19 lockdown in Australia: a multicenter cohort study. Am J Obstetrics Gynecol, 227(3), 491.e1–491.e1 https://doi.org/10.1016/j.ajog.2022.04.022

I am the lead data analyst of the Collaborative Maternity and Newborn Dashboard project that revealed an excess of stillbirths during the first pandemic year in Melbourne. These findings lead to a Safer Care Victoria fellowship to perform a deeper analysis of perinatal outcomes during the pandemic to inform the state government's future pandemic response. We received scientific conference awards with extensive media coverage on the ABC Health Report about these findings. I cleaned and analysed the data, interpreted the results, and co-wrote the final manuscript.

- Hui, L., **MARZAN, M. B.**, Davey, M. A., Homer C., Farrell T., Davies-Tuck M., & Umstad, M. (2023). COVID-19 communique: A report on maternal and newborn outcomes during the COVID-19 pandemic. ISBN 978-1-76131-204-5.

We analysed the impact of the pandemic on maternal and newborn health indicators. The report was presented to the key officials of the Victoria's Department of Health and endorsed by the Victoria's Health minister for public release. I performed statistical analyses and co-wrote the entire report.

How have you contributed to the development of others?

I have grown a wide network of mentees through my emerging leadership roles in international and national projects in public health.

I currently hold a lecturer position in the Graduate School of Medicine at the University of the East, Ramon Magsaysay Medical Centre in the Philippines. In this role, I serve as advisory committee member for higher degree research students. Presently, I supervise an MSc student on a machine learning application for cardiovascular disease risk prediction (Sep.2023-). I am also marked MSc thesis for the School of Health Sciences at the University of South Australia (Oct.2023).

Through my work on perinatal outcomes during the pandemic, I have formed supervisory relationships with clinicians who require my statistical and epidemiological expertise. I have currently mentored 8 clinicians on projects beyond my core research group, ranging from congenital cytomegalovirus infection, gestational diabetes, antibiotic allergies, and aneuploidy screening practices in Melbourne. I also have mentored other health

professionals in their research on case complexities and on trends in abortion care.
To date, I have co-supervised a three University of Melbourne (UoM) MD student research projects (July-Sep/23). All three students have had oral or poster presentations at national annual scientific meetings with all the outputs published or submitted for publication. I also co-supervised a MSc Health Information Management student from La Trobe University, who performed an audit of congenital anomaly clinical coding in 2023. I am also a PhD panel member for 1 of the PhD students in the University of Melbourne (Jul/23-Present) and is currently co-supervising a PhD student.
I am frequently invited to give lectures on health data analytics, having presented at events such as the La Trobe University Health Data group (2022), the University of San Carlos (2021), and the University of the East Ramon Magsaysay Medical Center (2023).

How have you contributed to the wider research community?

Global Leadership
I have strong research leadership connections to the Philippines, where I did my pre-PhD training. I am a member of the expert advisory group of epidemiologists for the Department of Health (Philippines).
In 2023,I led a collaboration of investigators from the Murdoch Children's Research Institute, the University of Melbourne, the Philippine's Department of Health, and the Department of Science and Technology in an application to the Bill and Melinda Gates Foundation' grand challenges grant scheme. From a pool of 182 applications, we reached the interview short list, evidence of my ability to bring senior researchers together and conceptualize a competitive grant proposal.
I have been collaborating with the Institute for Health Metrics and Evaluation on their Global Burden of Disease (GBD) Study since 2014. During my tenure with UNICEF (Philippines), we developed a reimbursement package for preterm births by using the GBD dataset.
In 2019, during my PhD, I was hired by the Asian Development Bank to assess eHealth in the Philippines. This led to a multi-billion-dollar eHealth strategy, which became a basis for the million-dollar eHealth investment plan of the Philippine government. This is a testament of my international reputation as a public health statistician.

National Leadership
In recognition of my leadership during the COVID-19 pandemic response, I was appointed to Safer Care Victoria Maternity and Learning Health Network Advisory Data Group in 2022. This group, comprising various clinical and data experts, seeks to enhance maternity health service safety through surveillance of perinatal indicators such as stillbirth and preterm birth.

Peer Review
I am a regular peer reviewer for leading medical journals, including The Lancet and the British Medical Journal and Scientific Reports. I have also reviewed for PlosOne, Addiction Journal, Prenatal Diagnosis, and BMC Global Public Health.

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

The proposed research program is in line with the strategic objectives of the organizations with which I am affiliated. It unites my current projects, focusing on integrating climate hazards into birth and maternal records. Additionally, it aims to expand the scope tothe critical first 2000 days of a child's life, offering a comprehensive approach to understanding the impacts on early development.
Starting in 2020, I joined the Department of Obstetrics, Gynaecology, and Newborn Health of the University of Melbourne as the chief data analyst for the Collaborative Maternity and Newborn Dashboard for the COVID-19 Pandemic (CoMaND). My responsibilities expanded to leading new projects emerging from CoMaND. I oversee geospatial and epidemiological modeling focused on postcode-level indicators and its association with adverse maternal and perinatal outcomes. At Safer Care Victoria, I analyze over 350,000 birth records from 2018 to 2022 to study the unintended consequences of COVID-19 lockdowns on perinatal health. Furthermore, I am developing machine learning models to predict maternal and infant readmissions within the first year after birth, a project funded by a philanthropic research grant. At the Murdoch Children's Research Institute, I am a part-time post-doctoral research fellowship with the Generation Victoria birth cohort, the most extensive study of its kind worldwide, which has gathered data and biosamples from approximately 45,000 children in Victoria. Together with A/Prof Mavoa, who is a co-investigator on this grant, we are enhancing geospatial the cohort's capabilities. This involves integrating geospatial data to explore how factors like the external and built environment, as well as social and economic conditions, affect maternal and child health. My work has led to the development of outputs that are in line with the goals of the University of Melbourne, Faculty of Medicine, Dentistry, and Health Sciences, especially concerning the impacts of climate change and global health crises.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

1. COLLABORATIVE MATERNITY AND NEWBORN DASHBOARD (CoMaND)
As the chief data analyst for CoMaND project, I lead the data analysis for research publications, coordinate the 12 study sites, provide training, and draft the regular reports. My subsequent Fellowship with Safer Care Victoria has expanded this research leadership role into the Department of Health. In April 2023, I presented our interim research findings to Safer Care Victoria's executive team. My academic leadership involves generating new research questions and expanding our methodology to perform more sophisticated analyses, including geospatial analysis. In this way, I successfully led a grant proposal that secured an Innovation Grant from the Norman Beischer Medical Research Foundation ($65,000) in 2022. This consolidates the collaborations that we established through the CoMaND project, expanding our value beyond pandemic-related research. Our team is now using geospatial analysis to understand the interplay between urban environments, social health determinants, and their effect on maternal and perinatal conditions. My new research stream was awarded $40,000 by the UniMelb to expand the analysis to the whole of Victoria, allowing me to hire my own research assistant and grow my own team.

2. GENERATION-VICTORIA FELLOWSHIP

My growth as an emerging leader in perinatal epidemiology and geospatial analysis has also been enhanced by a part-time 2023-24 fellowship with Generation Victoria (GenV), the large state-wide birth cohort study lead by the Murdoch Children's Research Institute. This gives me important senior mentorship by a geospatial expert, ensuring that this current research and technical skills are expanding.

3. FILIPINO AUSTRALIAN STUDENTS COUNCIL

During my PhD, I was actively engaged with the Filipino Australian Students Council (FASTCO) in Victoria, supporting Filipino students with their transition and studies in Australia. In 2019, I organised a 3-day research symposium on the Philippines at La Trobe University. This was co-sponsored by La Trobe Uni, the Philippine Embassy, and the Australia Awards Scholarship of DFAT. We had over 100 international and local delegates to this event. I have also been part of the research committee of FASTCO in 2021 and 2023. In 2023, I co-led the formation of Filipino STEM post-docs and PhD society of Victoria.

4. UNIVERSITY OF MELBOURNE DEPARTMENT OF OBSTETRICS, GYNAECOLOGY AND NEWBORN HEALTH

I am an active contributor to the research and research training culture of the Department. I have been invited to judge presentations at the Melbourne Medical School Research Conference on Women's and Children's Health in 2023. I also provide biostatistical and epidemiological advises to scientists and clinicians in our department.
In 2022, my contributions were rewarded with a University of Melbourne grant for leadership development ($1500). In 2023, I was also granted a $10,000 Departmental travel scholarship to expand my skills in Bayesian epidemiology and causal inference in the Netherlands.

5. PROFESSIONAL SOCIETY MEMBERSHIPS

I am an active member of the Statistical Society of Australia, the American College of Epidemiology, and the Perinatal Society of Australia and New Zealand. My contributions to PSANZ have included reviewing research abstracts and facilitating academic discussions at conferences.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

I intend to allocate my minimum of 10 days per year for training and continuing professional development through a blend of online and onsite programs. My goal is to further expand my expertise in biostatistics and epidemiology by engaging with online courses available on platforms such as Coursera and EdX, which provide a wide range of statistical and epidemiological courses. In addition to honing my technical skills, I plan to improve my project management abilities and soft skills by taking advantage of courses offered through LinkedIn Learning. Furthermore, I aim to supplement my learning on Coursera and EdX with Udemy courses, focusing on enhancing my proficiency in Python coding. I also aim to enhance my skills in using R platform for other advanced analytics techniques which I can learn from Udemy.
The University of Melbourne offers several courses free to staff, including mentorship and supervision training, which I intend to enroll in later this year. Additionally, I will participate in skills development programs in diversity and inclusion available within our department at the University of Melbourne, further broadening my professional competencies.

Coapplicant details

Coapplicant	
Full Name	Suzanne Mavoa
Department	Population Health
Organisation	Murdoch Children's Research Institute
Email Address	suzanne.mavoa@mcri.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
08 January 2024		Associate Professor /Principal Research Fellow	Murdoch Children's Research Institute
08 May 2022	09 November 2023	Principal Environmental Epidemiologist	Environment Protection Authority
01 February 2022	05 May 2022	Senior Tutor (non-research)	University of Melbourne
01 January 2017	31 December 2021	Senior Research Fellow	University of Melbourne
07 February 2012	31 December 2016	Senior GIS Analyst	University of Melbourne
06 August 2006	04 February 2012	GIS Analyst	Massey University
02 March 2002	01 August 2006	GIS Consultant	AECOM (engineering consultancy)

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
01 February 2010	12 February 2016	MB/PhD	Population health	Massey University

01 February 1997	30 November 1998	Master of Science (MSc)	Geography	University of Auckland
01 March 1991	30 November 1995	Other undergraduate degree or qualification	BCom (Hons) in Information Systems	University of Auckland
01 March 1991	30 November 1994	Bachelor of Science (BSc)	Geography/Computer Science	University of Auckland

Career breaks	
Provide details	
From Jan 2022-Dec 2023 I worked in non-research roles. My current role, which commenced 8 Jan 2024 is part-time (0.8FTE).	

Do you wish to undertake this award part time?	Yes

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**
MCRI core funding	100	fixed-term

Are you a healthcare professional?	No

Indicate your healthcare profession

Are you clinically active?	

What is your specialty? If your specialty is not on the list, select ‘Other’ and specify.

Specify

What percentage of your research time will you spend on this project?

20

How have you contributed to the generation of knowledge?

I am an expert in natural and built environment determinants of health and innovative geospatial methods. My multiple novel geospatial methods have advanced the way the field measures environmental exposures, generated new knowledge on environment-health relationships, and successfully delivered two geospatial environmental health platforms that have been widely used by policy makers. I have 128 peer-reviewed publications, my research has been cited in 113 policy documents (Overton, Mar 2024) and 2 patents, and I rank among senior leaders in my field globally (globally ranked 16th in 'geographic information systems and health', and 19th in 'built environment and health', SciVal 2013-22).

Ten outputs that demonstrate sustained significant contributions

FWCI = Field weighted citation impact

1. Badland, H.M., Opit, S., Witten, K., Kearns, R.A., **Mavoa, S**., 2010. Can virtual streetscape audits reliably replace physical streetscape audits? Journal of urban health, 87(6), pp.1007-1016

FWCI 9.72 (ie cited 872% more than papers in the same field) . I conceived the idea of using Google StreetView to assess neighbourhood environmental exposures. This approach is now widely used (32 countries; 20 fields incl. health, ecology, disasters), and now has numerous automated deep learning applications. Demonstrates geospatial innovation.

2. **Mavoa, S**., Oliver, M., Witten, K. and Badland, H.M., 2011. Linking GPS and travel diary data using sequence alignment in a study of children's independent mobility. International Journal of Health Geographics, 10(1), pp.1-10.

FWCI 2.23. I conceived and developed a novel application of sequence alignment algorithms – typically used to sequence DNA – to automatically link GPS and travel survey data. Cited in a global patent (to link diary and GPS data) currently held by Huawei. Demonstrates geospatial innovation.

3. **Mavoa, S**., Witten, K., McCreanor, T. and O'Sullivan, D., 2012. GIS based destination accessibility via public transit and walking in Auckland, New Zealand. Journal of transport geography, 20(1), pp.15-22.

FWCI 9.30. I developed a novel geospatial method of assessing access via transit and walking in the context of social impact of climate change policies. Cited by 8 policy documents, 1 patent, across 22 fields, and 7 languages. >50% citations in the last 5 years. Demonstrates geospatial innovation related to climate change.

4. *Koohsari, M.J., ***Mavoa, S**., (CO-FIRST author) *Villanueva, K., Sugiyama, T., Badland, H.M., Kaczynski, A.T., Owen, N., Giles-Corti, B. 2015. Public open space, physical activity, urban design and public health: Concepts, methods and research agenda. Health & Place, 33, 75-82.

FWCI 10.80. Identified issues with open space and health research preventing intervention design and policy uptake. Proposed a framework to improve research quality and policy-relevance. 6 policy document citations (incl. WHO). I led the environmental section. Demonstrates intellectual leadership, policy-relevance, and green-infrastructure and health research.

5. **Mavoa S**, Koohsari, M.J., Badland, H.M., Davern, M., Feng, X., Astell-Burt, T., Giles-Corti, B. 2015. Area-level disparities of public open space: a Geographic Information Systems analysis in metropolitan Melbourne. Urban Policy and Research. 33(3), 306-323.

FWCI 1.34. First to use geospatial methods to assess inequalities in open space planning policy implementation. Proposed new methods of measuring access to open space. I co-conceived the study and developed the methods. Informed policy-relevant healthy city

indicators and scorecards. Demonstrates geospatial innovation, policy-relevance, and green-infrastructure inequities.
6. **Mavoa, S.,** et al. 2016. The Australian National Liveability Study final report: development of policy-relevant liveability indicators relating to health and wellbeing and recommendations for their dissemination. Project Report. The McCaughey VicHealth Community Wellbeing Unit, Melbourne Australia. ISBN 978-0-9872841-6-7.
I led the technical development of policy-relevant geospatial liveability indicators, informed by my previous methodological advances. The multi-state project involved policy stakeholder contributions ranging from identification of indicator priorities and research questions to providing input on the indicator design and outputs. Demonstrates leadership and stakeholder engagement in geospatial innovation.
7. **Mavoa, S.,** Eagleson, S., Badland, H.M., Gunn, L., Boulange, C., Stewart, J., Giles-Corti, B. 2018. Identifying appropriate land use mix measures for use in a national walkability index. Journal of Transport and Land Use, 11(1).
FWCI 2.82. Presents and tests my novel method that enables calculation of national walkability measures. Part of the liveability study (output #6). This method has been used in research and national/global healthy city indicator projects. Demonstrates geospatial innovation.
8. **Mavoa, S**., Davern, M., Breed, M., Hahs, A., 2019. Higher levels of greenness and biodiversity associate with greater subjective wellbeing in adults living in Melbourne, Australia. Health & Place, 57, pp.321-329.
FWCI 6.23. First to show relationships between greenness, biodiversity and wellbeing. Developed geospatial methods to quantify biodiversity, and private vs public greenness. Cited by 2 Australian health policy documents. Led to 5 invited talks (4 international). Demonstrates geospatial innovation and green-infrastructure and health research.
9. Peters, R.L., Sutherland, D., Dharmage, S., Lowe, A., Perrett, K., Tang, M., Lycett, K., Knibbs, L.D., *Koplin, J.J., ***Mavoa, S**. 2022. The association between environmental greenness and the risk of food allergy: a population-based study in Melbourne, Australia. Pediatric Allergy and Immunology, 33, e13749.
FWCI 3.39. First to link early life greenness exposure and objectively measured food allergy. Unexpected relationship was moderated by socioeconomic status and air pollution levels, highlighting the complexity of environment-health relationships in a time of environmental change. I co-conceived the study with the 1st author, was primary supervisor of Sutherland, who initiated this study in their Honours research. Led to invited review. Demonstrates environment-health research and interrelated relationship between greenness and pollution.
10. *Wang, Y., *Crowe, (CO-FIRST) M., Knibbs, L.D., Fuller-Tyszkiewicz, M., Mygind, L., Kerr, J.A., Wake, M., Olsson, C.A., Enticott, P.G., Peters, R.L., Daraganova, G., ***Mavoa, S**., *Lycett, K. 2023. Greenness modifies the association between ambient air pollution and cognitive function in Australian adolescents, but not in mid-life adults. Environmental Pollution, 324, p.121329.
FWCI 2.22. First to discover that greenness modifies the association and air pollution and cognitive function in adolescents. This has implications for environmental interventions (eg greening cities). As co-senior author, I was primary supervisor for Crowe (Masters student whose work the paper was based on), I conceived the original student research, co-conceived the extension, and trained the student. Demonstrates the importance of interactions between different aspects of the environment.

How have you contributed to the development of others?

Development of researchers
I have supervised 2 medical students research projects, 4 Hons, 7 Masters (1 current), 3

PhD (2 current), and 2 international postdoctoral trainees. I have also served on PhD committees (7 complete incl. 1 chair, 4 current) and advised/mentored an additional 27 research students/postdocs (13 international incl. hosting 2 international PhD student visits). My mentees/students have gone on to grant successes, PhD scholarships, competitive clinical training placements, research roles, postdoctoral fellowships, tenure track positions, and senior government/think tank roles.
I also regularly train and advise researchers within my organisation, nationally (5 universities in Australia), and internationally (New Zealand, Japan, Brazil, Luxembourg). This is typically via ad-hoc meetings/advice, running workshops/training (incl. in person via funded research visits), and providing expert input on grants.

Development of non-academic staff

In my recent government role, I worked with my team to create workplans that met organisational needs and also helped progress their personal career goals. For example, after learning a team member wanted to develop visualisation skills, I juggled work plans so that they were able to lead a small visualisation project with the support of an expert consultant. Based on this experience they were asked to use their new skills to support visualisation needs of another group in the organisation.
In the same role, I was a ‘change champion’, leading the improvement of career development across the Science division. This involved seeking input from staff at all levels and implementing small changes to make career development opportunities more accessible to all (e.g. advocating for and monitoring regular career development days, setting up a conference calendar, and providing clarity on available funding).

How have you contributed to the wider research community?

I contribute to the wider research community in several ways. I was an Australian Health Geography Study Group committee member from 2016-2021. In this role I worked with other committee members to cultivate the discipline in Australia. We organised annual workshops/networking events, regular newsletters and social media. I led a submission from the group to provide input into research code changes. I also led and edited a Health Geography special issue published in 2019 in Geographical Research. As a result, I was an invited panellist discussing the future of our field at our leading international symposium in 2019. Our group grew from ~70 in 2016 to over 200 in 2021.
I review 10 manuscripts on average each year across > 30 different journals, including my field’s leading journals (e.g. Health & Place). I regularly examine PhDs (5 to date) and assess for national and international grant submissions (Australia, New Zealand, Luxembourg, Singapore, Hong Kong).
I was Health co-chair for the 2017 State of Australian Cities conference, and on the organising committee for the 2019 International Medical Geography Symposium.
In 2023 I gave an invited lecture at the International Graduate Summer School: Climate Change and Urban Eco-environmental Exposures and Their Health Effects. 9th SURE Summer School, Wuhan, China.

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

I am a GenV Geospatial fellow, leading research on geospatial methods and environmental determinants of child health at the Murdoch Children's Research Institute (MCRI). This research capacity is new to the organisation yet has been identified as a strategic priority, as shown by funded fellowships for myself and co-applicant Marzan.
Both my own research and the proposed project addresses specific MCRI priorities: *Life-course*, and the *Generation Victoria (GenV) cohort*. GenV is a whole of population cohort that aimed to recruit all babies born in a 2-year period (2021-23) in the state of Victoria and their parents. The cohort will follow the children and their families throughout their lives, and includes substantial linkage, including to administrative, clinical, biospecimen, and phenotypic data. The cohort currently has more than 115,000 participants and is intended to be an ongoing open science resource.
In 2024 co-applicant Marzan and I are enabling GenV for geospatial data and analyses. We are currently generating high-resolution geospatial measures of climate change vulnerability, greenspace, air pollution, and disadvantage, and linking these to GenV for use by ourselves and the wider research community. These measures are for 2018-2023 and will be available for use in the proposed grant. Our initial analyses using these GenV linked measures and perinatal outcomes (2024-25) will inform and complement the proposed research. Since climate change is a strategic priority for GenV, any measures developed in the proposed grant, including those developed by co-applicants Nice and Nazarian, will also be linked to the cohort.
In summary, the proposed project is ideally aligned with strategic priorities at MCRI (lifecourse, geospatial and climate change). It will be able to leverage existing funded research (GenV) and contribute to a sustainable resource that will support high quality research on the health impacts of climate change in the years beyond this grant.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

Mentoring

As described above, I mentor students and staff. In 2018, in recognition of my potential, I was selected for the University of Melbourne mentoring training. Since then, I have supported mentees to move into and out of academia (eg mentoring non-research staff to secure PhD scholarships, and mentoring research staff to move into government roles), address challenges in their careers (eg negotiating change in supervisory status) and succeed in their chosen career.

Supporting collaboration and interdisciplinarity

My research is highly collaborative and interdisciplinary. Examples of recent collaborations I initiated and supported include:

- Nature and health - I initiated and secured funds to support this ongoing collaboration with ecologists, public health experts, psychologists, computer scientists and planners (2017-present)
- Climate Change Health Effects, Adaptation, and ResiLience (HEAL) **-** University of British Columbia networking grant (2022). I supported this grant application as a co-investigator along with researchers from a range of disciplines such as planning, epidemiology, medicine, urban forestry, and geography.

I also support interdisciplinary collaborative research via expert advice and training on geospatial methods to multiple disciplines (eg computer science, engineering, planning, medicine and public health, horticulture and ecology). From 2017-2021 I was a steering committee member for joint International Cartography Association (ICA)-Open Source

Geospatial Foundation (OSGeo). The 'ICA-OSGeo' laboratory is one of 22 globally, whose purpose is to promote access to and use of geospatial data for evidence-based research and decision-making across multiple disciplines.

Leadership and people management

My leadership and people management approach is to actively listen to people, ask questions, provide space for all to speak/share (eg providing space for quieter colleagues to share in meetings), share and advocate for opportunities, be generous with praise (including when the person I am praising is not there), and only provide critical feedback in private.

For example, in a previous role I developed a positive and inclusive culture by meeting regularly with and listening to my team in one-on-one meetings, and as a team, and asking questions about issues they faced, their work and personal goals, and preferred working styles. In doing so, I realised that there were potential clashes that could lead to conflict and resentment. Therefore, I rearranged workplans and goals to ensure every team member was able to lead a project that supported their career development, and that every team member also contributed to some of the more tedious tasks.

In the same role, I was a 'change champion', leading the improvement of career development and collaboration across the division. For example, I sought input from staff at all levels and implemented small changes to make career development opportunities more accessible and inclusive to all (e.g. advocating for and monitoring regular career development days, setting up a conference/opportunities calendar, and providing clarity on available funding).

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

I will work on this grant 1 day a week (0.2FTE). I will use the pro-rata 2 days a year training and continuing professional development to participate in an MCRI mentoring program, and undertake leadership training.

I will work with staff employed on this grant under my supervision to develop a personalised training and continuing development program. This will include training and mentoring programs provided by MCRI as well as specialist skills and knowledge (e.g. geospatial analyses, visualisation, climate and health courses).

Coapplicant details

Coapplicant	
Full Name	Kerry Nice
Department	School of Earth, Atmosphere and Environment
Organisation	Monash University
Email Address	kerry.nice@unimelb.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
17 November 2016		Research Fellow	University of Melbourne
01 March 2019	31 December 2020	Research Fellow	Monash University
01 January 2017	01 June 2018	Research Fellow	Monash University
01 January 2012	31 December 2016	Research Assistant	Monash University

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
01 January 2013	01 March 2017	Doctor of Philosophy (PhD;Dphil)	Science	Monash University
01 January 2011	01 November 2012	Master of Arts (MA)	Geography	Monash University
01 September 1985	31 May 1990	Bachelor of Arts (BA)	English	University of Colorado

Career breaks	
Provide details	

Do you wish to undertake this award part time?	Yes

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**
GC22011 Hort Innovation: Re-imagining streets with green infrastructure	20	24 months

Are you a healthcare professional?	No

Indicate your healthcare profession

Are you clinically active?	

What is your specialty? If your specialty is not on the list, select 'Other' and specify.

Specify

What percentage of your research time will you spend on this project?
20

How have you contributed to the generation of knowledge?
My previous career (13 years as a senior level software engineer in industry) provided a large skill set on which to build my academic career. My proficiency in software development, data analysis, and project management has translated well to my navigation of multiple research areas and development of high quality research and research outputs. Highlighted below are ten outputs across the areas of climate modelling and urban heat and the use of neural networks and machine learning to model urban systems and their impacts on public health outcomes. [1] **Kerry A. Nice**, Andrew M. Coutts & Nigel J. Tapper 2018, 'Development of the VTUF-3D v1.0 urban micro-climate model to support assessment of urban vegetation influences on human thermal comfort', *Urban Climate*, doi:10.1016/j.uclim.2017.12.008 Describes a climate model I developed in my PhD, one of the few that examines cooling impacts of urban blue-green infrastructure at a micro-climate scale. (IF: 6.4)

[2] Naika Meili, Gabriele Manoli, Paolo Burlando, Elie Bou-Zeid, Winston T. L. Chow, Andrew M. Coutts, Edoardo Daly, **Kerry A. Nice**, Matthias Roth & Nigel J. Tapper et al., 2020, 'An urban ecohydrological model to quantify the effect of vegetation on urban climate and hydrology (UT&C v1.0)', *Geoscientific Model Development*, doi:10.5194/gmd-13-335-2020
Urban climate model I contributed to the development, local scaled with advanced hydrology and vegetation modelling. Highly cited. Widely utilised model. (IF: 5.2)
[3] Ashley M. Broadbent, Andrew M. Coutts, **Kerry A. Nice**, Matthias Demuzere, E. Scott Krayenhoff, Nigel J. Tapper & Hendrik Wouters, 2019, 'The Air-temperature Response to Green/blue-infrastructure Evaluation Tool (TARGET v1.0): an efficient and user-friendly model of city cooling', *Geoscientific Model Development*, doi:10.5194/gmd-12-785-2019
Local scaled climate model I co-developed and maintain, to allow quick assessments of the air temperature impacts of water and vegetation. Often used by consultants due to its ease of use. (IF: 5.2)
[4] Pui Kwan Cheung, C.Y. Jim, Nigel Tapper, **Kerry A. Nice** & Stephen J. Livesley, 2022, 'Daytime irrigation leads to significantly cooler private backyards in summer', *Urban Climate*, doi:10.1016/j.uclim.2022.101310
Describing one of the many research outputs, through PhD student supervision, into the urban cooling effects of irrigation of vegetation at a household scale. (IF: 6.4)
[5] Marzie Naserikia, Melissa A. Hart, **Negin Nazarian**, Benjamin Bechtel, Mathew Lipson & **Kerry A. Nice**, 2023, 'Land surface and air temperature dynamics: The role of urban form and seasonality', *Science of The Total Environment*, doi:10.1016/j.scitotenv.2023.167306
This research establishes the relationship between satellite measured land surface temperatures and ground level air temperatures. This methodology developed in the work will be utilised in this project. One of my many joint projects with co-applicant Negin Nazarian. (IF: 10.9)
[6] **Kerry A. Nice**, **Negin Nazarian**, Mathew J. Lipson, Melissa A. Hart, Sachith Seneviratne, Jason Thompson, Marzie Naserikia, Branislava Godic & Mark Stevenson 2022, 'Isolating the impacts of urban form and fabric from geography on urban heat and human thermal comfort', *Building and Environment*, doi:10.1016/j.buildenv.2022.109502
Research I led using my model VTUF-3D to model 10,000 urban configurations to comprehensively assess impacts of morphologies and material types on urban heat. (IF: 7.9)
[7] Jasper S. Wijnands, **Kerry A. Nice**, Sachith Seneviratne, Jason Thompson & Mark Stevenson 2022, 'The impact of the COVID-19 pandemic on air pollution: A global assessment using machine learning techniques', *Atmospheric Pollution Research*, doi:10.1016/j.apr.2022.101438
Method I co-developed to use machine learning to quantify changes in air pollution (NO2, O3, PM2.5, PM10) due to COVID-19 in 800 global cities. Informs methods for this project. (IF: 4.9)
[8] **Kerry A. Nice**, Jasper S. Wijnands, Ariane Middel, Jingcheng Wang, Yiming Qiu, Nan Zhao, Jason Thompson, Gideon D.P.A. Aschwanden, Haifeng Zhao & Mark Stevenson 2020, 'Sky pixel detection in outdoor imagery using an adaptive algorithm and machine learning', *Urban Climate*, doi:10.1016/j.uclim.2019.100572
Research I led to extract sky view factors from imagery of urban areas through computer vision and machine learning. This parameter is an essential input for urban climate research and urban modelling. (IF: 6.4)
[9] Jason Thompson, Mark Stevenson, Jasper S Wijnands, **Kerry A Nice**, Gideon DPA Aschwanden, Jeremy Silver, Mark Nieuwenhuijsen, Peter Rayner, Robyn Schofield & Rohit Hariharan et al. 2020, 'A global analysis of urban design types and road transport injury: an image processing study', *The Lancet Planetary Health*, doi:10.1016/s2542-5196(19)30263-3
I co-developed the methodology in this research that utilised neural networks to discover

urban typologies from 2 million maps of 1700 global cities to discover how urban design impacts road trauma. (IF: 9.4)
[10] Mathew J. Lipson, Sue Grimmond, Martin Best, Gab Abramowitz, Andrew Coutts, Nigel Tapper, **Kerry Nice**, et al. 2023, 'Evaluation of 30 urban land surface models in the Urban-PLUMBER project: Phase 1 results', *Quarterly Journal of the Royal Meteorological Society*, doi:10.1002/qj.4589
This documents my input into a high profile intercomparison of 30 urban land surface models that included VTUF-3D and TARGET. (IF: 9.8)

How have you contributed to the development of others?

I am a senior member of my research lab and assisted many of the junior members with research, policies, grant applications, software and hardware setup, and general guidance on how to navigate academia. In the early days of the research lab, my previous software engineering skills were instrumental in creating the strong computational direction of the lab, enabling the use of machine learning, computer vision, large datasets, and high performance computing. As a result, this lab has been very successful and recognised as a leader in the use of these techniques to explore the impacts of urban systems (transportation networks, social networks, and physical urban form) on population health.
I have supervised 3 PhD students (2 completions), 1 visiting CSC PhD, 10 Masters of IT, and 1 honours student. Their fields include urban heat research, infrastructure detection and inventories from urban imagery (street view and aerial), and transportation pollution estimates. I also mentor and assist student researchers from Chile, Netherlands, Switzerland with urban climate model development and usage.

How have you contributed to the wider research community?

I have been active in evaluating research and research projects across my field. I have performed 77 peer reviews for 23 leading climate and urban design journals, including Urban Climate, Sustainable Cities and Society, Environmental Science & Technology, Environment and Planning B, Scientific Reports, Science of the Total Environment, and Landscape and Urban Planning. I have performed 15 reviews of applications for Australian Research Council grants (Discovery, Future Fellowship Linkage, etc.).
I have been active in the International Association for Urban Climate (IAUC) through attendance at many conferences and contributions to the society. I was on the organising committee and the Early Career Development Committee for the 2022 IAUC Virtual Poster Conference and the 2023 11th International Conference on Urban Climate.
In the Faculty of Architecture, Building and Planning, I serve on the Graduate Research Subcommittee. The committee's main task is assessing PhD and scholarship applications to the faculty, but also includes developing programs and policies for the graduate research program.

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

I am a senior member of the Transport, Health and Urban Systems Research Lab at the Melbourne School of Design at the University of Melbourne. The aim of the lab is to explore the effects of physical and social systems on the health of populations. My research as part of the lab develops novel methods utilising big data sources, artificial intelligence, and advanced analytical methods to provide new insights into how the design of urban areas and social systems influence health outcomes for populations.
Over the 7 years in this lab, I have developed many different methods utilising urban imagery (millions of images), computer vision, neural networks, and modelling to assess urban design impacts. These methods have crossed over many different disciplines and research areas such as, spatial analysis of urban systems, especially transportation systems, discovering spatial inequities in access to social services, analysis of all road intersections in Australia to detect safe design, quantifying the impacts of COVID-19 on global air pollution, and modelling and mapping urban heat and testing heat mitigation strategies through increased urban vegetation and water sensitive urban design.
In many cases, data did not exist to support this research and had to be extracted from urban imagery (what cycling infrastructure has been installed and what condition is it in) or generated through machine learning (urban morphology data to support climate modelling or predictions of pollution levels using neural networks trained on years worth of pollution and weather conditions).
Each of these projects and new methodologies supported generation of insights into how the effects of urban form and transportation influence the health of residents in cities.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

I have spent the majority of my research career engaged in collaborative and interdisciplinary research. Through my involvement with the CRC for Water Sensitive Cities during my PhD and afterwards, I built lasting connections with local governments, industry, consultants, and researchers across economics, climate, architecture, urban planning, and engineering. My expanding research network spans a wide range of research areas and multiple countries. Membership in the International Association for Urban Climate (IAUC) has enabled research collaborations in climate informatics with Ariane Middel (from Arizona State, and current president of the IAUC), climate model development with other modellers across Europe and Singapore, and especially my collaborations with co-applicant Negin Nezarian and other members of the ARC Centre of Excellence for Climate Extremes at UNSW.
My research with the Transport, Health and Urban Systems (THUS) Research Lab has evolved to include urban analytics through machine learning and computer vision, with an emphasis on public health outcomes and collaborations with Ruth Hunter's Centre for Public Health at Queen's University Belfast and James Woodcock's MRC Epidemiology Unit at Cambridge. Co-applicant Suzanne Mavoa was also a member of THUS during her time at the University of Melbourne and we are co-authors on two papers (currently in review).
Through my model development, I have been involved in many student research projects across many different countries, through research projects and co-authorship, but more often in (uncredited) assistance with the demands of modelling, meeting to discuss possible research directions, and troubleshooting problems. I try to be as generous as possible with my time and assistance in the hope that others in turn will pass that on and help create more inclusive and collaborative research networks.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

I will work on this grant 1 day a week (0.2FTE). I will use the pro-rata 2 days a year training and continuing professional development to participate in an Australian Research Council Centres of Excellence mentoring program, and to undertake leadership training. Additionally, for staff under my supervision employed on this grant, I will implement a training and development program to increase their knowledge in spatial analysis and data science, and provide mentoring resources through programs offered by the Australian Research Council.

Coapplicant details

Coapplicant	
Full Name	Negin Nazarian
Department	School of Built Environment
Organisation	University of New South Wales
Email Address	n.nazarian@unsw.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
18 July 2018		Scientia Senior Lecturer	University of New South Wales

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
24 September 2012	12 December 2015	Doctor of Philosophy (PhD;Dphil)	Engineering Science	Mechanical Engineering
24 September 2011	30 June 2012	Master of Science (MSc)	Engineering Science	Mechanical Engineering

Career breaks	
Provide details	

Do you wish to undertake this award part time?	Yes

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**

Are you a healthcare professional?	No

Indicate your healthcare profession

Are you clinically active?	

What is your specialty? If your specialty is not on the list, select ‘Other’ and specify.

Specify

What percentage of your research time will you spend on this project?
20

How have you contributed to the generation of knowledge?

Most of my professional life has focused, in one way or another, on ways humans interact with the environment. Urban climatology, interwoven with urbanization and climate change, has become the most recent of these endeavours, shaping my career over the last decade. As an urban climatologist, I've delved deeply into understanding climate challenges in cities and actively explored solutions that transcend scientific boundaries, encompassing social and political dimensions.

High-impact Research at Climate-Resilient Cities lab

I am internationally recognized as an emerging leader in the urban climate field, with accolades and critical acclaim underscoring the impact of my research. I have established UNSW’s Climate-Resilient Cities research lab, leveraging unique interdisciplinary expertise across climate science, numerical modelling, data science, and urban design. At the CRC lab, our collective efforts have resulted in novel methods, metrics, and datasets tailored for assessing urban climate impacts. In less than five years, the CRC lab has solidified its reputation in three key areas:

1. Urban climate modelling across scales. Our research significantly contributes to a) understanding of urban climate processes and b) informing regional climate models on city-scale mechanisms that contribute to local climate change. Our recent works on Urban Canopy Parameterizations (Nazarian et al. 2020, Lu et al. 2023a-b, 2024) directly contributed to improving temperature predictions in urban models. Additionally, we have curated the largest dataset of high-resolution urban airflow and turbulence, known as Urban Turbulent Airflow analyses with Large Eddy Simulations (UrbanTALES, forthcoming). This dataset, derived from over four years of simulation, serves as crucial "ground-truth" data for evaluating urban canopy models utilized in mesoscale climate analyses by four different labs and three PhD projects. Leveraging our extensive knowledge of urban datasets and multi-scale modelling expertise, my lab is tackling some of the most pressing questions in urban climate modelling, making models more suitable for assessing heat and air quality in cities.

2. Urban Climate Informatics (UCI): I am one of the founding members of the emerging

field of Urban Climate Informatics (UCI), which seeks to revolutionize urban climate analyses through the application of innovative sensing and analytics methods such as wearables, artificial intelligence, and big data (Middel et al. 2022). My expertise is applying these methods for human-centric assessment of heat exposure in cities. My publications on Coolbit (Nazarian et al. 2021) were the first example of using wearable sensors for providing early detection of heat stress, and more importantly, quantifying the impact of heat on lifestyle. Furthermore, my lab is actively engaged in developing Machine Learning algorithms to replace computationally intensive physical modelling of urban flow. Through direct collaboration with international experts and industry partners, we are at the forefront of this emerging field, developing innovative methods for obtaining realistic, personalized climate analyses in cities.

3. Urban Overheating: I am deeply committed to cultivating thought leadership by developing frameworks, methodologies, and indicators to mitigate the impacts of urban overheating. In 2022, I led a global effort to develop the first integrated framework for urban overheating that followed the IPCC frameworks on climate hazards and risk. This effort involved coordinating discussions among 17 experts from 7 countries across 10 subfields (Nazarian et al. 2022). This work followed a perspective paper in 2020, challenging the most common indicator (mis)used in the field, Urban Heat Island, offering a critical assessment of when/how it should be used or avoided (Martilli et al. 2020). Furthermore, I introduced novel frameworks to translate climate model outputs into practical metrics and guideline maps for architects and planners. These frameworks streamline design decisions and integration of climate considerations into urban planning processes (Nazarian et al., 2019; Martilli et al., 2024).

Ten Career-Best Research Outputs

[1] Nazarian et al. 2022, ‘Integrated Assessment of Urban Overheating Impacts on Human Life’, Earth's Future.
Established 1st integrated framework for urban overheating impacts, leading review across 10 subfields through discussions among 17 global experts

[2] Nazarian et al. 2019, ‘Outdoor thermal comfort autonomy: Performance metrics for climate-conscious urban design’, Building and Environment.
A novel framework to translate climate model outputs into practical metrics & guideline maps for architects & planners, simplifying design decisions

[3] Lipson, Nazarian, et al. 2022, ‘A Transformation in City-Descriptive Input Data for Urban Climate Models’, Frontiers in Environmental Science.
An open access building morphology dataset for Australian Cities that enables regional climate models to accurately represent city characteristics

[4] Middel, Nazarian, et al. 2022, ‘Urban Climate Informatics: An Emerging Research Field’, Frontiers in Environmental Science.
Establishing the field of urban climate informatics, revolutionising urban climate analyses by deploying innovative sensing, datasets, and analytics

[5] Nazarian et al. 2021, ‘Project Coolbit: Can your watch predict heat stress and thermal comfort sensation?’, Environmental Research Letters.
Early detection of heat stress achieved through innovative wearables, also presenting the 1st quantification of heat impact on activity and lifestyle

[6] Potgieter, Nazarian et al. 2021, ‘Combining HighResolution Land Use Data With Crowdsourced Air Temperature to Investigate Intra-Urban Microclimate’, Frontiers in Environmental Science.
Demonstrating how citizen weather stations can be a major boon to health monitoring and urban planning in Australian Cities

[7] Nice, Nazarian et al. 2022, ‘Isolating the impacts of urban form and fabric from geography on urban heat and human thermal comfort’, Building and Environment.
Demonstrating how non-linear changes in urban form and fabric can change urban heat exposure in Australian cities

[8] Naserikia, et al. 2022, ‘Background climate modulates the impact of land cover on urban surface temperature’, Scientific Reports.
Providing a global analysis of land surface temperature and its spatial variability based on urban form and fabric
[9] Krayenhoff et al. 2020, ‘A multi-layer urban canopy meteorological model with trees (BEP-Tree): Street tree impacts on pedestrian-level climate’, Urban Climate.
Ranked as ”top 1% cited” in the field, it provides one of the most comprehensive representations of street trees to date
[10] Martilli et al. 2020, ‘Is the Urban Heat Island intensity relevant for heat mitigation studies?’, Urban Climate.
Challenging the most common indicator (mis)used in the field, Urban Heat Island, offering critical assessments of when/how it should be used or avoided

How have you contributed to the development of others?

Since 2018, I have supervised six HDR students at UNSW (three to completion thus far) and mentored two PhD researchers internationally (University of Reading, UK, and University of Guelph, Canada). Furthermore, I acted as the committee member and examiner of three PhD theses. Moreover, I've supervised 5 post-docs, and 12 research assistants and undergraduate scholars in the CRC lab.
Under my supervision, students received several prestigious awards, including the Best Paper award and Postgraduate Research Support scholarship at UNSW as well as the Best Presentation Award in the 15th Symposium of Urban Environment at AMS. Overall, mentored students and postdocs have successfully published 12 highly cited journal articles (with four additional publications underway), participated in numerous highly prestigious international conferences and established international collaborations with esteemed research institutes locally and internationally. Lastly, I took on the mentorship role for early-career female academics with notable success (two securing the prestigious Horizon Fellowship at the University of Sydney and one Assistant Professor at the Pratt Institute). These successful experiences showcase my commitment to training the next generation of successful academics and professionals.
Since joining UNSW, I received over $3M in research income (as Lead, Chief Investigator, or Partner Investigator) across 18 projects. Of these, $1,236,011 are from grants that primarily supported research in my lab. Additionally, I secured two PhD scholarships (~$200,000) to support PhD students in my group. Lastly, I successfully led applications for the National Computational Merit Allocation Scheme for 5000 kilo-service units (KSU) of supercomputing resources. This resource (the equivalent of ~$80,000) enabled the creation of the most extensive urban airflow datasets. Our work has led to the research capability development beyond UNSW, through the development of open-source numerical models, datasets, and applications used by several international groups, creating collaborations that spark novel projects and enhance research quality.

How have you contributed to the wider research community?

I am part of the leadership team of the two scientific bodies in urban climate. Since 2016, I have been a member of the Board of Urban Environment (BUE) of the American Meteorological Society (AMS) and in Sep 2023, I was voted as the Chair. In 2019, I was elected as a board member of the International Association of Urban Climate (IAUC). I have been actively involved with professional activities and contributed to six international

conferences. In 2019, I was selected to chair the 11th International Conference on Urban Climate, making me the youngest and first female of colour to chair this conference. ICUC is the largest gathering bringing together experts from several fields and producing highly-regarded publications and reports that shape future directions in research. Receiving the Chair position represented a vote of confidence in my leadership abilities and a recognition of my research achievements in the field. Due to the pandemic, the conference was postponed for 2 years, during which I chaired a virtual poster conference with 200 attendees.
My leadership in the field was further recognized in 2021 when I was selected as an Associate Editor of the leading journal Urban Climate and invited as an author of "Urban Heat Island Guide" by the World Meteorological Organization. Ever since, I have engaged as an expert advisor in several successful EU- and US-funded projects.
Internationally, I have been selected as a scoping author for the Intergovernmental Panel on Climate Change (IPCC) Special Report on “Climate Change & Cities”, representing the Australian Focal Point, Department of Climate Change, Energy, the Environment and Water, while also being appointed as a Scientific Advisor for The GAW Urban Research Meteorology and Environment of the World Meteorological Organization (WMO) and Urban Science Program, World Weather Research Program (WWRP) and World Climate Research Program (WCRP).

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

Critical acclaim for research leadership and global impact is a key vision at UNSW. I have actively contributed to this vision through my research and mentorship as well as direct contribution to impact beyond academia noted above.
Furthermore, since joining UNSW, I have garnered recognition through prestigious affiliations and positions, underscoring critical acclaim for my research and leadership. Noteworthy appointments in Australia include Chief Investigator at the **ARC Centre of Excellence for Climate Extreme (CLEX)** and Associate Investigator at the **ARC Centre for the Weather of the 21st Century (W21C)**, both of which are home to the most distinguished climate scientists in Australia; Scientific Advisory at the **National Committee for Earth System Science** of the Australian Academy of Science, establishing a decadal plan for earth system modeling in Australia; Fellow at **City Futures Research Centre (CFRC)** at UNSW, one of the leading institutes in urban studies; and Committee Member of the Climate Solutions Centre scientific advisory group of the **Australian Museum**, informing museum initiatives and exhibitions that inspire more Australians to support climate solutions. These positions have facilitated extensive collaborations and several funded research grants as well as financial support for PhD scholarships and research associates.
The Scientia Fellowship further enabled me to retain and establish international collaborations, leading to experimental campaigns at the National University of Singapore (2018, 2019 & 2020) as well as visiting scholarships at the Centre for Research in Environment, Energy, and Technology (Apr 2019), Arizona State University (2019 & 2022), and Building Technology lab at the MIT Department of Architecture (2019- 2020). Overall, these positions have facilitated extensive collaborations, tangible research impacts, and several funded research grants as well as financial support for PhD scholarships.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

My leadership and social engagement extends to advancing the professional field. I am an active advocate for diversity and gender equity, and since 2018 I led 6 university-wide events providing information, support, and advocacy on topics relevant to HDR, academic, and professional women. In 2021, I was selected as the **UNSW Gender-equity Champion**, advocating for several policy changes (focused on carer and childcare support) to build an equitable and inclusive research culture. Most notably, I was selected as the **Cohort 8 of Homeward Bound** in 2023, a ground-breaking, global leadership initiative, set against the backdrop of Antarctica, empowering women in environmental decision-making.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

I consider being an academic as a continuous learning process and focus on professional training in both research and teaching. Since 2018, I received five certificates from UNSW and other recognized institutes (such as MIT and AMS) that directly contributed to my research and teaching.
Similalry, I plan to use the allocated training time as part of this grant for obtaining additional training in research and policy leadership, particularly as part of the Certificate in Executive Management and Development that I've previously engaged with.

Coapplicant details

Coapplicant	
Full Name	Merilyn Riley
Department	Department of Public Health
Organisation	La Trobe University
Email Address	Merilyn.Riley@latrobe.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
10 June 2010		Senior Lecturer, Co-ordinator Partnerships, Discipline Lead	La Trobe University
01 December 1992	01 October 2010	Senior Research Officer, Chief Health Information Manager	Victorian Department of Health
10 January 1991	01 November 1992	Research Officer	Nursing Mother's Association of Australia
26 January 1986	01 February 1989	Health Information Manager	Victorian Department of Health

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
30 August 2017	30 June 2024	Doctor of Philosophy (PhD;Dphil)	Public Health	La Trobe University (Candidature)
01 March 1994	01 November 1995	Other postgraduate degree or qualification	Epidemiology & Biostatistics	University of Melboure
01 February 1989	01 November 1992	Other undergraduate degree or qualification	Theology	Australian College of Theology
01 February 1983	01 November 1985	Other undergraduate degree or qualification	Applied Science (Medical Record Administration)	Lincoln Institute of Health Sciences

Career breaks	
Provide details	
Feb 1989 - Jan 1991 - further study July 1998 - July 1999 - parental leave November 2000 - Jan 2001 - parental leave	

Do you wish to undertake this award part time?	Yes

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**

Are you a healthcare professional?	No

Indicate your healthcare profession

Are you clinically active?	

What is your specialty? If your specialty is not on the list, select 'Other' and specify.

Specify

What percentage of your research time will you spend on this project?
20

How have you contributed to the generation of knowledge?
I worked for 20+ years with the Victorian Perinatal Data Collection Unit (VPDCU) and Victorian Congenital Anomalies Register (VCAR) within the Victorian Department of Health (DOH). My roles included:1) management of statewide population health datasets; 2) research into perinatal, birth defects and data quality topics at a local, national and international level; 3) development of data integrity policies and protocols; and 4) representation of DOH at national committees. I have also been employed for 14 years in academia as Course Co-ordinator and Discipline Lead in Health Information Management at La Trobe University. I was awarded the Health

Information Management Association of Australia (HIMAA) National Practitioner of the year in 2022 and have won author/co-author of the best conference paper at our HIMAA National Conference over the past three years. I am the author/co-author of 40 peer-reviewed publications and was first author of twelve. I have been an author/presenter or co-author on fifteen conference presentations and have a h-index of 16. My two different career roles reflect the duality within my research outputs.

1. Development of the Victorian Birth Defects Register (VBDR)

I spent almost 20 years responsible for the development and management of VCAR or the Victorian Birth Defects Register (VBDR), as it was previously known. This became a gold-class monitoring and surveillance system. Keys areas involved:

(i) Enhancing sources of notification to improve ascertainment of birth defects.

Sourcing and liaising with key new stakeholders to obtain access to congenital anomaly data sources previously unavailable to the VBDR e.g., annual government in-hospital separation data for children up to five years admitted with a congenital anomaly ICD code in any Victorian hospital. This significantly increased the ascertainment of notifications to the VBDR and improved its quality as a monitoring and surveillance register.

(ii) *Embedding methods of data quality assessment.*

I was instrumental in the development, and embedding, of a regular audit plan and processes to evaluate the VBDR data quality. These data quality processes became a template for data quality activities for other DOH datasets.

· **Riley M**, Phyland S and Halliday J (2004) Validation study of the Victorian Birth Defects Register. *J Paed. Child Health.* 40(9-10):544-48. Doi:10.1111/j.1440-1754.2004.00460.x 37 citations.

· Kilkenny M, **Riley M** and Lumley J (1995) Follow-up validation study of the Victorian Congenital Malformations Register. *J. Paediatr. Child Health.* 31(4):323-25. doi:10.1111/j.1440-1754.1995.tb00820.x.18 citations.

(iii) Improvement in classification of the genetic conditions within the International Classification of Diseases-11th Revision.

Invited participant in a national working group in 2008-2009 to improve classification of genetic conditions, given the paucity of appropriate codes within the International Classification of Diseases (ICD)-10th revision. Outcome: submission to the World Health Organisation for the implementation of additional codes within the next release of the ICD. Many of the recommended changes were adopted, resulting in much greater specificity of codes for genetic conditions within the ICD-11.

2. Collaborative research involving the VBDR

Between 2004–2009 I collaborated with 10 researchers on studies utilising VBDR data. My role included researcher consultation on the most appropriate data available to address the research questions, abstraction of data and provision of appropriate documentation for informed analysis of the data. For example,

· Chew Colleen, Halliday JL, **Riley MM** and Penny DJ (2007) A population-based study of antenatal detection of congenital heart disease by ultrasound. *Ultrasound Obstet Gynecol,* 29(6):619-24. doi:10.1002/uog.4023. 141 citations.

· Collins VR, Muggli EE, **Riley M**, Palma S and Halliday JL (2008) Is Down syndrome a disappearing birth defect? *Paediatrics,* 152(1):20-24. Doi:10.1016/j.jpeds.2007.07.045. 113 citations.

3. Biennial monitoring and surveillance reports

I created and produced, in collaboration with Professor Jane Halliday, 11 regular (biennial) and ad-hoc reports related to *Births in Victoria* or *Birth Defects in Victoria*. These reports provided population-based prevalence figures on Victorian birth defects that were widely utilised for research and health service planning. For example,

· **Riley M,** Halliday J, 2008. *Birth Defects in Victoria, 2005-2006*. Victorian Perinatal Data Collection Unit, Victorian Government Department of Health, Melbourne. Available at:https://www.health.vic.gov.au/publications/births-defects-in-victoria-2005-2006

4. Environmental Impact Health Assessments – toxic waste dumps

Collaborator in two DOH studies involving health assessments and toxic waste dumps (Dandenong South & Lyndhurst health assessment, Tullamarine hazardous waste landfill). My role involved cluster analyses of the likelihood of birth defect development. This interdepartmental collaboration with the Environment Protection Authority (EPA) won the following award:
Achieving the Best Commendation, Department of Health, February 2012. Excellence in achievement by a team: Health Environments South Dandenong and Lyndhurst Health Assessment Project Team FOR
Utilising innovative health assessment and communication strategies, and demonstrating the value of cross-department projects to address community issues
· State Government of Victoria. Department of Health (2011) Dandenong South and Lyndhurst health assessment. Available at:https://www.health.vic.gov.au/publications/dandenong-south-and-lyndhurst-health-assessment-executive-summary-september-2011

5. HIM Workforce

At La Trobe University, I have contributed significantly to HIM workforce and professional competency standards knowledge. This research has been utilised by HIMAA (our professional association) in developing workforce summit and workforce consultation documents. For example,
· **Riley Merilyn**, Robinson Kerin, Prasad Natasha, Gleeson Barbara, Barker Emma, Wollersheim Dennis and Price Julie (2020) Workforce survey of Australian graduate Health Information Managers: employability, employment, and knowledge and skills used in the workplace. *Health Information Management Journal,* Vol. 49(2-3):88–98. doi:10.1177/1833358319839296.9 citations.

6. Data quality and information integrity of government datasets

I have been involved in providing statistics on the "quality" of datasets for perinatal data, congenital anomalies (as mentioned above), and other government datasets over many years. In addition to information provided above in 4(ii), I have been instrumental in studies evaluating the quality of data used for research purposes. For example,
· Davey Mary-Ann, Sloan Mary-Louise, Palma Sonia, **Riley Merilyn** and King James (2013) Methodological processes in validating and analysing the quality of population-based data: a case study using the Victorian Perinatal Data Collection, *Health Information Management Journal* 42(3):12-9, DOI:http://dx.doi.org/10.12826/18333575.2013.0010. 44 citations
· Riley M, Robinson K, Kilkenny MF, Leggat SG. (2023) The suitability of government health information assets for secondary use in research: A fit-for-purpose analysis. *Health Information Management Journal*. 52(3):157-166. doi:10.1177/18333583221078377. Epub 2022 Apr 26. PMID:35471919. 4 citations.

How have you contributed to the development of others?

Student Placement Supervision

I have a long history of mentoring students at both the DOH and La Trobe University. I supervised over 20 final year HIM students on professional placement at DOH. This incorporated creating authentic student projects and supervising students to deliver meaningful outcomes. I have also supervised six Honours students, two as an industry supervisor and four as an academic.

Academic staff mentoring

As HIM Professional Practice Co-ordinator I mentored industry supervisors, junior HIM academic supervisors and students on placements. As HIM Discipline Lead, I have

intentionally mentored junior HIM staff to develop their research skills, and to foster an environment for staff to contribute to their discipline through enhanced engagement through conference presentations and delivering professional development workshops. In 2023, the highest number of HIM staff (7/9) presented at a national conference in the 40 year history of the discipline. I mentored five of these presenters (with myself being a sixth) and was a co-author on each of their papers.

Development of HIM Professional Competency Standards

I have contributed significantly to the revision and development of HIM Professional Competency standards. I have been part of Executive Working Groups in 2013, 2017, 2021 for a review and revision of these standards and in 2021-2022 was involved in the development of new Health Data Analytics Professional Competency Standards for our discipline.

Lloyd S, Edmonds L, Chan W, Barnes C, Dedeigbo O, Guo S, Matiussi A and **Riley M** (2021) A *multi-source approach to the development of health data analytics competency standards for health information managers*. In Henderson J, Rogers K and Redden J (Eds). Proceedings of the HIMAA 2021 Virtual National Conference, 'Health Information Management: The Intersection of Health Care and Data Science'. 25-28 October. North Ryde, NSW: Health Information Management Association of Australia, pp.10-22. ISBN 978-0-9946206-8-2

How have you contributed to the wider research community?

Peer-review and journal editorial roles

I have been a peer-reviewer for four journals over many years (Australian & New Zealand Journal of Public Health, Australian Health Review, Health Information Management Journal of Australia (HIMJ), and Medical Journal of Australia). I have been an Editorial Advisor for the HIMJ since 2018 and have twice been invited to join the editorial team (most recently in December 2023). I have been the guest editor for two special editions of our professional magazine, HIM-Interchange, and an invited academic reviewer for HIMAA Conferences.

Workshops and Knowledge-sharing activities

As a member of the HIMAA Research Advisory Committee I have been responsible for developing and delivering research-based workshops at our professional association conference, including the 2023 International Federation of Health Information Management Congress. As Professional Practice Co-ordinator at La Trobe, we have delivered many professional development workshops over the past few years on topics such as, *Developing meaningful student projects, How to deal with difficult students* etc.

Leadership Positions

In both organisations where I have worked, I have risen to leadership positions. At the VPDCU, I commenced as Health Information Manager, advanced to Chief Health Information Manager and then became Senior Research Officer. I represented DOH at State and National levels as an expert in health classification of congenital anomalies and in management of perinatal data. At La Trobe I have been Course Co-ordinator, HIM Discipline Lead and am currently Co-ordinator of Partnerships for the Department of Public Health. The latest appointment reflects the breadth of my networks and recognition of leadership capacity within this area.

Within HIMAA, I was invited onto the Executive Committees on development of

Professional Competency Standards (2013, 2017, 2021, 2022) and recently to be part of the Education Committee for the Implementation of ICD-11 (2024).

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

Partner of choice

One of La Trobe's broad goals is to become a 'partner of choice' for industry and community engagement. The specialisation of our discipline in the areas of health classification and clinical coding auditing has directed some strategic research and partnerships as there are very few other organisations with this specialisation. For example, we partnered with the Australian Stroke Clinical Registry (AuSCR) to evaluate the quality of coded stroke data in AuSCR. The resultant findings of both incorrect and under-reporting of stroke by 25% has resulted in the development of a Stroke Education campaign for clinicians on the importance of stroke documentation and for clinical coders in understanding more about the classification of stroke for reporting purposes. I am part of the Australian and New Zealand Stroke Coding Working Group. Also, my previous experience and research on the classification of congenital anomalies has resulted in recent consultation with the DOH to employ our organisation to partner with them to undertake congenital anomaly classification work on their behalf.

Ryan OF, **Riley M**, Cadilhac DA, et al. (2021) Factors Associated with Stroke Coding Quality: A Comparison of Registry and Administrative Data. *J Stroke Cerebrovasc Dis*. 30(2):105469. doi: 10.1016/j.jstrokecerebrovasdis.2020.105469.

Employability

Part of La Trobe University's strategic plan is to '*produce some of the most employable graduates in the country – with the skills and capabilities necessary for long term career success'*. Within the HIM academic team at La Trobe I have mentored staff to develop research streams around workforce and employability, professional practice, HIM Competency Standards, and the future of clinical coding and auditing in Australia. Where possible I have encouraged engagement with members from industry in progressing these research streams in publications and conference presentations. Our discipline contributes significantly to the employability goals of La Trobe.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

Mentoring, leadership and promoting research integrity

I have an open door, team focussed aproach to both staff management and research. Over the past five years at La Trobe (since commencing Discpline Lead role), I have developed research streams which are led by different individuals. I am involved in all of the steams as research mentor but the leadership is managed by reasonably Early Career Researchers to enable them to develop leadership skills whilst working in a supportive

enviroment. I have fostered a collaborative approach to research with the understanding that if we all contribute then it decreases the workload but we can still achieve positive outcomes. Amongst staff who have heavy teaching commitments, along with research requirements, this approach that has lead to good results. For example, most staff (seven out of nine) submitted abstracts and presented at our most recent discipline conference (November 2023) and we have delivered six joint publications from the team in the last eighteen months.
All academic staff are coached in the knowledge of NHMRC guidelines for the ethical conduct of research. I mentor junior academic staff in the completion of ethics application for team research studies. I have published also number of papers focussing on the fitness-for-purpose of government health datasets, the availability of documentation to support the use of these data by researchers who are not the primary data producers, and the knowledge and perceptions of Victorian researchers on the 'trustworthiness' of the government health datasets. The findings from this research have been embedded into our core teaching around data quality and information integrity of data used in research. It has been used to enhance the knowledge of early career researchers in effective data management practices.

Supporting collaboration and interdisciplinarity

To support collaboration with research partners in industry we are intentional in trying to obtain external personnel to be involved in each of our research studies. This not only provides opportunity for novice industy-based researchers to obtain experience but it provides us with insight into current industry practices.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

- Program/Change Management delivered from organisations such as the Institute of Management. Knowledge in this area would assist with the implementation of big projects and provide knowledge on how to assist staff through transformation programs.
- 'Culture, Visions and Values' to enable me to inspire and motivate staff more, including greater understanding of contextual issues facing staff.
- Communication training – this could be formal or informal, and would be particularly useful given the interdisciplinary nature of the research team and the potential for involving a broad range of collaborators
- Conference attendance.
- Advanced STATA training.

Coapplicant details

Coapplicant	
Full Name	David Burgner
Department	Infectious Diseases Unit, General Medicine
Organisation	Royal Children's Hospital, Melbourne, Australia
Email Address	david.burgner@mcri.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
01 January 2010	31 December 2028	Senior Research Fellow	Murdoch Children's Research Institute
01 April 2013	31 December 2028	Professorial Fellow	University of Melbourne
01 January 2018	31 December 2028	Consultant in Paediatric Infectious Diseases	Royal Children's Hospital, Melbourne, Australia
01 March 2010	31 January 2018	Consultant in Paediatric Infectious Diseases	Monash Children's Hospital, Melbourne, Australia

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
01 April 1996	31 January 2002	Doctor of Philosophy (PhD;DPhil)	Paediatric Infectious Diseases/Genomics	Oxford University
01 September 1983	30 June 1989	Primary Med Qual (BM;MBChB;MBBS;MD)	Medicine	University of Bristol

Career breaks	
Provide details	

Do you wish to undertake this award part time?	No

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**

Are you a healthcare professional?	

Indicate your healthcare profession

Are you clinically active?	

What is your specialty? If your specialty is not on the list, select 'Other' and specify.

Specify

What percentage of your research time will you spend on this project?
20

How have you contributed to the generation of knowledge?
Research outputs 13 book chapters, ~ 425 publications (currently publishes ~45 papers/year), including in *Nature Human Biol*, *Nature Genet*, *Nature Comms, Lancet, Lancet Infect Dis, Brit Med J, Circulation, Eur Heart J, PLoS Med, PLoS Genet, Int J Epidemiol*. His h-index is 68, i10 index 261, with ~15700 citations (Google Scholar January 2024). He has been awarded ~AUD35 million in research funding, including continuous National Health and Medical Research Council (Australia) support for 15 years, and from National Heart Foundation (Australia), CIHR (Canada), NIHR (UK), NIH (US), Dutch Heart Foundation, A*STAR. Total career ~150 presentations, including >100 inter/national invited/keynote/plenary presentations. Top 10 publications in last 10 years [1] Calvert C, Brockway M, Miller JE, …[115 total authors]… BURGNER D*, Stock SJ*, Azad MB*. [*JOINT SENIOR & CORRESPONDING AUTHOR]. Changes in preterm birth and stillbirth during COVID-19 lockdowns in 26 countries. NATURE HUMAN BEHAVIOUR 2023; 7(4): 529-544. I co-founded the international Perinatal Outcomes in the Pandemic (iPOP) consortium, on

effect of pandemic restriction on preterm birth and stillbirth. Analysing 52 million births from 26 countries, these population-level data were the first unbiased estimates of impact of lockdowns. Findings informed policy worldwide and mechanistic studies.
[2] Gillies MB*, **BURGNER DP***, Ivancic E, Nassar N, Miller JE, Sullivan SG, Todd IMF, PSA, Schaffer SA, Zoega H [*JOINT FIRST AUTHORS]. Changes in antibiotic prescribing following COVID-19 restrictions: Lessons for post-pandemic antibiotic stewardship. BRITISH J CLINICAL PHARMACOLOGY 2022; 88: 1143-51.
In a 'natural experiment' using Australian national data, antibiotic prescriptions for respiratory infections fell 70% with pandemic restrictions, in parallel with markedly reduced hospitalisations for non-COVID infection. These data provided evidence that antibiotics are over-prescribed for viral infections. As co-first author, I co-conceived the project, co-supervised the analysis and write-up.
[3] Mansell T, Saffery R, Burugupalli S, Ponsonby AL, Tang MLK, O'Hely M, Bekkering S, Smoith AAT, Rowland R, Ranganathan S, Sly PD, Vuillermin P, Collier F, Meikle P, **BURGNER DP,** Barwon Infant Study Investigator Group. Early life infection and proinflammatory, atherogenic metabolomic and lipidomic profiles in infancy: a population-based cohort study. eLIFE 2022; 11: e75170.
Infections in infancy associate with a pro-atherogenic and pro-diabetic metabolome and lipidome, building on substantial epidemiological evidence linking infection and cardiometabolic risk. Major translational projects, e.g. impact of breast-feeding to mitigate risk, are ongoing. As senior author, I conceptualised, secured funding and supervised the study.
[4] Longmore DK, Miller JE, Bekkering S, Saner C, Mifsud E, Yanshan Z, Saffery R, Nicol A, Colditz G, Short, KR, **BURGNER DP**, International BMI-COVID consortium. Diabetes and Overweight/Obesity Are Independent, Non-additive Risk Factors for In-Hospital Severity of COVID-19: An International, Multicenter Retrospective Meta-analysis. DIABETES CARE 2021; 44(6): 1281-1290.
This international study (n=7,244,11 countries) showed for first time that overweight was an independent risk factor for poor outcomes with COVID-19 and provided robust evidence for the independent effects of obesity and type 2 diabetes. I co-conceived the study, secured funding, led the collaboration, supervised analyses, and co-wrote the manuscript.
[5] Miller JE, Goldacre R, Moore HC, Zeltzer J, Knight M, Morris M, N..., **BURGNER D**. Mode of birth and risk of infection-related hospitalisation in childhood: A population cohort study of 7.17 million births from 4 high-income countries. PLOS MEDICINE 2020; 17(11): e1003429.
Provided definitive evidence that caesarean section increased risk of hospitalised infection in offspring. I established and co-lead the consortium, conceptualised the study, obtained funding, supervised analyses, and co-wrote the manuscript. I led the media engagement, resulting in 33 inter/national media reports, including NYT, with total reach of 69.1 million.
[6] Tosif S, Neeland MR, Sutton P, Licciardi PV, Sarkar S, Selva KJ, ..., **BURGNER DP***, Crawford NW* (*JOINT SENIOR AUTHOR). Immune responses to SARS-CoV-2 in three children of parents with symptomatic COVID-19. NATURE COMMUNICATIONS. 2020; 11(1): 5703.
One of series (Nat Comms x3, JAMA ON) reporting immunological data early in the pandemic. Showed markedly different immune responses in children vs adults with implications for monitoring and diagnostics. I co-led COVID-19 clinical and laboratory response. I made major contributions to all stages of study and manuscript.
[7] Collier F, Ellul S, Juonala M, Ponsonby AL, Vuillermin P, Saffery R, **BURGNER D**; Barwon Infant Study Investigator Group. Glycoprotein acetyls (GlycA) at 12 months are associated with high-sensitivity C-reactive protein and early life inflammatory immune measures. PEDIATRIC RESEARCH 2019; 85(5): 584-5.
First data on GlycA in early life, highlighting its advantages as a measure of chronic inflammation even in infancy. I conceived and led the study, supervised the analyses and co-wrote the manuscript as senior author. I now co-lead an extensive international research

program on inflammation across the life course.
[8] Miller JE, Hammond GC, Strunk T, Moore HC, Leonard H, Carter KW, Bhutta Z, Stanley F, de Klerk N, **BURGNER DP**. Association of gestational age and growth measures at birth with infection-related admissions to hospital throughout childhood: a population-based, data-linkage study from Western Australia. LANCET INFECTIOUS DISEASES 2016; 16(8): 952-61.
Seminal data linkage study showed that even babies born slightly early, underweight, or stunted had significantly increased risk of hospitalisation with infection until age 18 years. I conceived and led this study, secured funding, supervised the analyses and interpretation, and co-wrote the manuscript and revisions.
[9] Levin M, **BURGNER DP**. Treatment of Kawasaki disease with anti-TNF antibodies. LANCET 2014; 383(9930): 1700-1703.
Optimal treatment of Kawasaki disease is unknown. This invited commentary from a leading journal reflects my standing as Australia's leading KD researcher, clinical authority, and medical advisor to the Australian KD Foundation. I am ranked worldwide top 0.01% in KD research (expertscape). I co-wrote the commentary and revisions.
[10] Burugupalli S, Smith AAT, Oshlensky G, … Saffery R, Vuillermin P, Ponsonby AL, **BURGNER D***, Meikle P* [JOINT SENIOR AND CORRESPONDING AUTORS], Barwon Infant Study Investigator team. Ontogeny of circulating lipid metabolism in pregnancy and early childhood - a longitudinal population study. eLIFE 2022 Mar 2:11:e72779. doi: 10.7554/eLife.72779.
First study of detailed longitudinal MS lipidomics in pregnancy and early life. I co-led the study and was co-PI on NHMRC/A*STAR grant. The manuscript highlights my success in establishing highly innovative and productive linkages across disciplines.

How have you contributed to the development of others?

I make considerable investments into mentorship and career development of EMCR clinicians and scientists across disciplines and career stage nationally and globally. I (part)-fund 5 postdocs and 2 PhDs.
I have supervised 13 PhD (7 primary, 8 completed), including interstate and internationally; 3 MSc, 14 Hons/BMedSci (12 H1), and 8 MD Research students. My former PhDs include a clinical professor and four clinical leads. I currently supervise 8 post-docs and 3 research assistants. My group regularly employs overseas-funded post docs. I supervise a BRIDGE Translation Excellence Program post-doc at Copenhagen Uni, 2 post docs at Radboud amc, The NL (funded by Dutch fellowships). I mentor Profs in O+G (Denmark), cardiology (Canada), and epidemiology (Canada). I prioritise EMCR career development, so extensively (and appropriately) use joint first/senior authorship positions.
I was the first paediatrician to receive the Royal Australasian College of Physicians Award for Excellence in Mentorship and the Australasian Society for Infectious Diseases Mentorship Award. I was the only MCRI researcher invited onto the Melbourne Uni Senior Research Mentor's Program.
I am scientific co-lead for MCRI's LifeCourse Initiative, which has a popular educational program in life course epidemiology and methods.
I am a senior mentor on the Melbourne Children's Campus mentoring scheme and currently mentor 6 paediatricians (junior consultants and advanced trainees), and other specialists (e.g. dentist, O+G, neonatologist, research nurses). As a RACP accredited supervisor for paediatric infectious diseases (PID), I have supervised and mentored ~20 basic and advanced trainees.
I was inaugural Education Officer of the World Society PID, leading development of online education (5,000+ users). I initiated the (2014- now biennial) invitation-only WSPID Research Workshop (100 participants) , particularly aimed at clinicians and researchers

from LMICs.
I have established an extensive collaborative network in 32 centres in 17 countries. This provides an ideal platform for EMCR career development.

How have you contributed to the wider research community?

Honours and awards
Fellow of Australian Academy of Health and Medical Sciences (elected 2022). ASID Frank Fenner Prize for Infectious Diseases (ID) research. Author of 13 chapters and >425 papers, publishing >45 papers/year; I am the most productive researcher at MCRI (~3000 employees) for last 4 years.

Office bearer
World Society for Paediatric ID (WSPID) Board (2008-16) and Education Officer (2016-22). ANZ PID Group Board (2010-4) and Chair (2014-16). European Society for PID Research Committee of (2022-). Australian Paediatric Surveillance Unit Scientific Panel (2014-22).

Editorships, reviewing and advisory roles
Section Editor, Pediatric Research (2021- Q1 paediatrics). Editorial Board, Pediatric Infectious Diseases Journal (2014- Q1 paediatrics). Editor, PLOS ONE (2008-2021; Q1 Multidisciplinary). Review for Lancet, Lancet Inf Dis, NEJM, BMJ, Circulation, JAMA Pediatr.
Peer review: NHMRC (Project Grants, Synergy Grants, CRE); Heart Foundation; Wellcome Trust; Welsh, Polish, Hong Kong, and NZ Govt. grant agencies; ESPID; Uni Montreal.
PhD examiner for Utrecht, Amsterdam, Nijmegen, and Toronto Universities.
Senior author, national refugee health guidelines for Federal Govt. Previous member of Health Advisory Working Group for Health in Detention, Dept of Immigration and Citizenship.
Advisor, Australian Immunisation Handbook and Australian Blood Service Handbook (2011).
Former member of RACP Policy and Implementation Committee. RACP Written Exam Committee (2013-4).

Conference convening and invited speaker
Co-convener of 1st Australian Refugee Health Conference (2009). Faculty WSPID Congress (x4) and International Kawasaki Disease Symposium (x5); Workshop Convener, Pediatric Academic Societies (2023). Delivered ~60 presentations in last 10 years including: the Ipsen Oration, (Aarhus Uni), The Fred Grauaug Oration (WA, x2) and invited/keynote/plenaries at PAS; WSPID (x2); ESPID (x3); ASID (x3); ASID/ESCMID (x2); RACP (x3); Paediatric Society of NZ; PSANZ (x3); DoHAD; DoHAD ANZ; Cool Topics in Neonatology; Clinical Updates at RCH (x2), Monash Children's (x2), WA and Singapore

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

Murdoch Children's Research Institute (MCRI) is the largest and most successful paediatric research instiute in the Southern Hemisphere and ranked in the top 3 worldwide. I was recruited as a senior clincial scientist to MCRI in 2010. I established and lead the **Inflammatory Origins research group**, which brings together researchers and clinicains across a variety of disciplines and methodological approaches, including: data linkage, epidemiology, bioinformatics, infectious diseases, innate immunology, population cohorts, disease and high-risk cohorts, and animal models. Inflammatory Origins now has 23 EFT staff and students and is one of the most productive groups at MCRI. Our work was described in a recent international review by Prof Sir Andrew Pollard as "tremendous and potentially transformative." (personal communication).
Our research program aims to understand **the differential susceptibility to infection and inflammation across the life course and how these and other factors impact long term cardiometabolic and other non-communicable disease risks**. This program is extremely well-aligned with MCRI's overall vision, which is ***ensuring that all children have the opportunity to live a healthy and fulfilled life***. Our group takes a life course approach to addressing major health issues by effectively combining a variety of methodological approaches. We have been particularly successful in establishing cross-disciplinary collaborations to develop innovative approaches. Specific examples that align with MCRI strategic priorities include:

- ***improve detection, diagnosis and treatment of rare disease:*** Kawasaki disease (KD) is a paediatric mystery and the commonest cause of childhood acquired heart disease. I am the most productive KD researcher in Australia and have co-led definitive epidemiological, clinical and genetic studies
- ***reduce misuse ot antibiotics.*** We have provided epidemiological evidence of longterm effects of pregnancy antibiotics
- ***use life-long data to predict and prevent complex disease*.** This central to our research program. We combine epidemiological and mechanistic approaches to generate translatable new knowledge

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

I have established and lead a large (23 EFT) research program at MCRI, including 6 post docs, 5 RAs and 4 PhD students. The program places considerable resources and emphasis on career development for EMCRs and actively promotes diversity across the group (20 group members are women, many work part time). The program is one of the most productive at MCRI and has a high inter/national profile. The research program is considered an exemplar of cross-disciplinary collaboration by the MCRI and described by an MCRI international review as “tremendous and potentially transformative” (Prof Sir Andrew Pollard, Oxford University, personal communication).
Our methodological and conceptual approaches include total population data linkage, social epidemiology, longitudinal population-derived and high-risk cohort studies, omics and cellular immunology, animal models, and clinical research.
The program readily works across disciplines, e.g. studies of inflammation due to social inequalities and racism. This inclusive research is reflected in my group's diversity. I prioritise and fund research training for all group members.
I co-lead the LifeCourse Strategic Initiative at MCRI, and the largest grouping of longitudinal cohorts in Australia and New Zealand. LifeCourse drives inter-disciplinary collaboration nationally and internationally, has a popular education program, and operates an Open Science model.
Internationally I lead/co-lead a substantive collaborative network, including with seminal

cohorts worldwide. I am a PI on key cohorts in Canada (CHILD, CIHR funded); South Africa (Drakenstein, NIH and NIHR funded); Tanzania (Copenhagen Uni funded), Denmark (Odense Child Study); and Australian Temperament Study. I pioneered CVD assessment in these studies. I (co)-lead collaborations with leading studies: ALSPAC, Born in Bradford, CV Risk in Young Finns, N Finland Birth Cohort, and GenR. This provides an excellent platform for EMCR career development; international collaborators co-supervise PhD students and are CIs on my grants. I co-founded the International Kawasaki Disease Genetics Consortium.I have ~$37M career funding as CI, including NHMRC (continuously 14 years), NIH, NIHR, CIHR, A-STAR, Heart Foundation.
I actively involve consumers and those with lived experience in our research. I am Medical Advisor to the Kawasaki Disease Foundation and had an analogous role for the UK KD Group previously. I have a sustained media profile: my research has been featured on ABC TV Catalyst, ABC RN Science Report, The Project, national TV, radio and print, in The Conversation, New York Times, Washington Post and The Guardian.
Previously I established and led the multi-disciplinary Paediatric Refugee Service in Western Australia, which provided comprehensive care to newly arrived migrants. The service also provided extensive education on refugee health, and undertook research to inform policy and practice. I was co-convener of the 1st Australian Conference on Refugee Health and sat on government and College policy committees on refugee health.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

- Ongoing professional coaching in advanced research and project management
- Respectful Graduate Supervisor Development Workshops (Uni Melbourne)
- Training in large-scale multi-disciplinary project management
- Advanced media training
- Supervisor Workshops (Ressearch supervision, Uni Melb; Clinical supervision, RACP)
- Continuing professional career coaching
- Environmental and climate epidemiology conferences and courses

Coapplicant details

Coapplicant	
Full Name	Rosemarie Anne Boland
Department	Maternity and Newborn, Safer Care Victoria
Organisation	SaferCareVictoria
Email Address	rosemarie.boland@unimelb.edu.au

Career history (current/most recent first)			
From	**To**	**Position**	**Organisation**
22 May 2023	30 June 2024	Senior Project Officer- Data Lead- Victorian Preterm Birth Prevention Jurisdiction (0.4 FTE)	SaferCareVictoria
07 July 2022	01 June 2024	NICUS Data Registry Coordinator	Agency for Clinical Innovation, NSW Health
02 February 2014	31 December 2023	Research Fellow	Murdoch Children's Research Institute, Melbourne

Education/training				
From	**To**	**Qualification**	**Subject**	**Organisation**
02 February 2010	02 August 2014	Doctor of Philosophy (PhD;Dphil)	Perinatal Epidemiology	Faculty of Medicine, Dentistry and Health Sciences
02 February 1994	29 September 1997	Other postgraduate degree or qualification	Master of Nursing-Neonatal Intensive Care	Faculty of Medicine, Nursing and Health Sciences
02 January 1989	03 October 1990	Other qualification	Obstetric Certificate-Registerd Midwife	St Margaret's Hospital
02 February 1983	06 March 1989	Other undergraduate degree or qualification	Bachelor of Applied Science, Advanced Nursing	Faculty of Medicine, Nursing and Health Sciences

Career breaks	
Provide details	

Long Term Sick Leave 24 July 2023 - 11 December 2023.

Do you wish to undertake this award part time?	Yes

Source(s) of personal salary support		
Salary source	**Percentage contribution to salary**	**Type of contract (for example, fixed term, tenure-track or permanent).**

Are you a healthcare professional?	Yes

Indicate your healthcare profession
Nurse

Are you clinically active?	No

What is your specialty? If your specialty is not on the list, select ‘Other’ and specify.

Specify

What percentage of your research time will you spend on this project?
20

How have you contributed to the generation of knowledge?
I am recognised as a leading expert in perinatal epidemiology for my translational research aimed at improving outcomes for extremely preterm infants, especially those born in non-tertiary hospitals and in paramedic practice. **Improving outcomes of babies born extremely preterm** Babies born extemely preterm, (EP, <28 weeks' gestation) have significantly higher survival rates and lower rates of long term major neurosensory disability when they are 'inborn' in a tertiary perinatal centre with a co-located neonatal intensive care unit (NICU) and exposed to antenatal corticosteroids and magnesium sulfate (MgSO4) before birth. (**Publication 1 & 2).** Outcomes are worse when these babies are 'outborn' in non-tertiary hospitals, (**Publications 3 & 4)** and poorest when infants <32 weeks are born at home or in transit to hospital ('born before arrival'). **(Publication 5).** My population-based research studies span more than 3 decades in Victoria, and the data from my studies has informed the development of statewide clinical practice guidelines

aimed at improving outcome of the most immature babies born at 22-24 weeks' gestation by facilitating in-utero transfer, administration of antenatal steroids and MgSO4 and birth in a tertiary centre. (**Publication 6).**

Supporting publications:

1. Boland, RA, Cheong, JL & Doyle, LW. Changes in long-term survival and neurodevelopmental disability in infants born extremely preterm in the post-surfactant era. *Seminars in Perinatology*. 2021, 45(8) 1-10. doi.org/10.1016/j.semperi.2021.151479

2. Doyle LW, Spittle AJ, Olsen J, Kwong A, **Boland RA**, Lee KJ, Anderson PJ, and Cheong JYL, for the Victorian Infant Collaborative Study Group. Translating antenatal magnesium sulphate neuroprotection for infants born <28 weeks' gestation into practice – a geographical cohort study *Australian and New Zealand Journal of Obstetrics and Gynaecology*. 2021: 61(4): 513-518. DOI: 10.1111/ajo.13301

3. Boland RA, Davis PG, Dawson JA, & Doyle LW. Outcomes of infants born at 22–27 weeks' gestation in Victoria according to outborn/inborn birth status. *Archives of Disease in Childhood: Fetal and Neonatal Edition*. 2017, 102**(2)**: F153–F161. DOI 10.1136/archdischild-2015-310313.

4. Boland RA, Dawson JA, Davis PG & Doyle LW. Why birthplace still matters for infants born before 32 weeks: Infant mortality associated with birth at 22-31 weeks' gestation in non-tertiary hospitals in Victoria. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 2015, 55**(2):** 163-169. DOI 10.1111/ajo.12313.

5. Boland RA, Davis PG, Dawson JA, Smith J, Stewart MJ & Doyle LW. Very preterm birth before arrival at hospital. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 2018, 58**(2):** 197-203. DOI 10.1111/ajo.12690,

6. Boland RA, Cheong JL, Stewart MJ., & Doyle LW. Temporal changes in rates of active management and infant survival following live birth at 22-24 weeks' gestation in Victoria. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 2021: 61(4): 528-535. DOI: 10.1111/ajo.13309.

Translational Research: Development of a digital extremely preterm birth outcome predictor: NIC-PREDICT

Available at https://nic-predict.com.au

CIA: Rosemarie Boland, Co-Investigators: Professor Lex Doyle & Professor Jeanie Cheong. Digital collaborator: Dr Jubal John

My research has consistently demonstrated that many perinatal clinicians do not have accurate perceptions of outcome in extremely preterm (EP) infants, underestimating survival chances and overestimating major disability rates in survivors. **(Publication 7)**. Our most recent study conducted in 2020 found clinicians ability to predict outcome is worse than it was a decade ago. **(Publication 8)**. This may be leading to parents making life and death decision for their babies based on inaccurate prognostication of outcome.

We tested an extremely preterm birth outcome predictor created by the NICHD (USA) but found it was not accurate for predicting outcome in EP infants born in Victoria, underestimating survival chances and overestimating the risk of major neurosensory disability in surviving EP children. (**Publication 9).**

To address this knowledge gap, my team and I developed a digital extremely preterm birth outcome predictor for use by clinicians to improve accuracy of outcome prediction in EP babies.

NIC-PREDICT is a digital tool designed to predict (estimate) outcomes for extremely preterm infants if they are offered active care after birth. NIC-PREDICT may be used to assist with counselling families about the possible outcomes for babies born at 23-27 weeks' gestation in Victoria, Australia. Active management is defined as resuscitation at birth and admission to a neonatal intensive care (NIC) unit for ongoing care. Hence the name: NIC-PREDICT. The tool can be NIC-PREDICT can be used before birth, allowing the treating clinician to determine how infant outcomes can be improved by providing perinatal interventions such as antenatal corticosteroids and in-utero transfer (to facilitate

tertiary centre birth) before birth. This may further assist with parent counselling and decision-making to provide or withhold such interventions.
We have recently show that the availability of NIC-PREDICT has resulted in greatly improved ability of perinatal clinicians to predict outcome for individual infants, based on their risk factors. (**Publication 10)**. Translation of this digital tool into clinical practice has enabled perinatal clinicians in Victoria to provide accurate information to parents making life and death decisions about providing or withholding intensive care to the most immature babies born <28 weeks' gestation.
Supporting publications:

7. Boland RA, Dawson JA, Davis PG & Doyle LW. What are we telling the parents of extremely preterm babies? *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 2016, 56**(3):** 274-281. DOI 10.1111/ajo.12448.

8. Boland, RA, Cheong, JL, Stewart MJ, Kane, SC & Doyle, LW. Disparities between perceived and true outcomes of infants born at 23-25 weeks' gestation. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 2022, 62(2): 255-262
DOI: https://doi.org/10.1111/ajo.13443

9. Boland RA, Davis PG, Dawson JA & Doyle LW. Predicting death or major neurodevelopmental disability in extremely preterm infants born in Australia. *Archives of Disease in Childhood, Fetal and Neonatal Edition.* 2013, May 98**(3**): F201-F204. DOI 10.1136/archdischild-2012-301628.

10. Boland, RA. Cheong, JLY, Kane, SC, Stewart, MJ and Doyle, LW. Improving accuracy of outcome prediction for infants born extremely preterm using a digital tool: Translating "NIC-PREDICT" into clinical practice - the first steps. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* Online first, 3 March
2024. https://doi.org/10.1111/ajo.13808

How have you contributed to the development of others?

In recognition of my skills and commitment to mentoring the current and next generation of clinician-researchers, in 2021, I was appointed as Chair of the inaugural Research, Audit and QI Executive Committee at the statewide Paediatric Infant Perinatal Emergency Retrieval Service (PIPER, Victoria), based at the Royal Children's Hospital. A key objective of this committee is to provide research training, resources and mentoring for medical and nursing staff undertaking research projects within the PIPER neonatal, paediatric and maternal emergency retrieval services.
From 2018-2021, I was Chair of the Perinatal Society of Australia and New Zealand (PSANZ) Early Career Research (ECR) Executive Committee I coordinated multiple events for EMCRs at the PSANZ international conferences, established new scholarship opportunities for nursing and midwifery researchers, & coordinated the ECR travel awards.
In the past five years, I have mentored 12 PhD students (9 completed) from multiple disciplines, including neonatology, physiotherapy, psychology, occupational therapy and nursing. I have also mentored 8 Honors, 4 Masters and 4 medical students, and 8 PIPER neonatal transport fellows during their Royal Australasian College of Paediatricians (RACP) training.
I have co-supervised a PhD student to completion of her PhD (2020-2024). Our student conducted an RCT that will change clinical practice worldwide, to reduce the risks of

extubation failure in extremely preterm infants born <28 weeks.

Strategic Leadership

I developed the Data Governance and Management Framework for the Neonatal Intensive Care Units' Data Registry (NICUS) at the Agency for Clinical Innovation, NSW Health. I review and manage all research requests using NICUS data- a statewide data set of all babies admitted to a NICU in NSW or the ACT and 9 Special Care Nurseries in NSW, and a Follow-up data set at 2-3 years and at 5 years of corrected age. I mentor researchers wanting to use NICUS data.

How have you contributed to the wider research community?

I am nationally recognised as a leader in translating perinatal and neonatal research into clinical practice. I am the only dedicated research fellow working within a statewide perinatal, neonatal and paediatric emergency retrieval service (PIPER), specializing in retrieval research. I am the current (and inaugural) Chair of the PIPER Research, Audit and Quality Assurance Committee, responsible for prioritizing research projects undertaken in PIPER, reviewing research protocols, supporting early/mid-career researchers undertaking research projects, and for providing research training in statistics and research methodologies.

In 2020, I was appointed to the newly established Research and Reporting Committee at the Consultative Council on Obstetric and Paediatric Mortality and Mortality (CCOPMM) at the Department of Health Victoria. This committee provides advice to the Council to identify priority areas for research and to ensure reporting of these matters to both council and to the broader health and human services system.

From 2018-2020, I was the Chair of the Perinatal Society of Australia and New Zealand (PSANZ) Early Career Research Executive and member of the PSANZ Board of Directors. PSANZ is an international perinatal society, with multidisciplinary membership of neonatologists, obstetricians, midwives, nurses, basic scientists, allied healthcare professionals, epidemiologists and consumers.

In 2018, I was appointed as the Australian representative of the inaugural European Society for Paediatric Research (ESPR), Nursing Section Executive. In 2021, we established a formal mentoring program for early-mid career researchers.

In September 2023, I was appointed to the ESPR Epidemiology Section as a Board member.

Grant Reviewer:

Health Research Council of New Zealand (HRC): External Reviewer
HRC, Ministry of Health, and the 2020 Maternity Services Research RFP. 2020
National Health and Medical Research Council: External Reviewer
Project Grant 2017 round
National Health and Medical Research Council: External Reviewer
NHMRC-NAFOSTED Joint Call for Collaborative Research Project 2018

How have you engaged policymakers, practitioners or the publics with your research? What impact has it had?

Describe how your research contributes to the strategic aims of your organisation.

The mission of my organisation is to '"Support care, treatment, research and learning that will improve the lives of young people and their families."
Evidence of how I contribute to these aims:
In 2020, I was seconded from my positions at the Murdoch Children's Research Institute (Postdoctoral Research Fellow) and from PIPER (statewide perinatal educator) to Safer Care Victoria (SCV) at the Department of Health. I was appointed as a Senior Project Officer at SCV to lead the development of the first statewide Clinical Practice Guideline for the management of extremely preterm births at 22-25 weeks' gestation. I established an Expert Working Group of multidisciplinary clinicians to develop evidence-based guidelines for management of the mother in preterm labour, care of the newborn, and parent information sheets regarding care and long-term outcomes for babies born at 22, 23 or at 24 weeks. We also developed a consensus statement defining the Zone of Parental Discretion for decision-making for babies born this early. My appointment to the role of Senior Project Officer to lead this ethically and clinically challenging project is testament to my proven leadership qualities.
In 2021, I was appointed to the New South Wales Extremely Preterm Birth Consensus Framework Steering Committee, to provide expert input into development of a statewide guideline for the management of births at 22-25 weeks. Having led the development of the EP guideline for Victoria, I have provided advice and insights into the challenges experienced in Victoria, and how we overcame these. My appointment to this Steering Committee in NSW is further evidence of my leadership skills on both an institutional and national level.
Since 2019, I have co-led the development of the NeoResus Program. NeoResus is an evidence-based, multidisciplinary training program in newborn resuscitation, now taught in 5 of the 7 Australian states.

Describe your approach to developing and supporting a positive and inclusive research culture, including examples from previous and current groups.

Mentoring
In 2018, I was appointed as the Australian representative of the inaugural European Society for Paediatric Research (ESPR), Nursing Section Executive. In 2021, we established a formal mentoring program for early-mid career researchers. As the Executive members are all highly experienced neonatal nursing academics and clinician-researchers, hence offer formal mentoring for applicants to the ESPR mentoring program from all disciplines.
Co-Chair: NHMRC Centre for Research Excellence in Newborn Medicine Mentoring sub-committee 92019- present). Myself and my co-Chair established the mentoring committee for our early and mid-career researchers in the CRE Newborn. We have provided education sessions, social events, webinars and training in research methods for all members of our multidisciplinary research team.
Supporting collaboration and interdisciplinarity
I am highly regarded for my collaboration and team work skills with a wide range of multidisciplinary perinatal healthcare clinicians in an extensive range of settings from government organisations, the University sector, public and private hospitals in multiple states of Australian, professional boards and statewide organisations such as Ambulance Victoria. I uphold and promote these values by engaging in collaborative research projects with senior and junior staff in my workplace and to mentor junior staff embarking on their career in perinatal care and perinatal research.
I established the Paediatric Infant Perinatal Emergency Retrieval (PIPER) Research

Committee in 2021. PIPER is the single statewide emergency consultation and retrieval service for pregnant mothers, newborn babies and children in Victoria. The roles of the Committee members include reviewing all PIPER perinatal, neonatal and paediatric research projects, and supervising and mentoring medical and nursing staff undertaking research projects for PhD, Master's, College Projects and for QI and Audits.

Research Grants- Collaboration with multidisciplinary teams

Associate Investigator: Medical Research Futures Fund (2023): "Wait a Minute or More" - delayed cord clamping trial.

Associate Investigator: Centre for Research Excellence in Newborn Medicine (2019-2023)

Leadership and people management

I was the Chair of the Early Career Research Executive for the Perinatal Society of Australian and New Zealand (PSANZ) for a 2-year term (2018-2021). I established a scholarship for neonatal nurses and midwives to encourage participation in research and in the annual congresses. I ran mentoring events at the annual congresses and fostered collaboration amongst all 7 disciplines in PSANZ.

I was seconded to Safer Care Victoria (Victorian Government Department of Health) in 2019 to lead a multidisciplinary team to develop a statewide guideline for births at 22-24 weeks' gestation. As part of that work, I engaged with consumers to help develop the Parent Information sheets for births at 22, 23 and at 24 weeks' gestation.

Promoting research integrity

I pride myself as being an ethical clinician-researcher and take great care to ensure I follow all principles of good data governance, adhering to all principles outlined in the NHMRC National Statement on Ethical Conduct in Human Research. I uphold and promote these values, and strive to act as a role model for the next generation of clinicians and researchers in my team.

Your organisation will give you and the staff employed on your grant a minimum of 10 days a year to undertake training and continuing professional development. Explain how you will use this time.

Advanced Training in Statistical Analysis

STATA courses run by the Clinical Epidemiology and Biostatistics Unit (CEBU) at the Murdoch Children's Research Institute (MCRI), Australia.

STATA 2: Reproducible data analysis in STATA- this 2 day course covers producing descriptive statistics, calculating confidence intervals, hypothesis testing (using chi square, t-tests and nonparametric tests), calculating odds ratios and relative risks and performing basic regression analysis. Although I have been doing my own data analysis in STATA for more than 10 years, I am largely self-taught or have been taught various methods of analysis by my supervisors. I would like to undertake more formal training to ensure I am teaching my students the correct methods for all aspects of data analysis – and to learn some new tips or tricks myself.

Many of the staff and students I mentor and/or supervise do not have access to, or expertise in using statistical programs such as STATA, but have access to Power BI to create dashboard and graphic to display data in format that is responsive.

I have not been trained in the use of Power BI and so plan to attend 2 days of training to learn to use it, so that I can support my students and other team members in using Power BI.

Conference attendance and presentations

I plan to submit my research to the main national and international conference help annually by the following leading perinatal organisations:

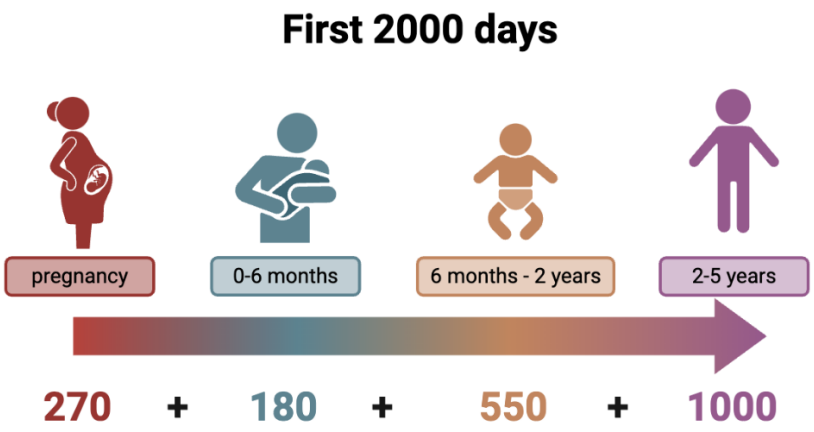
- European Academy for Paediatric Research (EAPS). Vienna 2024,
- Joint European Neonatal Societies (JENS)
- Perinatal Society of Australia and New Zealand (PSANZ)

I contribute to abstract review, conference chairing and conference judging at all these conferences and will use some of the Professional Development days to attend and present at these conferences.

"Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days"

INTRODUCTION

Pregnant women, their infants and children bear a disproportionate burden of climate hazards, and this is exacerbated by societal, cultural, and economic factors (1, 2). Furthermore, the "first 2000 days" spans sensitive stages of fetal and early childhood development when environmental stressors can have devastating and persistent impacts (3). In response to increasing threats from climate hazards on this crucial life stage, we propose to link total population maternal and child health datasets with novel geospatial environmental datasets to create a ***Climate Health Impacts Laboratory*** *for the first* ***2000 days (CHIL2000).*** *This innovative platform will be a unique resource to answer research questions and inform policy initiatives.*



Evidence is rapidly accumulating on the adverse effects of climate hazards on pregnancy and early childhood health, including increases in stillbirth, congenital anomalies, preterm birth, maternal mental and physical disorders, and high-burden childhood illness (2, 3). Harmful environmental exposures in the first 2000 days also have impact across the life course and have transgenerational effects(3).

Australia is vulnerable to global warming as the driest inhabited continent(4). Our country is experiencing increasingly frequent climate hazards including heat waves, bushfires, droughts, and floods, as well as rising background ambient temperatures and air pollution (5, 6). The national government has recognised these climate threats to human health by launching a "*Health in all policies*" action plan to support and facilitate health-climate risk assessment and health adaptation planning at all levels of the health system (7, 8).

We will advance the national action plan through a strategic partnership between (i) the State government's peak healthcare safety and improvement agency, Safer Care Victoria (SCV); (ii) an expert transdisciplinary team of researchers in obstetrics, paediatrics, climate science, geospatial modelling, and environmental epidemiology; and (iii) healthcare consumers and policy makers.

AIMS AND RESEARCH QUESTIONS

Aim: We will build a unique platform for research and policy simulation by linking individual records from maternal and child health datasets and overlaying novel geospatial environmental datasets to create the Victorian **Climate Health Impacts Laboratory for the first 2000 days (CHIL2000)**.

We will use the **CHIL2000** to answer the following research questions:

1. What are the effects of extreme heat days on the risk of the following exemplar adverse maternal, perinatal and childhood health outcomes?
    a. Maternal
        i. Hypertensive disorders of pregnancy
        ii. Gestational diabetes mellitus
        iii. Mental health disorders
    b. Infant
        i. Stillbirths / perinatal deaths
        ii. Preterm birth
        iii. Fetal growth restriction
        iv. Congenital anomalies
    c. Childhood
        i. Infectious diseases
        ii. Asthma

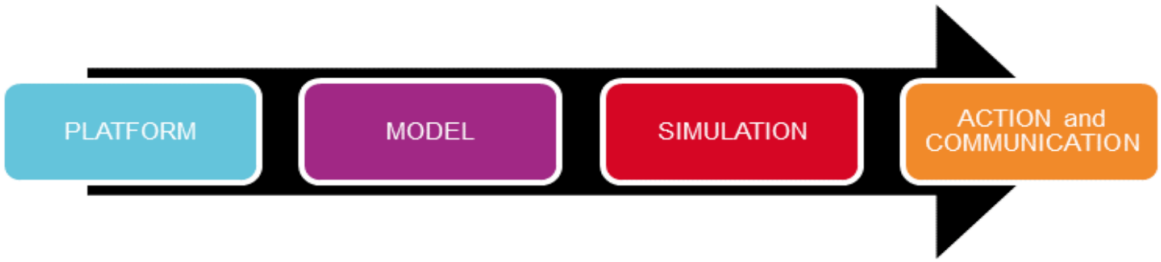
2. Do sociodemographic and other environmental factors (e.g. air pollution, tree coverage) modify the impact of heat on our key outcomes?

3. What are the estimated impacts of hypothetical climate adaptation policies on these outcomes in Australia? Are these impacts distributed equitably?

4. Which climate adaptation policies could improve maternal, perinatal and childhood health outcomes under scenarios of extreme weather events in a cost-effective manner?

We will use the answers from these research questions to design intervention programs and policies to protect the health of pregnant people and young families.

Overview of the CHIL2000 steps to policy impact



Project Steps

- **Step 1. PLATFORM:** Integrate state-wide health datasets, geospatial datasets, including novel high-resolution micro-climate indicators, to investigate the relationship between climate hazards and adverse maternal, perinatal, and childhood health outcomes.
- **Step 2. MODEL:** Use the dataset from *Step 1* to model the health burden of climate hazards in Victoria, including subgroup analyses.
- **Step 3. SIMULATION:** Simulate the downstream impacts of policy scenarios designed to reduce the health burden identified in *Step 2*.
- **Step 4. ACTION AND COMMUNICATION:** Employ the state government's Plan-Do-Study-Act (PDSA) framework to pilot the interventions designed in *Step 3*.

EXPECTED OUTCOMES

1. New evidence on the health impacts of climate hazards on maternal, infant and child health in a high-income, geographically-diverse setting, including the identification of vulnerable subgroups and protective factors.
2. Evidence-based guidance for government policymakers on potential strategies to protect maternal and infant health from climate hazards.
3. Methodological advances in generating geospatial datasets of climate hazards.

4. Scalable, adaptable model for application to other settings and populations.

BACKGROUND

Pregnant people and young children are an urgent priority group for climate research

The first 2000 days represent a critical window for optimal growth and development(9), making it a time of both great opportunity and vulnerability (9, 10). Rising global temperatures are associated with preterm birth (11), the largest single cause of perinatal morbidity and mortality worldwide (12). Other serious impacts of rising heat exposure during pregnancy include increases in congenital anomalies (13, 14) and stillbirths (15). Infants and young children are highly susceptible to the effects of extreme heat, experiencing increased rates of asthma, infection, and kidney disease as well as adverse psychological effects (2). Air pollution from natural disasters such as bushfires likely compounds the adverse effects of heat (2, 16). The health impacts and downstream consequences are likely to differ by sociodemographic and built-environment characteristics (2, 15, 17-19). The Intergovernmental Panel on Climate Change have consistently argued that strategies to safeguard the health of pregnant women and children have not been adequately prioritised, highlighting the need for targeted investment (2, 20). A national stakeholder engagement report conducted by the Australian government recommended that health inequities among vulnerable populations, including "young people and future generations" must be a core principle of the national strategy (21).

More research is needed from high income settings

To date, most research on the impact of climate on maternal and child health has been conducted in low- and middle-income countries, where factors such as limited healthcare access and data collection can affect the precision of findings (19). A recent scoping review of climate change and perinatal health has called for more research from high income countries (22). Victoria, Australia, is an ideal location to study the effects of climate hazards on maternal and infant health as it has a universal healthcare system, high baseline health status, an ethnically diverse population, and comprehensive environmental and population health data collection systems. This setting permits nuanced measurements of climate hazard impacts across urban and regional areas, with less risk of confounding from pervasive adverse biological and social issues. A state-based approach is meaningful from a policy perspective, as Australian emergency and health services are delivered at state level.

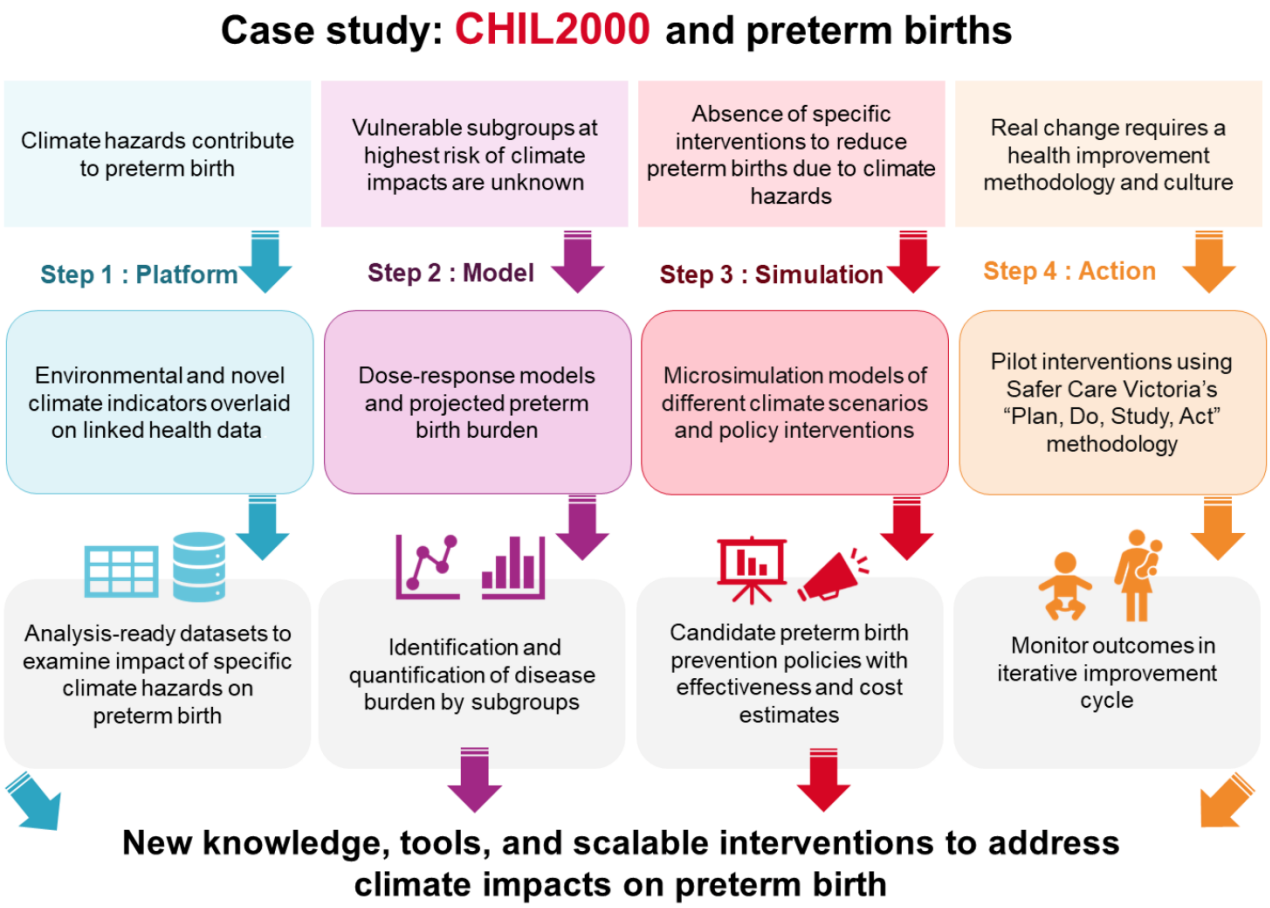
Need for more nuanced climate hazard data

Current methods of heat hazard mapping are limited by insufficient resolution and spatial coverage (17, 23). Furthermore, maps sourced from satellite-sensed land surface temperatures do not adequately capture human heat exposure (17, 23). Challenges also include accurately overlaying hazard maps with population vulnerabilities and projecting spatial hazard changes for future urban and population growth (17, 23). Therefore, this project seeks to generate detailed hazard maps (100x100m resolution) for assessing impacts of climate hazards on maternal and child health and informing critical public health policy interventions.

Closing the gap between research outputs and policy

The urgency of addressing climate challenges has been globally and nationally acknowledged (7, 8). However, these reports often offer generic recommendations for global calls for action, rather than specific measures for implementation by stakeholders and consumers. A key priority highlighted in the Victorian Health and Human Services Climate Adaptation plan 2022-2026 was "*to invest in better monitoring and a more robust evidence base on climate-related health impacts in Victoria*". Our study will provide the evidence to generate targeted policy interventions with local, national, and international relevance.

Figure 1. An example of our approach



Our team has the transdisciplinary relationships and expertise to deliver this ambitious program.

Established government-academic partnerships in maternal and child health

Prof Hui and Dr Marzan have extensive experience partnering with Safer Care Victoria (SCV) to investigate the effects of the Melbourne COVID-19 lockdown on maternal and perinatal outcomes. Their work includes research and government publications on the impacts of the COVID-19 pandemic on stillbirth, preterm birth, congenital anomalies, and healthcare utilisation in Victoria (24-27). Prof Burgner has extensive clinical and research expertise in childhood infection, life course epidemiology and population-based data linkage. He co-leads an international study on preterm birth during the COVID-19 pandemic, collaborating with Prof Hui (28-31). A/Prof Boland is a neonatal nurse and perinatal epidemiologist who has a long track record working with SCV to improving newborn health services and state-wide initiatives to reduce preterm birth. Ms Riley is a leading health information specialist with decades of experience managing population health datasets and researching perinatal outcomes, congenital anomalies, and data quality (32, 33).

Environmental epidemiology and climate science expertise
A/Prof Mavoa is a health geographer and epidemiologist with extensive experience developing novel geospatial measures and linking geospatial and health data (34-36). She was recently the Principal Environmental Epidemiologist at the Environmental Protection Authority Victoria where she delivered policy-relevant research outputs on pollution and health. She is leading the development of a Victorian geospatial platform that will be used in a separate large Victorian birth cohort study(37). Dr Marzan, Dr Nice and Dr Nazarian and collaborator A/Prof Sun are cooperating on this work, which will deliver some geospatial indicators for use in this grant.

Dr Nice and Dr Nazarian are established urban climate scientists with active collaborations in urban heat modelling (38-42) and climate informatics (use of machine learning, statistics, and innovative data sources to support climate research) (43). They use cutting-edge methods to project the impacts of climate change and develop evidence-based policy recommendations (17, 38, 40-42). Dr Nice also collaborates with A/Prof Mavoa in the Transport, Health, and Urban Systems research lab.

Our collective expertise spans clinical medicine, climate science, epidemiology, and data science, and we are uniquely positioned to leverage Victoria's comprehensive health and environmental datasets. Our transdisciplinary approach will address the complex challenges of climate hazards on maternal, newborn, and child health, offering innovative solutions and policy guidance with national and global relevance.

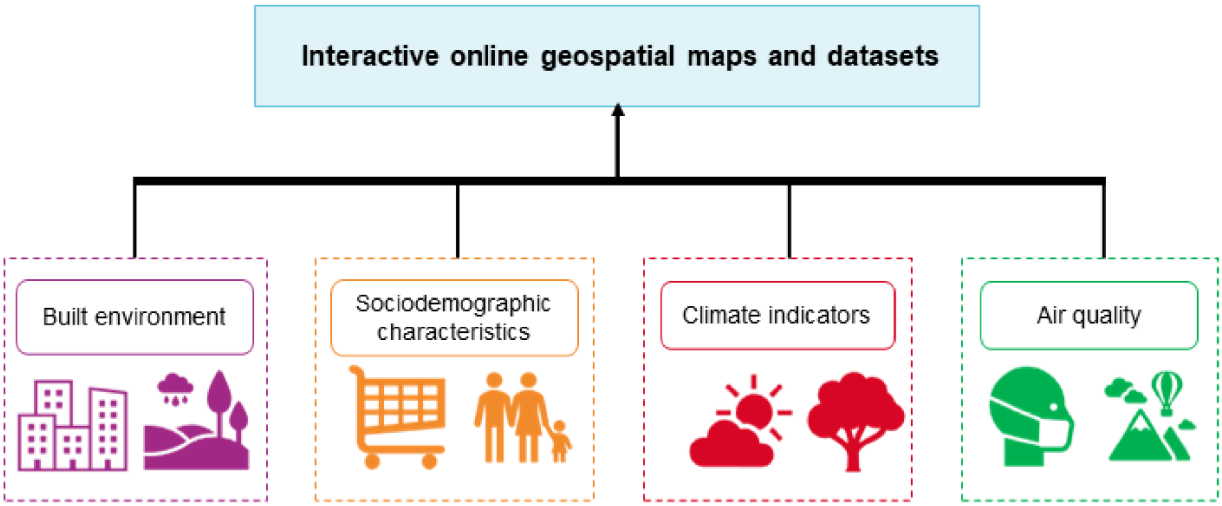
PROJECT DESIGN AND METHODS

Step 1. PLATFORM

Geospatial indicators and novel climate hazard datasets

Co-applicants Mavoa, Marzan, and collaborator Sun are currently developing climate related indicators (air pollution, greenness, heat vulnerability, disadvantage) for all addresses in the state of Victoria from 2018-2023 (44). This project will extend the temporal coverage of these initial indicators (2008-2027) and create new indicators of climate hazards (flood, bushfire, drought, air pollution), socio-demographics, and other relevant contextual data (e.g., parks, vegetation, housing). Data will be sourced from the Bureau of Meteorology, Environmental Protection Authority Victoria, and the Department of Energy, Environment, and Climate Action.

Figure 2. Spatial data linkage



A major component of this project is the generation of novel high-resolution datasets of heat hazards (17) that will overcome limitations of current heat datasets that only measure surface temperature (as opposed to temperature experienced by people). We will be able to perform a precise overlay of heat maps with population health and vulnerability using heat maps developed by Nazarian and Nice (23, 45, 46) that leverage quality-controlled, crowd-sourced citizen weather observations from cities across Australia. These data will be upscaled into high resolution maps using machine learning algorithms and the approach outlined in previous studies (47, 48).The resulting heat maps will account for the influence of urban form and local and regional climate conditions and enable testing of heat mitigation strategies. To generate future heat hazard maps that account for projected climate shifts and future urbanisation growth, a 'morphing' process developed by Nice (39) will be used. This

process will use the multi-model global climate projections (Coupled Model Intercomparison Project Phase 6) (49) to superimpose climate change signals onto present-day time series.

Maternal, Perinatal and Child Health Datasets Data Linkage

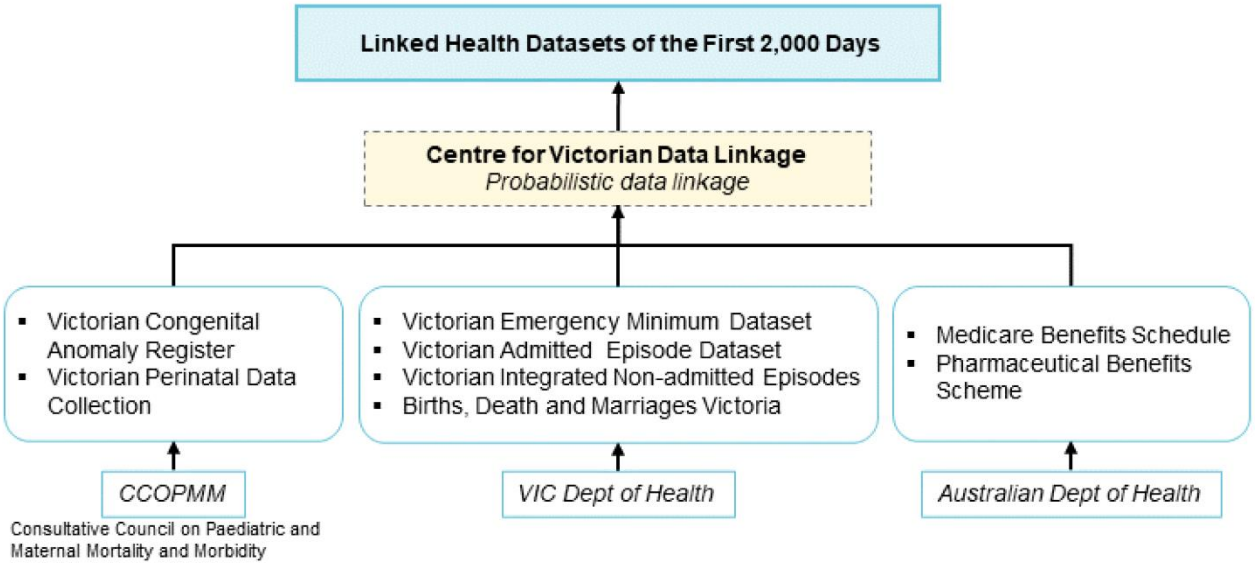
The Victorian Perinatal Data Collection is a state-wide maternity database that collects detailed demographic and health information including obstetric conditions, procedures and outcomes, neonatal morbidity, and congenital anomalies, as well as residential address and location of birth. The Victorian Congenital Anomalies Register collects data from a variety of notification sources, including paediatricians, maternal child health nurses and clinical laboratories. These two data collections are the legislative responsibility of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity. The Births, Death and Marriages Victoria register provides notifications of maternal and paediatric deaths after the perinatal period.

The Victorian Department of Health is the custodian of the Victorian Admitted Episodes Dataset, Victorian Emergency Minimum Dataset and Victorian Integrated Non-Admitted Health datasets. These are administrative datasets that collect demographic, administrative and ICD-coded clinical/diagnostic data on all hospital admissions, emergency department presentations and hospital outpatient episodes.

National datasets available for Victorian data linkage include the Pharmaceutical Benefits Scheme, which records claims for subsidised prescription medicines, and the Medicare Benefits Schedule, which details government-subsidised medical services, including consultations, surgeries, and diagnostic services.

When linked, these data sources will provide comprehensive state-wide profile of healthcare utilization during the first 2000 days across the public and the private hospital sectors.

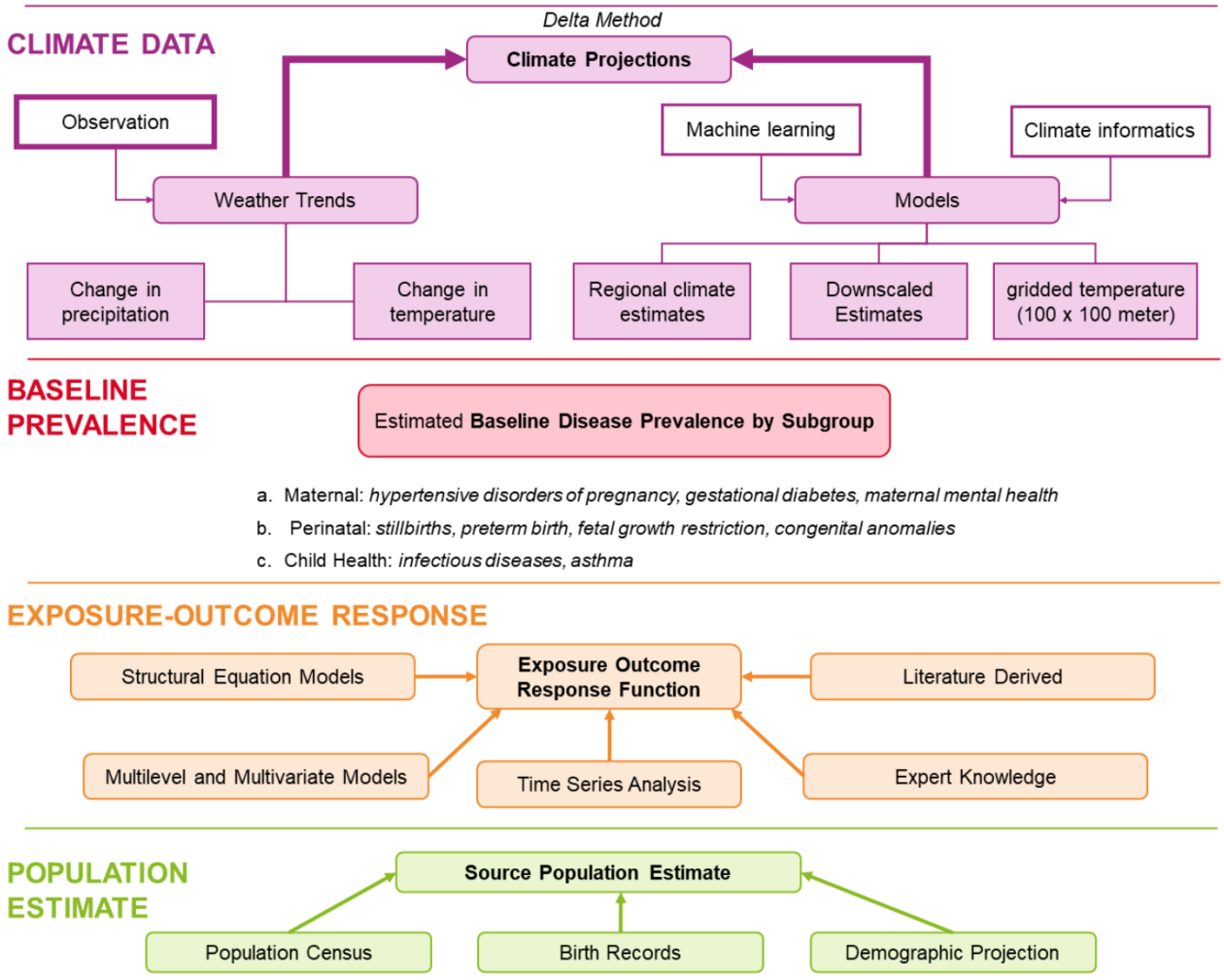
Figure 3. Health data linkage



Step 2. MODEL

We will use the methodological framework developed by United States Environmental Protection Agency for projecting climate-related disease burdens (50).

Figure 5. Disease Burden Calculations



Climate Data
We will use extensive environmental data augmented by our novel climate hazard datasets (Step 1). Nazarian, Nice, Mavoa and Sun will supervise the integration of high-resolution geospatial datasets with the health data at appropriate scales (e.g. 100 x 100m heat hazard). This will enable spatially explicit assessment of climate exposure and health outcome relationships.

Baseline Prevalence
Baseline prevalence of the conditions from linked health datasets from will come from step 1. This is needed for evaluating future disease burdens and the effectiveness of potential interventions.

Exposure-Outcome Response
We will identify exposure response functions for each climate hazard and health outcomes of interest. Where appropriate exposure response functions exist in the literature, we will use these. In other cases, we will use the approach described below to identify Victoria specific response functions.

Time Series Analysis will be applied to evaluate and project health trends over time, informed by historical climate patterns. We will define directed acyclic graphs (DAGs) for each research question to incorporate assumptions about the relationships between variables in the causal pathway. Structural Equation Models (SEM) will be informed by the DAGs and will identify multifaceted links between climate variables and health impacts that are part of complex causal networks. Multilevel and multivariable models will identify relationships between climate hazards and our health

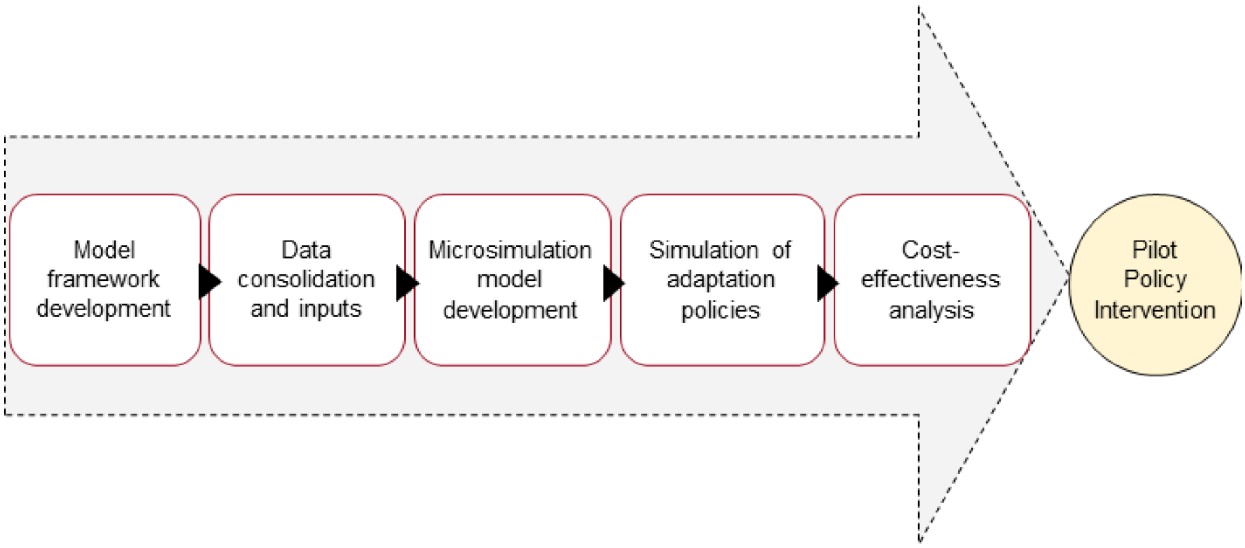
outcomes of interest, while also considering the broader environmental and demographic context, and the hierarchical nature of the data. Parsimonious models will be created based on the results of the SEMs.

Population Estimate
Demographic and climate hazard projections will determine the disparate impacts of climate hazards across various populations. Demographic projection data will come from sources such as the Australian Bureau of Statistics and Births, Death, and Marriages of Victoria.

Step 3. SIMULATION

Data consolidation and inputs will come from Steps 1 and 2. To assess the effectiveness of climate adaptation policies on maternal and perinatal health outcomes, we will develop a microsimulation model to simulate individual-level health outcomes over time, incorporating transition-based elements and Markov chains (51, 52). These features will enable us to robustly model the progression of health states in individuals arising from a variety of climate change scenarios and policy interventions.

Figure 6. Simulation modelling framework



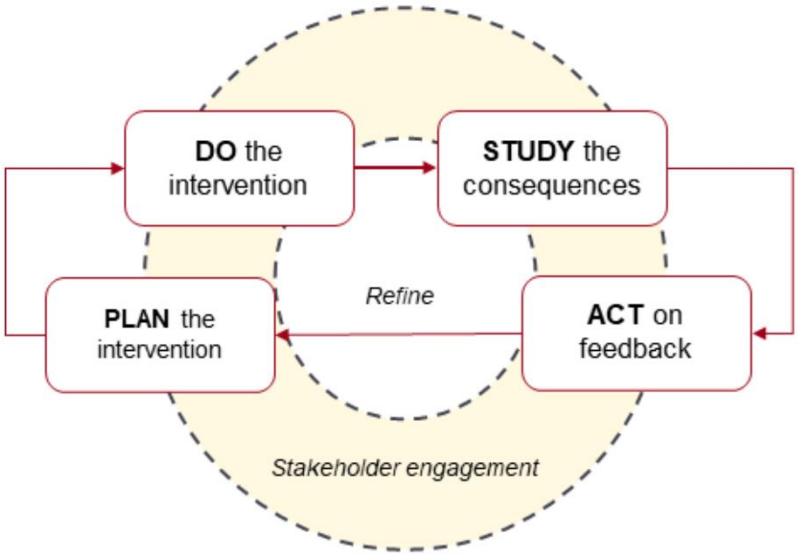
The simulation phase includes an effectiveness analysis to evaluate the economic feasibility of adaptation policies. The impacts of various scenarios (baseline case +/- interventions) will be assessed in terms of both health outcomes and economic costs. Co-applicant Marzan used simulated policy modelling in his PhD thesis and will apply the modified approach (53). Collaborators Hua and Dalziel will lead estimation of costs associated with the implementation of each policy and incremental costs of improvements, such as cost per case of preterm birth averted or averted hospital readmissions (54). Sensitivity analyses will test the reliability of simulated forecasts against data and assumption uncertainties.

Step 4. ACTION AND COMMUNICATIONS

We will incorporate the Plan-Do-Study-Act (PDSA) approach to pilot the interventions identified through the simulation in CHIL2000. Safer Care Victoria (SCV) has been using this method to implement key initiatives for quality and safety in Victoria with remarkable success and results (55). The PDSA cycle involves planning the intervention (Plan), implementing the intervention on a small scale (Do), observing and learning from the consequences (Study), and determining necessary adjustments (Act), which can then be tested in subsequent cycles(56). This iterative process allows for careful testing, evaluation, and refinement of adaptation strategies before their broader implementation.

“Next user” and healthcare consumer engagement is a critical part of the communication plan. We will work with our established clinician and consumer networks within the Maternity and Newborn Learning Health Network at SCV.

Figure 7. PDSA Cycles



CHALLENGES AND MITIGATION MEASURES

Our project faces several challenges. Data privacy and interoperability will be major issues. To address these, health datasets will be securely linked by the Centre for Victorian Data Linkage, safeguarding privacy. Interoperability issues will be addressed through the adoption of established coding standards like ICD-10-AM and use of common data models. Our team is well-versed in navigating data privacy regulations and ethical considerations during analysis and modelling.

Technical challenges associated with integrating novel methodologies will be mitigated by leveraging the University of Melbourne's data science infrastructure and our teams’ expertise to implement it. This approach ensures the effective handling of complex data and the application of advanced analytical techniques.

Securing stakeholder buy-in and aligning our recommendations with policy priorities are crucial for the project's impact. We have already engaged key government collaborators, as well obtaining the support of non-government stakeholders such as the National Preterm Birth Prevention Alliance and the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (see letters of recommendation). To ensure our findings and recommendations are acceptable and translated into policy within the project's timeframe, we will draw on established consumer networks in government and research and align our recommendations with government policy priorities.

SUMMARY

Safeguarding pregnant women and children during the "first 2000 days" of life is a critical priority for any climate health strategy. Our CHIL2000 initiative will provide a unique resource for evidence-based research and policy in maternal and child health and be a flagship for transdisciplinary collaboration.

TIMELINE

Figure 8. GANNT Chart

Activities	2025				2026				2027			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
CROSS-CUTTING THEMES												
Project inception report & plan & launch	X											
Ethics review	X	X										
Data governance assessment for data linkage (health)	X	X										
Data governance assessment for data linkage (geospatial)	X	X										
Consumer engagement	X	X	X	X	X	X	X	X	X	X	X	X
Public dissemination					X	X	X	X	X	X	X	X
Knowledge management	X	X	X	X	X	X	X	X	X	X	X	X
PLATFORM												
Building new climate change hazard datasets	X	X	X	X	X	X	X	X	X	X		
Maternal, perinatal and child health datasets data linkage	X	X	X	X	X	X	X	X	X	X	X	X
Geospatial data collection and integration	X	X	X	X	X	X	X	X	X	X	X	X
MODEL												
Literature review	X	X	X	X								
Climate integration and analysis			X	X	X	X	X	X	X	X		
Establishing baseline prevalence			X	X	X	X	X	X	X	X		
Exposure-outcome response function			X	X	X	X	X	X	X	X		
Demographic projections			X	X	X	X	X	X	X	X		
SIMULATION												
Literature review & framework development			X	X	X	X						
Data consolidation and inputs					X	X	X	X	X	X	X	X
Microsimulations (transition probability & Markov)					X	X	X	X	X	X	X	X
Effectiveness analysis					X	X	X	X	X	X	X	X
Cost-effectiveness analysis					X	X	X	X	X	X	X	X
ACTION & COMMUNICATION												
Forming an expert and consumer group	X	X										
Planning the interventions (plan)									X	X	X	X
Pilot implementations (do)									X	X	X	X
Learning from the consequences (study)									X	X	X	X
Determining necessary adjustments (act)									X	X	X	X

Additional information for **Grant reference: 311222/Z/24/Z**

This combined PDF document contains in order:

Collaborator letters of support

1. Co-signed letter of support from **Prof Mark Umstad** (Chair of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity, Safer Care Victoria) and **Adj Prof Karrie Long** (Chief Nursing and Midwifery Officer of Safer Care Victoria, Department of Health, Victorian Government, Australia)

2. Co-signed letter of support from **Ms Bronwyn Hogan** (consumer lead) and **Dr Penelope Sheehan** (clinical lead) of the Safer Care Victoria Maternity and Newborn Learning Health Network

Letters of recommendation

1. **Dr Gillian Gibson**, President of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)

2. **Professor John P Newnham AM**, 2020 Senior Australian of the Year, Professor of Obstetrics (Maternal Fetal Medicine), Division of Obstetrics and Gynaecology, School of Medicine, The University of Western Australia. Chair, The Australian Preterm Birth Prevention Alliance Interim Director, The Western Australian Centre for Heath Research for Women and Babies

The Wellcome Trust Climate Impacts Awards Committee: *Unlocking urgent climate action by making the health effects of climate change visible*

215 Euston Road London NW1 2BE

Date: 12/03/2024

Dear Committee Members,

RE: **Statement of Support for Prof Lisa Hui's application for a Wellcome Trust Climate Impacts Award: Grant reference: 311222/Z/24/Z**

"*Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days"*

I am writing to affirm the enthusiastic support of Safer Care Victoria and the Consultative Council on Obstetric and Paediatric Mortality and Morbidity for Prof Lisa Hui's application for a Wellcome Trust Climate Impacts Award.

Safer Care Victoria (SCV) is an Administrative Office of the Victorian Department of Health and is Victoria's leading authority for quality and safety in healthcare. The Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM) sits within SCV and is responsible for reviewing, investigating, and reporting on obstetric and paediatric mortality and morbidity and any related matters referred by the Minister for Health.

SCV recognises the benefits of academic-government partnerships and their potential to accelerate the generation of evidence to inform government policy. Prof Hui and Dr Marzan have already demonstrated their value to government policy makers in their secondment to SCV to examine the indirect impacts of the COVID-19 pandemic on maternal and newborn outcomes in Victoria. This current proposal represents a unique opportunity to leverage this existing partnership and to capitalize on Victoria's comprehensive health and environmental datasets to understand the impact of climate change on maternal and child health.

Victoria is facing increasing climate changes threats, including rising temperature, bushfires, drought, and floods. We recognize the particular vulnerability of pregnant people and young children to climate change, but lack the means to measure or monitor its impact on this population. More than 75,000 women give birth in Victorian hospitals each year, and our special care nurseries and neonatal intensive care currently support 10,000 babies each year. Preterm birth is the most common reason for

intensive care admission - **the emerging relationship between rising temperatures and preterm birth rates is a major concern for policy makers**.

This project **aligns with the key strategic priorities** highlighted in the Victorian Health and Human Services Climate Adaptation plan 2022-2026, including investing in "*a more robust evidence base on climate-related health impacts in Victoria"*. It also synergizes with the $154 million investment made by the government into the Victorian Women's Health and Wellbeing Program.

We will provide the following support for the project if successful:

- Provide ready access to Department of Health datasets subject to relevant legislative requirements
- Support from the Centre for Victorian Data Linkage and the Victorian Agency for Health Information for the data linkage
- Secondment of research staff to SCV to conduct the work within our Secure Data Vault
- Rapid incorporation of research outcomes into policy development and actions through the Plan-Do-Study-Act framework
- Engagement of SCV Maternity and Newborn Learning Health Network in co-design, co-production and implementation of policy outcomes
- Support the public communication strategy through the SCV Communication team

Yours sincerely,

Professor Mark P. Umstad AM

Chair, Consultative Council on Obstetric and Paediatric Mortality and Morbidity, Safer Care Victoria

Adj Professor Karrie Long

Chief Nurse and Midwifery Officer
Safer Care Victoria

Safer Care Victoria

The Wellcome Trust Climate Impacts Awards Committee: *Unlocking urgent climate action by making the health effects of climate change visible*

215 Euston Road London NW1 2BE

19 March 2024

Dear Committee Members,

RE: **Statement of Support for Prof Lisa Hui's application for a Wellcome Trust Climate Impacts Award: Grant reference: 311222/Z/24/Z**

"*Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days"*

We are writing as the clinical and consumer co-leads of Safer Care Victoria's Maternity and Newborn Learning Health Network (MNLHN) to confirm our enthusiastic support for this research proposal.

The MNLHN brings together consumers, clinicians and researchers to improve safety and quality of healthcare, experiences and outcomes for women receiving maternity care in Victoria.

Prof Hui and Dr Marzan are already well known to us through their contributions in the MNLHN Data Group, which provides expertise on data analytics including identification, interpretation, and use of data to support the work of the LHN.

Climate change is a major threat to the health of our community, and particularly pregnant people and newborns. This project proposal is an exciting opportunity to use our existing data collections to understand the health impacts of climate change, and to explore potential solutions for climate justice.

We confirm that we will provide the engagement of Safer Care Victoria's MNLHN for this project, including co-design of the research questions to be answered by the CCHIL2000, the policy interventions for simulation, and the dissemination of the results to health services and consumers.

Yours sincerely,

Bronwyn Hogan
MNLHN Consumer Lead

Penelope Sheehan
MNLHN Clinical Lead

OFFICIAL

RANZCOG™
Excellence in Women's Health

24 March 2024

The Wellcome Trust Climate Impacts Awards Committee:
Unlocking urgent climate action by making the health effects of climate change visible
215 Euston Road London NW1 2BE

Dear Committee Members,

Re: Statement of recommendation for Prof Lisa Hui's application for a Wellcome Trust Climate Impacts Award: Grant reference: 311222/Z/24/Z

"Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days"

I am writing to offer my wholehearted support to the grant application submitted by Professor Lisa Hui and colleagues from Victoria, Australia in my capacity as President of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG).

The RANZCOG is the leading national organisation involved in oversight of maternity services, with the responsibility for education and accreditation of medical practitioners in maternity care. The specific risks of climate change to pregnancy, the developing fetus, and the future health of children are emerging as a major element of our maternity care efforts, and as such RANZCOG is fully committed to supporting research into climate change impacts.

Professor Hui is RANZCOG-trained maternal fetal medicine specialist and a national leader in research and clinical care. She has been a longstanding contributor to our specialty and women's health through her work on College committees, invited talks at our annual scientific meetings, and clinical guideline development. She has received RANZCOG awards for her excellence in research. I highly recommend Professor Hui and her team to the Wellcome Trust Climate Awards scheme for their expertise and commitment to improving the health outcomes for families.

Yours sincerely,

Dr Gillian Gibson
President

THE ROYAL AUSTRALIAN AND NEW ZEALAND
COLLEGE OF OBSTETRICIANS AND GYNAECOLOGISTS
ABN 34 100 268 969

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web ranzcog.edu.au

AUSTRALIAN Preterm Birth Prevention ALLIANCE

22 March 2024

Wellcome Trust Climate Impacts Awards Committee
215 Euston Road
London NW1 2BE

Dear Committee Members,

Re: Statement of recommendation for Prof Lisa Hui's application for a Wellcome Trust Climate Impacts Award: Grant reference: 311222/Z/24/Z
"Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days

In my role of Chair of the Australian Preterm Birth Prevention Alliance, I am writing to offer my keen support to the grant application submitted by Prof Hui and colleagues from Victoria, Australia.

The Australian Preterm Birth Prevention Alliance is a national partnership of clinical leaders, researchers, health departments, and communities working together to safely lower the rate of early birth by implementing evidence-based clinical guidelines. Although we have made substantial progress in this mission, our understanding of preterm birth is incomplete, and thus our impact remains limited.

The role of climate change on preterm birth and stillbirth must be one of the most urgent research priorities in human health. As the driest continent on the planet, Australia is particularly vulnerable to these climate change threats. Understanding the impacts of climate change on human reproduction, and any mitigating or protective factors, is the first step to protecting our future generations.

Prof Hui is maternal fetal medicine specialist with an international reputation. Her team has demonstrated their research and policy leadership in maternity care, most notably, during the COVID-19 pandemic. I have no doubt that they have the expertise and stakeholder engagement to successfully deliver this project.

I wholeheartedly recommend this application team to the Wellcome Trust and their focus on maternal and early childhood health. The Alliance will be glad to support the dissemination of outcomes from this project and the incorporation of new evidence into national policy and practice.

Yours sincerely,

Professor John P Newnham AM
2020 Senior Australian of the Year
Professor of Obstetrics (Maternal Fetal Medicine),
Division of Obstetrics and Gynaecology, School of Medicine, The University of Western Australia.
Chair, The Australian Preterm Birth Prevention Alliance
Interim Director, The Western Australian Centre for Heath Research for Women and Babies

11 March 2024

Wellcome Trust Grant Committee
Gibbs Building
215 Euston Road
London NW1 2BE

RE: Wellcome Trust Climate Impact Award: Grant reference 311222/Z/24/Z– *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days*
Lead applicant: Professor Lisa Hui

To Whom It May Concern,

I am writing in emphatic support of Professor Lisa Hui's application for the Wellcome Trust Grant for the above project.

Prof Lisa Hui is an outstanding clinician-academic currently employed in the Department of Obstetrics, Gynaecology and Newborn Health at the University of Melbourne.

As a permanent, ongoing member of our team, I can confirm Prof Hui's contract will cover the duration of this project.

My team and I commit to providing all necessary support for Prof Hui, including allocating at least 20% of their current work time towards this project.

I further confirm our Department has the resources, capacity and relevant expertise to support this work. Our department is located within state-of-the-art facilities at the Mercy Hospital in Heidelberg, Victoria. We have ample research assistants and office space, all of which will be rallied in service of Prof Hui's successful project delivery.

Additionally, Prof Hui will continue to be provided with the support and mentorship of senior academics such as Prof Stephen Tong and myself.

We are committed to the career development of our researchers, and Prof Hui will be provided with 10 days a year to undertake training and professional development.

Should this application be successful, the Department will implement a robust project work design, ensuring Prof Hui and the team have a system of onboarding, embedding and planning.

We look forward to having the opportunity to actively support the endeavours of the project described in application, and wish Prof Hui every success in this application.

Sincerely,

Professor Sue Walker AO
MB BS MD *Melb.* DipRACOG FRANZCOG DDU CMFM
Head, Department of Obstetrics, Gynaecology and Newborn Health, University of Melbourne
Sheila Handbury Chair of Maternal Fetal Medicine
Director Perinatal Medicine, Mercy Hospital for Women

Postal address:
The University of Melbourne, Level 4
Mercy Hospital for Women
163 Studley Road, Heidelberg VIC 3084

Phone:
T: +61 3 8458 4381

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK

25 March 2024

Institutional Letter of Commitment

To whom it may concern,

The University of Melbourne University supports the participation of the below named researchers on the application titled *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days*.

Sponsor: Wellcome Trust
Scheme: Climate Impacts Awards: Unlocking urgent climate action by making the health effects of climate change visible
Applicants, University of Melbourne:
Professor Lisa Hui
Associate Professor Rosemary Boland
Dr Kerry Nice
Dr Melvin Marzan
Period of Performance: 01/01/2025 – 31/12/2027
Proposed direct Costs (AUD): $ 4,303,426
Proposed indirect/overhead costs (AUD): $ 530,574
Total request (AUD): $ 4,834,000

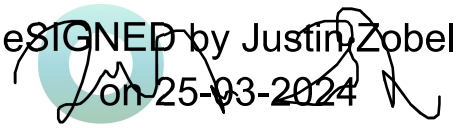
This letter also indicates that The University of Melbourne University will:

- Give the applicant the space and resources they'll need for the period of time that they are working on the grant.
- Give the applicant and any staff employed on the grant 10 days a year (pro rata if part-time) to undertake training and continuing professional development (CPD) in line with the Concordat to Support the Career Development of Researchers.
- Provide a system of onboarding, embedding and planning for the applicant when they join the organisation and/or start the award.
- Provide the applicant with the status and benefits of other academic staff of similar seniority.

- If teaching buyout is being requested, ensure that the applicant will retain at least 10% of their teaching time and that teaching buyout for the applicant is not being provided by other grants for the same period it is requested on this grant.

This statement is to confirm the intent of The University of Melbourne University to participate in the following study contingent upon the agreement of terms to be established between the two parties. The appropriate programmatic and administrative personnel involved in this grant application are aware of the sponsor's grant policy and are prepared to establish the necessary inter-institutional agreement(s) consistent with that policy.

Yours Sincerely,



Professor Justin Zobel
Acting Deputy Vice-Chancellor (Research)
The University of Melbourne

18 March 2024

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK

Re: Institutional letter of commitment

To whom it may concern,

The University of New South Wales supports **Dr Negin Nazarian's** participation the proposal led by The University of Melbourne, titled *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days*.

This statement is to confirm the intent of The University of New South Wales to participate in the following study contingent upon the agreement of terms to be established between the two parties.

Sponsor: Wellcome Trust
Scheme: Climate Impacts Awards: Unlocking urgent climate action by making the health effects of climate change visible
Project title: Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days
Lead, University of Melbourne: Professor Lisa Hui
Period of Performance: 01/01/2025 – 31/12/2027
Proposed direct Costs (AUD): $ 138,941
Proposed indirect/overhead costs (AUD): $ 20,841
Total request (AUD): $ 159,782

Institutional details are as follows:

Legal name: UNIVERSITY OF NEW SOUTH WALES
Address: Sydney NSW 2052
Administrative Contact: Debbie Docherty, Director, Research Grants and Contracts, rgc@unsw.edu.au

This letter also indicates that The University of New South Wales will:

- Give the applicant the space and resources they'll need for the period of time that they are working on the grant.
- Give the applicant and any staff employed on the grant 10 days a year (pro rata if part-time) to undertake training and continuing professional development (CPD) in line with the Concordat to Support the Career Development of Researchers.
- Provide a system of onboarding, embedding and planning for the applicant when they join the organisation and/or start the award.

- Provide the applicant with the status and benefits of other academic staff of similar seniority.
- If teaching buyout is being requested, ensure that the applicant will retain at least 10% of their teaching time and that teaching buyout for the applicant is not being provided by other grants for the same period it is requested on this grant.

The appropriate programmatic and administrative personnel involved in this grant application are aware of the sponsor's grant policy and are prepared to establish the necessary inter-institutional agreement(s) consistent with that policy.

Yours Sincerely,


Digitally signed by Kate McGeoch
Date: 2024.03.20 16:45:07 +11'00'

Name: Kate McGeoch
Title: Associate Director, Research Grants and Contracts
Contact Details: rgc@unsw.edu.au

LA TROBE UNIVERSITY
Research Office

Mailing address
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La Trobe University
Victoria 3086 Australia

T + 61 3 9479 1134
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E researchgrants@latrobe.edu.au
latrobe.edu.au

Wellcome Trust Grant
Gibbs Building
215 Euston Road
London NW1 2BE

Scheme: Climate Impacts Award 2024

13 March 2023

RE: Wellcome Trust Climate Impact Award: Grant reference 311222/Z/24/Z– *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days*

Lead Chief Investigator: Professor Lisa Hui, University of Melbourne

Institutional letter of commitment

To whom it may concern,

This statement is to confirm the intent of the Department of Public Health, School of Psychology and Public Health, La Trobe University, to support Merilyn Riley's participation in the application for the above project. Merilyn Riley is a permanent continuing staff member within the Digital Health and Information Management Cluster in the Department of Public Health. She is a Senior Lecturer and Co-ordinator of Partnerships within the Department.

The project aims to investigate the impacts of climate change on maternal and infant health within the first 2000 days of life through linkage of health and geospatial datasets. Epidemiological and geospatial modelling will be utilised to determine the health burden of climate change in a high income, urbanized population.

As a permanent continuing staff member we can confirm that Merilyn's terms of employment will cover the expected duration of the project e.g. 1/1/2025 – 31/12/2027. La Trobe University will provide the necessary support (outlined below), including allocating 20% of Merilyn's current work time towards the project, should the application be successful.

This letter also confirms that La Trobe University has the resources, capacity and relevant expertise to support this work.

- We affirm that Merilyn Riley will be given the space and resources needed for the period of time that they are working on the grant.
- Merilyn Riley will be given 10 days a year (pro rata if part-time) to undertake training and continuing professional development (CPD)

- We will provide a system of onboarding, embedding and planning for Merilyn Riley should this application be successful.
- Provide Merilyn Riley with the status and benefits of other academic staff of similar seniority.
- If teaching buyout is being requested, ensure that Merilyn Riley will retain at least 10% of their teaching time and that teaching buyout for the applicant is not being provided by other grants for the same period it is requested on this grant.

The appropriate programmatic and administrative personnel involved in this grant application are aware of the sponsor's grant policy and are prepared to establish the necessary inter-institutional agreement(s) consistent with that policy.

Please note that this statement is not intended to create legal or binding obligations on either party. It is intended as a record of the Institution's current intentions only.

Yours Sincerely,

Alistair Duncan (Mar 15, 2024 19:22 GMT+11)

Alistair Duncan
Executive Director, Research Office
La Trobe University
E: researchgrants@latrobe.edu.au
P: (03) 9479 1134

murdoch children's research institute

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK

25 March 2024

Institutional Letter of Commitment

To whom it may concern,

Murdoch Children's Research Institute (MCRI) supports **Professor David Burgner and Associate Professor Suzanne Mavoa's** participation in the proposal led by The University of Melbourne, titled *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days*.

This statement is to confirm the intent of MCRI to participate in the following study contingent upon the agreement of terms to be established between the two parties.

Sponsor: Wellcome Trust
Scheme: Climate Impacts Awards: Unlocking urgent climate action by making the health effects of climate change visible
Project title: Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days
Lead, University of Melbourne: Professor Lisa Hui
Period of Performance: 01/01/2025 – 31/12/2027
Proposed direct Costs (AUD): $ 376,517
Proposed indirect/overhead costs (AUD): $ 56,478
Total request (AUD): $ 432,995

Institutional details are as follows:

Murdoch Children's Research Institute
The Royal Children's Hospital, 50 Flemington Road
Parkville, Victoria 3052 Australia
T +61 3 8341 6200 **F** +61 3 9348 1391 **W** mcri.edu.au
ABN 21 006 566 972

murdoch children's research institute

Legal name: Murdoch Children's Research Institute
Address: Royal Children's Hospital, Flemington Road, Parkville, 3052, Australia
Administrative Contact: Ms Marianne Ciavarella, Head of Research Funding

This letter also indicates that MCRI will:

- Provide the applicants the space and resources they'll need for the period of time that they are working on the grant.
- Provide the applicant and any staff employed on the grant 10 days a year (pro rata if part-time) to undertake training and continuing professional development (CPD) in line with the Concordat to Support the Career Development of Researchers.
- Provide a system of onboarding, embedding and planning for the applicant when they join the organisation and/or start the award.
  - Provide the applicant with the status and benefits of other academic staff of similar seniority.
  - If teaching buyout is being requested, ensure that the applicant will retain at least 10% of their teaching time and that teaching buyout for the applicant is not being provided by other grants for the same period it is requested on this grant.

The appropriate programmatic and administrative personnel involved in this grant application are aware of the sponsor's grant policy and are prepared to establish the necessary inter-institutional agreement(s) consistent with that policy.

Yours Sincerely,

Mr Greg O'Brien
Chief Operating Officer
Murdoch Children's Research Institute

greg.obrien@mcri.edu.au

25 March 2024

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK

To whom it may concern:

As an Australian registered non-for-profit, the University of Melbourne supplements research funding according to the Research Funding, Costing and Pricing Policy (MPF 13477). This policy is waived for purposes of abiding by Wellcome Trust Funding Guidance for the project entitled: *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days.* Find below a summary of overhead costs that have been identified as specifically supporting this project (in AUD):

Research grant administration	$ 159,172
Finance and accounting services	$ 159,172
Departmental administrative support	$ 106,115
Building and office maintenance	$ 79,586
Utilities	$ 26,529
Total	**$530,574**

I confirm that this breakdown is a true representation of the costs incurred, and there is no alternate source of funding. does not exceed 15% of the University of Melbourne portion of the project budget, and that these costs are necessary for the project's success.

Kind regards,

eSIGNED by Justin Zobel
on 25-03-2024

Professor Justin Zobel
Acting Deputy Vice Chancellor, Research
The University of Melbourne

Postal address:
Alan Gilbert Building, Level 5
161 Barry Street, Victoria 3010 Australia

Phone:
+61 9035 S943

LA TROBE UNIVERSITY
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Victoria 3086 Australia

T + 61 3 9479 1134
F + 61 3 9479 1464
E researchgrants@latrobe.edu.au
latrobe.edu.au

18 March 2024

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK

To whom it may concern:

La Trobe University is pleased to be partner on the grant application entitled *Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days.*

We confirm that the overhead funding of $22,631 AUD requested will be spent on below activities over the life of the grant:

- Research grant administration
- Finance and accounting services
- Departmental administrative support
- Library services
- Building and office maintenance
- Utilities

This does not exceed 15% of the La Trobe University portion of the project budget and these costs are necessary for the project's success.

Kind regards,

Jodie Banfield

Jodie Banfield, CFO
Email: j.banfield@latrobe.edu.au
Phone: +613 9479 1090

ABN 64 804 735 113
CRICOS Provider 00115M

25 March 2024

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK

To whom it may concern:

Find below a summary of overhead costs for Murdoch Children's Research Institute (MCRI) that have been identified as specifically supporting this project (in AUD):

Research grant administration	$ 1,682
Finance and accounting services	$ 6,647
Departmental administrative support	$ 36,608
Library services	$ 153
Building and office maintenance	$ 6,070
Utilities	$ 5,318
Total	**$56,478**

I confirm that this breakdown is a true representation of the costs incurred, and there is no alternate source of funding. This amount does not exceed 15% of MCRI's portion of the project budget, and that these costs are necessary for the project's success.

Kind regards,

Aaron Stork
Head of Finance
Aaron.Stork@mcri.edu.au
0469 964 284

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE

21 March 2024

Dear Wellcome Trust,

Re: Justification of overheads requested by UNSW – Dr Negin Nazarian

Project title: Climate-Resilient Futures: Integrating Big Data, Geospatial Innovations, and Epidemiological Insights to Safeguard Maternal and Child Health Through the First 2000 Days
Grant Type: **Climate Impacts Awards**

On behalf of The University of New South Wales (UNSW), I confirm that the overhead costs as stated in the application are a true representation of the Indirect Cost Recovery (ICR) incurred for Dr Negin Nazarian's funding request to the Wellcome Trust.

ICR covers the support UNSW provides for projects. This includes research infrastructure, facilities and services that are used to undertake relevant projects including the provision and maintenance of buildings and physical infrastructure, information resources and technology, UNSW libraries, telecommunications, insurance and legal services, financial management services, security, knowledge exchange, research management and support services, other central and faculty administrative services.

A rate is applied to all projects undertaken at UNSW. The actual rate is commercial in confidence to UNSW. UNSW is hereby requesting 15% of direct costs in overheads, the limit allowable under the guidelines, because UNSW rules require overheads are requested where eligible as a publicly funded organisation.

The total ICR is costed at **AUD$20,841** comprising the following components:

- Information technology, including personnel and infrastructure to support the program (AUD$5,210.25)
- Financial services to manage funding and transfer of funds (AUD$3,959.79)
- Research office and contracts personnel to manage the grant (AUD$4,585.02)
- Insurance, including legal personnel (AUD$3,959.79)
- Overheads for buildings and office space (AUD$3,126.15)

UNSW reports Higher education expenditure on R&D to the Australian Government's Department of Education, Skills and Employment. Dataset reports on expenditure and human resources devoted to research and development (R&D) can be downloaded here https://www.dese.gov.au/research-block-grants/resources/higher-education-expenditure-rd-herd-university

Please find below contact details for UNSW Research Grants & Contracts Office should you require anything further:

Research Office contact: Debbie Docherty – Director, Research Grants & Contracts
Institution: The University of New South Wales
Phone: +61 2 9065 8491
Email: rgc@unsw.edu.au

Yours sincerely,

Marie Saparamadu

Digitally signed by Marie Saparamadu
Date: 2024.03.21 09:00:02 +11'00'

Marie Saparamadu
Associate Director, Research & Revenue Accounting
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E: m.saparamadu@unsw.edu.au