Heart Foundation

Impact Report 2023

Contents

Message from the CEO

At the National Heart Foundation, we are dedicated to saving lives and improving heart health through research.

I am thrilled to present this impact report, which celebrates the remarkable achievements of our research community and underscores the difference that Heart Foundation-funded projects make in the lives of Australians. For over six decades, the Heart Foundation has proudly supported Australia's brightest cardiovascular researchers, investing over $750 million in pioneering research aimed at transforming cardiovascular health. Through the generous support of our donors, we have driven discoveries that bring us closer to better treatments, innovative prevention strategies, and ultimately, a future free of heart disease. Our researchers are part of an exceptional network, conducting some of the most impactful research in cardiovascular science. Many recipients of Heart Foundation grants have gone on to lead distinguished careers, making meaningful contributions not only in Australia but across the globe.
Each breakthrough in this report reflects the dedication, passion, and resilience of researchers committed to improving the lives of Australians affected by heart disease.

We extend our deepest gratitude to our donors, who make this work possible. Your support drives advancements in cardiovascular health and empowers a thriving community of researchers making a difference every day. Together, we are building a healthier future for all.

Sincerely,

David Lloyd
Chief Executive Officer,
Heart Foundation

Acknowledgment of Country

The Heart Foundation acknowledges the Traditional Owners and custodians of country throughout Australia and their continuing connection to land, waters and community. We pay our respect to them, their cultures, and Elders past, present and emerging.

2023 *research impacts* at a glance

Advancing knowledge

This report covers impacts from 184 research projects and represents over $44 million in research funding expenditure over six years. The majority of respondents were Vanguard Grant recipients and had either Biomedical or Clinical research projects.

771
Publications

1189
Citations

38
Databases

105
Keynotes & Plenaries

189
International Presentations

343
Academic presentations

20
Public Presentations

2
Commissioned Reports

67%
Proportion of projects involving consumers/ community

Significant Accomplishments

Including WA CVD Researcher of the Year, Young Tall Poppy recipients and Inspiring Women in STEM

Research capacity building

Strengthening cardiovascular research skills and resources

193
PhD students supervised

118
Post doctoral and mid-career researchers supervised

59
Memberships on peer review committees

Nearly $70 million
Additional funding leveraged commencing in 2023

2023 *research impacts* at a glance

Informed decision making

Shaping evidence-informed changes to cardiovascular policy and practice

Changes to guidelines and policy

Examples include physical activity in childhood, clinical practice guidelines and banning genetic testing in insurance underwriting

Clinical practice changes

Such as supporting a new model of genetic testing for inherited heart disease in NSW and WA

Partnerships with changemakers

Queensland and NT Health, med tech companies like XVIVO

11 Memberships on government and non-government advisory committees

Health, social and economic impacts

Translating research to ‘real world’ impacts

7 New Health Products

Including a website supporting Heart Checks and repurposing old medications with cardioprotective effects

23 Trials

Patents

6 pending patent applications

2 provisional patents

2 granted

13 New Health Products or Programs

Such as machine learning to support physical activity and world’s first program targeting Aboriginal fathers and children to improve lifestyle behaviours

Researcher spotlight

Showcasing the impactful work of Heart Foundation-funded researchers

Testing new technology for targeted treatments

Dr Richard Tan

Dr Richard Tan is a researcher based at the University of Sydney and a 2022 Heart Foundation Postdoctoral Fellowship recipient. Dr Tan works at the interface of immunobiology and engineering, focusing on developing technology for the targeted delivery of immunotherapies to treat vascular disease.

Key impacts: Patents, knowledge, start-up, additional funding, capacity building

Inflammation plays an important role in the development and progression of cardiovascular disease (CVD)[1,2], but it can be hard to treat effectively and directly[3].

Research by Postdoctoral Fellowship recipient, Dr Richard Tan, is breaking new ground on developing targeted therapies to address inflammation associated with cardiovascular disease. His work aims to maximise the therapeutic benefits of anti-inflammatory treatments for vascular disease while minimising any impacts on the broader immune system.

Standard treatment for vascular disease typically involves immunotherapy delivered systemically, which can impact normal immune function and increase the risk of infection[4]. More targeted delivery of immunotherapy may help us to harness its anti-inflammatory benefits without impacting the wider system[5].

Dr Tan's work has helped develop new knowledge and the technology to deliver targeted immunotherapy. His approach is twofold, leveraging new nanoparticle technology to ensure that immunotherapy 'sticks' to diseased blood vessels while developing new devices to enhance existing endovascular procedures.

Endovascular treatment is a common treatment for vascular disease that uses catheters to reach arteries and veins[4]. Although effective, this procedure may have to be repeated regularly to maximise its therapeutic effect.

Dr Tan's research aims to enhance endovascular treatment by extending its longevity while minimising its impact on the immune system. As part of a start up to drive commercialisation of this technology, Dr Tan works closely with medical device companies to ensure its effectiveness and acceptance among clinicians.

The Heart Foundation Postdoctoral Fellowship has been a launching pad for Dr Tan's research independence, building his capacity to lead a research team, and providing the opportunity to pilot new technologies and leverage additional funding to strengthen the evidence base, including a Heart Foundation Vanguard Grant in 2023.

Developing an innovative chatbot-delivered physical activity intervention

Professor Corneel Vandelanotte

Professor Corneel Vandelanotte is based at Central Queensland University and is a 2021 Heart Foundation Vanguard Grant recipient. His work aims to leverage modern technologies to support preventive health strategies at a population level.

Key impacts: New technology, cost-effective intervention, behaviour change

Changing physical activity behaviour remains a complex challenge in cardiovascular health[6], but new artificial intelligence technology is being used to 'nudge' behaviour change in the right direction.

Prof Corneel Vandelanotte, a 2021 Vanguard Grant recipient, has led the development of an innovative, machine-learning-based chatbot to promote physical activity. The tool is designed to deliver evidence-based strategies to promote behaviour change, including goal setting, use of nudges and tailored advice[7].

Machine-learning-based chatbots use real-time data (e.g. from activity trackers) and apply advanced language processing to provide personalised physical activity support. The app delivers physical activity counselling based on user preferences and needs.

This work is targeted specifically at people who are at greatest risk of cardiovascular disease including people who are physically inactive and both environmentally- and time-constrained. The tool provides both an accessible and cost-effective approach to support behaviour change in physical activity.

As part of this research, Prof Vandelanotte's team has commenced an ecological trial to collect real-word data about how people engage with the app. If effective at increasing physical activity levels, this app could be widely disseminated to promote physical activity for cardiovascular disease prevention.

This technology would be a low-cost and accessible offering that could be part of a multi-strategy plan to address physical inactivity in Australia. Data from this Vanguard Grant-funded project has supported Prof Vandelanotte in securing grants for larger trials, with sights on partnering with the industry to implement on a larger scale.

Transforming cardiac arrest care - the right patient, the right technology and the right care model

Associate Professor Mark Dennis

Associate Professor Mark Dennis is a cardiologist and researcher whose work focuses on acute cardiovascular care. He is based at the University of Sydney and is a recipient of a 2021 Heart Foundation Postdoctoral Fellowship.

Key impacts: Equity, technology, changes to treatment

During cardiac arrest, getting the right treatment at the right time is potentially lifesaving[8]. A/Prof Mark Dennis, a 2021 Postdoctoral Fellowship recipient, is working to maximise treatment outcomes by mapping the right care model for people with cardiac arrest.

Extracorporeal membrane oxygenation, or ECMO, is an intervention used during cardiac arrest that helps maintain adequate blood supply to the body and brain[9]. This treatment is potentially lifesaving but is extremely costly to deliver and having access to it depends on where a person lives[10].

Currently, ECMO machines are only available at a subset of hospitals in Sydney[11], leading to potentially inconsistent and inequitable access to treatment. Given the time-sensitive nature of this treatment, having it available at the hospital might mean it's too late for some people.

As part of his postdoctoral research, A/Prof Dennis is leading work to map access to ECMO and exploring alternative delivery models of this intervention to ensure it is equitable, appropriate and sustainable. Although placing these machines in all hospitals may seem like the best way to ensure equitable access, geo-spatial modelling led by A/Prof Dennis suggests that this is unlikely to truly address unmet needs in an efficient and sustainable way[12].

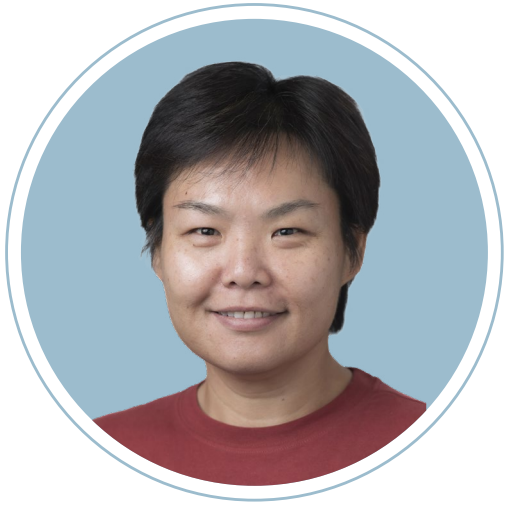
Cardiac care should be accessible to all, and improving its delivery may save lives and enhance feasibility. For example, having extracorporeal cardiopulmonary resuscitation (ECPR) delivered by trained specialists in the community who can administer care on-site, rather than relying solely on those who are stationed at hospitals, could save precious time in providing this critical intervention.

To support this model, Dr Dennis has integrated learnings from similar programs internationally and has been involved in developing specialised training to support alternative ECPR delivery methods.

A/Prof Dennis and his team are currently running a feasibility study to test how access to ECMO can be scaled in a way that is equitable and affordable. These learnings combined with trials overseas[13,14] have the potential to save lives and improve the cost-efficiency of this lifesaving treatment in Australia.

Modulating the brain-gut axis to improve stroke outcomes

Associate Professor Connie Wong



Associate Prof Connie Wong is based at Monash University, investigating stroke and its associated inflammatory response. She is a 2022 Heart Foundation Vanguard Grant recipient.

Key impacts: New treatment approaches, changes to clinical practice

'Leaky gut', or the passing of food particles from the gut to the bloodstream, has gained popularity in health media and research. However, the impact of cardiovascular events, such as stroke, on the gut is a more recent and emerging area of study[15].

Many people who have a stroke often experience infection-related complications[16], though the causes of post-stroke infection are complex and require further research[17].

A/Prof Wong's work has helped us better understand the connection between the gut microbiome which is the collection of microbes that live in the gastrointestinal symptoms and post-stroke infections[18]. Her research tells us that many people experience poor gut function post-stroke, and bacteria that escape the gut often find its way to the lungs, which are particularly vulnerable after an event that impacts blood flow to the brain[19]. This can lead to complications like infections or pneumonia, significantly hindering recovery for people with stroke[16].

A/Prof Wong is leading research to understand why these complications happen, identify the source of bacteria, and determine the best ways to prevent or treat these occurrences[19]. By identifying the source of bacteria and understanding the process by which infections occur, this lays the foundation for advancing prevention and management strategies for stroke.

This research was instrumental in securing additional funding, including a Heart Foundation Future Leader Fellowship in 2023, where A/Prof Wong will continue to translate her discoveries into clinical applications that can improve the quality of life for stroke survivors.

Managing atrial fibrillation burden and atrial remodelling - role of cardiorespiratory fitness and exercise training

Dr Adrian Elliot

Dr Adrian Elliott is based at The University of Adelaide, where he is leading work focusing on atrial fibrillation, heart failure, and physical inactivity. He received a 2020 Heart Foundation Future Leader Fellowship.

Key impacts: Behaviour change, changes to clinical guidelines

Exercise is a well-known management strategy for various cardiovascular diseases[20], but does it play a part in managing electrical problems in the heart?

The left atrium, one of the four chambers of the heart, plays a crucial role in cardiac function, as it holds blood returning from the lungs and supplies blood to other parts of the heart[21]. Changes in the left atrium can affect cardiovascular disease risk and related outcomes, such as hospitalisations and exercise intolerance[22,23].

Dr Adrian Elliott's work has found that exercise can improve the function of the left atrium[24]. For example, exercise can increase the amount of blood leaving the heart when it contracts. It can also help improve outcomes for people with an irregular or often fast heartbeat, called atrial fibrillation (AF). Exercise can both reduce the risk of AF and improve outcomes for people with existing AF[24].

Typically, AF is treated with medicines or procedures that address electrical problems in the heart. These treatments can be invasive, may have side effects, and often have to be repeated[25]. However, Dr Elliott's work has helped to demonstrate that lifestyle modifications can be just as - or more - effective than other treatments[26,27]. Dr Elliott's research is also building our understanding of how fitness can reduce a person's risk of AF.

These findings have led to changes in the clinical guideline for AF management. Results from the randomised controlled trial led by Dr Elliott, the ACTIVE-AF RCT, and now cited in the American clinical guidelines[28], have directly linked Heart Foundation-funded research to changes in the management of AF.

The next steps include testing an extended exercise program and exploring ways that the cardiac rehabilitation model can be refined to incorporate the best evidence on physical activity.

Genetic protection against cardiovascular disease

Professor Paul Lacaze

Professor Lacaze is based at Monash University working in public health genomics and population DNA screening. He received 2019 and 2023 Heart Foundation Future Leader Fellowships.

Key impacts: Prevention, changes to guidelines/clinical practice

Genetics can determine our eye colour, hair colour, and shape many things about our health, including our cardiovascular risk or protective factors[29]. Our genes can also tell us about the treatments that might be most effective for us[30].

Prof Paul Lacaze, a Heart Foundation Future Leader Fellow, has conducted genetic analysis of one of Australia's largest healthy elderly cohorts, the ASPREE cohort[31]. This genomic cohort consists of 15,000 healthy people in Australia aged 70 or over who did not have cardiovascular disease (CVD) at enrolment.

Genomic analysis of this cohort reveals that some ASPREE participants have a high genetic risk for CVD but remain unaffected, suggesting that they also carry protective genetic factors.

Investigating these protective genes has helped us discover genes that can prevent CVD[32]. Understanding these genes can inform potential therapeutic strategies and further research in younger populations, so that we can better identify people at risk and enhance prevention and management strategies.

Prof Lacaze's research continues under a 2023 Future Leader Fellowship, focusing on DNA screening in young adults to support early detection and prevention of coronary heart disease.

This work has significant potential for impact and could lead to the development of a future DNA-based preventative screening program, comparable to bowel cancer screening. Importantly, genetic screening could identify hidden risks to support people in Australia to take action to reduce their risk of CVD.

Given the burden of CVD in Australia, early detection and intervention could be both cost-effective and lifesaving.

Understanding the adverse cardio-metabolic effects of glucocorticoids – the clinical and biological determinants

Dr Angela Xun-Nan Chen

Dr Angela Xun-Nan Chen is an endocrinologist and Research Fellow at Flinders University and the George Institute for Global Health. She studies the cardiometabolic consequences of glucocorticoid excess and received a 2019 Heart Foundation Health Professional Scholarship.

Key impacts: Changes to clinical practice

While high blood sugar (or glucose) levels are often associated with diabetes, research tells us that poorly managed blood sugar levels also have a significant impact on heart health[33].

Glucocorticoids are hormones secreted by the adrenal glands that play an important role in glucose metabolism[34]. When present in excess, glucocorticoids can increase CVD risk by contributing to the development of diabetes or obesity[33,35].

Synthetic glucocorticoids are commonly prescribed to treat conditions like autoimmune or inflammatory disorders[36]. Unfortunately, a side effect of this medicine is an increase in blood sugar levels[37]. If not managed effectively, this can increase the risk of other health complications, including poor cardiovascular outcomes. Although this impacts a relatively small group of people, their treatment is very costly and their risk for complications is high.

Work led by Dr Angela Xun-Nan Chen aims to better understand the mechanisms that underpin glucocorticoid excess, obesity and CVD to improve management strategies and reduce the risk of poor outcomes[38].

Dr Chen has identified an improved process for calculating a person's insulin requirements, which can enhance blood sugar management and health outcomes[39]. This simple modification could transform standard clinical practice, helping to reduce the risk of cardiovascular events in hospitalised patients.

Her research also raises awareness of the downstream impacts of this medicine, allowing for earlier prevention and intervention.

Improving cardiovascular health through walking and cycling for transport - advancing understanding of active commuting behaviours among adults

Associate Professor Verity Cleland

Verity Cleland is an Associate Professor at the Menzies Institute for Medical Research, University of Tasmania and received a 2020 Heart Foundation Future Leader Fellowship. Her work focuses on physical inactivity and active transportation.

Key impacts: Behaviour change, policy change

A '15-minute city', where daily necessities and services are all within a 15-minute walk, has been praised for its potential health benefits and improved walkability[40].

But what about more regional communities where their local community is spread beyond the 15-minute boundary?

Active transport – for example walking or cycling to work or school – is a feasible and practical way to increase physical activity. But there remain challenges to ensuring this is possible and practical for all communities.

A/Prof Verity Cleland, a 2020 Future Leader Fellow, leads a portfolio of work that aims to address inadequate physical activity through active transport, particularly in non-urban areas[41]. Her research seeks to improve our understanding of barriers and facilitators to active transport, its impacts on cardiovascular health, and interventions to increase transport-related physical activity[42,43]. A/Prof Cleland and her team's research targets three levels – people, place, and policy.

At the people level, her work uses cohort studies to identify patterns and predictors of physical activity over time, and intervention studies to see the effect of financial incentives on physical activity. In terms of place, she has worked with regional communities to map their towns' walkability and develop reports to advocate for improvements to the built environment.

At a policy level, she advocates for greater investment in transportation infrastructure to make transport-related physical activity accessible for all people in Australia.

She is also currently reviewing transport-related physical activity policy in Tasmania and supporting parallel pieces of work around Australia.

In addition to her research activities, Associate Professor Cleland is an active advocate for policy change, collaborating with governments and policy makers to promote positive changes that will benefit individuals and communities.

By addressing the contexts in which people live and work, A/Prof. Cleland's research is making strides in CVD prevention and contributing to meaningful policy and practice changes.

Testing the feasibility of banning energy drink sales to children to protect their heart health

Professor Gina Trapp

Professor Gina Trapp is Head of Food and Nutrition Research at the Telethon Kids Institute. She works in nutrition and public health, with a focus on environments to support behaviour change and is the recipient of a 2021 Heart Foundation Vanguard Grant.

Key impacts: Behaviour change, policy change

To safeguard their health, young people are banned from accessing risky substances like tobacco and alcohol. However, in most places in Australia, there are no restrictions on the purchase and consumption of energy drinks by young people.

Prof Gina Trapp is a leading researcher investigating energy drink consumption among young people. Her previous work has identified that side effects from consuming energy drinks (e.g. heart palpitations, hypertension or cardiac arrest) are not uncommon[44].

Her research has caught the attention of members of the community, who were witnessing these problems among young people in their own neighbourhoods. This formed the basis of Prof Trapp's Heart Foundation Vanguard Grant-funded project, which enabled her to test the impact of a voluntary energy drink ban in a regional Western Australian town.

With the support of the community, change champions and retailers, the town underwent a four-month trial ban.

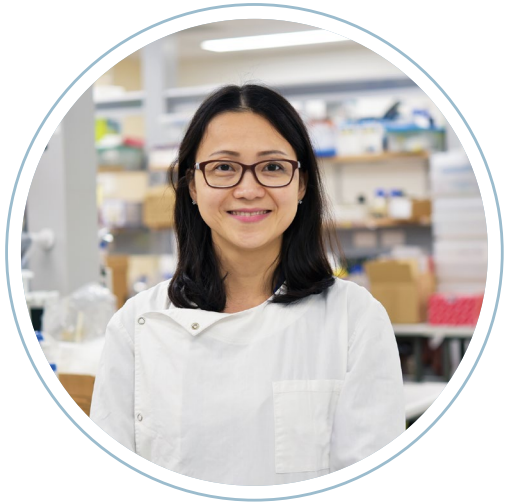
Prof Trapp and her team captured the experience, health and sales data during this period, and compared these metrics with a control community who had not implemented the ban. Following the end of the trial ban, the community unanimously voted to keep the ban in place. While the impacts for this community and the health of their young people are clear, the results also have broader implications for the rest of Australia.

The Vanguard funding allowed the team to develop a framework for engaging communities and implementing the ban, paving the way for a larger study. The funding also supported Prof Trapp in demonstrating proof of concept, and that this ban is acceptable to the community. Community acceptability, combined with cost-effectiveness, are critical factors when advocating for policy change.

Prof Trapp has been invited to share her learnings and delivered an Oration at the Public Health Association of Australia conference in September 2024.

Smart nanomedicine with diagnostic sensor and stimuli-responsive treatment mechanisms for cardiovascular diseases

Professor Hang Ta



Professor Hang Ta is a 2019 Heart Foundation Future Leader Fellowship recipient and researcher at Griffith University. She works on identifying nanomaterials for the diagnosis and treatment of cardiovascular diseases.

Key impacts: New technology, patents

Thrombosis, a blood clotting disorder, and atherosclerosis, the buildup of plaque in artery walls, are among the leading causes of cardiovascular death in Australia[45].

Detecting and treating these conditions can be challenging due to their microscopic nature, often requiring systemic imaging and medicines that come with adverse side effects. For example, current treatments for thrombosis suppress clotting throughout the whole body, which can lead to other unintended complications.

Prof Hang Ta's work aims to make the identification and treatment of cardiovascular diseases (CVDs) more targeted and less invasive. As a 2019 Future Leader fellow, her research is focused on identifying nanomaterials to support the diagnosis and treatment of CVD.

Nanoparticles, which range from 1 to 100 nanometres in diameter, are extremely small but versatile materials. By using binding agents, nanoparticles can attach to receptors on diseased areas of the body to 'guide' specific interventions, such as imaging or delivery of medicines.

Prof Ta's research has identified several nanoparticles and technologies that can improve the imaging, diagnosis and treatment of CVDs[46,47]. These findings can facilitate early intervention in vulnerable plaques, support personalised cardiovascular care, and may also have broader applications for treating other diseases, like cancer.

The Heart Foundation Fellowship has led to partnerships with the industry, enabling these technologies potential to be tested in larger animal models and bringing them one step closer to human clinical trials.

In addition, this work has formed the basis of several patent applications and has led to new areas of exploration, including the oral administration of nanoparticles. Prof Ta will continue this research as an Australian Research Council (ARC) Future Fellow, building on the work completed during her Heart Foundation Fellowship.

Vegetable types and their bioactives - growing the evidence for cardiovascular health benefits

Dr Lauren Blekkenhorst

Dr Lauren Blekkenhorst is a 2019 Heart Foundation Postdoctoral Fellow based at Edith Cowan University. Her work focuses on maximising health and heart benefits through dietary approaches.

Key impacts: Clinical practice, education

Vegetables have been long regarded as an essential part of a healthy diet, playing a key role in disease prevention, including CVD[48]. But are all vegetables created equal when it comes to risk reduction?

Despite their known health benefits, vegetable consumption in Australia is low[49]. Identifying which vegetables offer the greatest 'bang for buck' may be a more feasible way to promote consumption and reap their health benefits.

Dr Lauren Blekkenhorst is a Heart Foundation-funded Postdoctoral Fellow, whose research examines the vascular and metabolic benefits of vegetables and their bioactive components. Her work aims to increase vegetable consumption in the general population, and to identify which vegetables may be most beneficial to heart health.

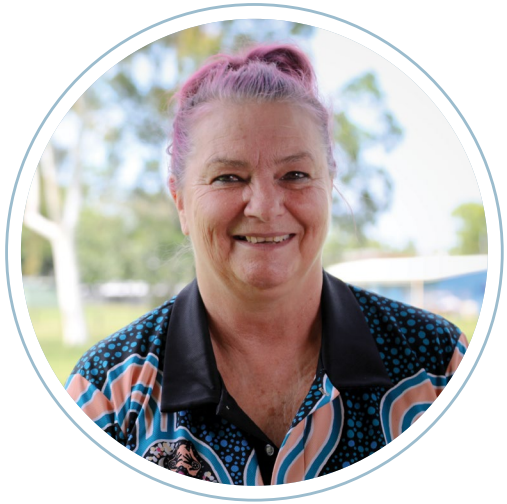
Her current research builds on her PhD, which identified the strong, positive link between cruciferous vegetables, allium and leafy greens on cardiovascular health[50]. Her postdoctoral funding has enabled her to explore why these vegetables are particularly beneficial for heart health, which can help support more targeted messaging and dietary interventions for CVD prevention.

The Heart Foundation Postdoctoral Fellowship has enabled Dr Blekkenhorst to build her lab, where she now supervises three PhD students. Building this capacity helps extend the knowledge in this area and has also supported Dr Blekkenhorst in leveraging additional funding as an associate investigator.

Diet is a modifiable risk factor for CVD, but behaviour change is challenging without systemic change. Dr Blekkenhorst hopes that improving our understanding of heart health-boosting bioactives can help guide nutrition education, generate standardised nutrition information for cardiovascular health and inform nutrition policy related to CVD.

Beyond the scars - impacts of rheumatic heart disease in young First Nations peoples

Associate Professor Vicki Wade



Associate Prof Vicki Wade is a 2021 Aboriginal and Torres Strait Islander Award recipient based at the Menzies School of Health Research. Her work focuses on the impact of rheumatic heart disease in young Aboriginal and/or Torres Strait Islander peoples.

Key impacts: Capacity building, changes to clinical practice

The health, wellbeing, and cultural safety of Aboriginal and Torres Strait Islander peoples in Australia is an urgent priority. CVD is among the leading contributors of preventable disease burden among Aboriginal and Torres Strait Islander peoples in Australia[51]. It is also a major factor in the life expectancy gap between First Nations and non-First Nations peoples[51].

A/Prof Vicki Wade, a recipient of the Heart Foundation Aboriginal and Torres Strait Islander Award, is working to improve our understanding of the social and emotional needs of Aboriginal and Torres Strait Islander peoples in managing rheumatic heart disease (RHD).

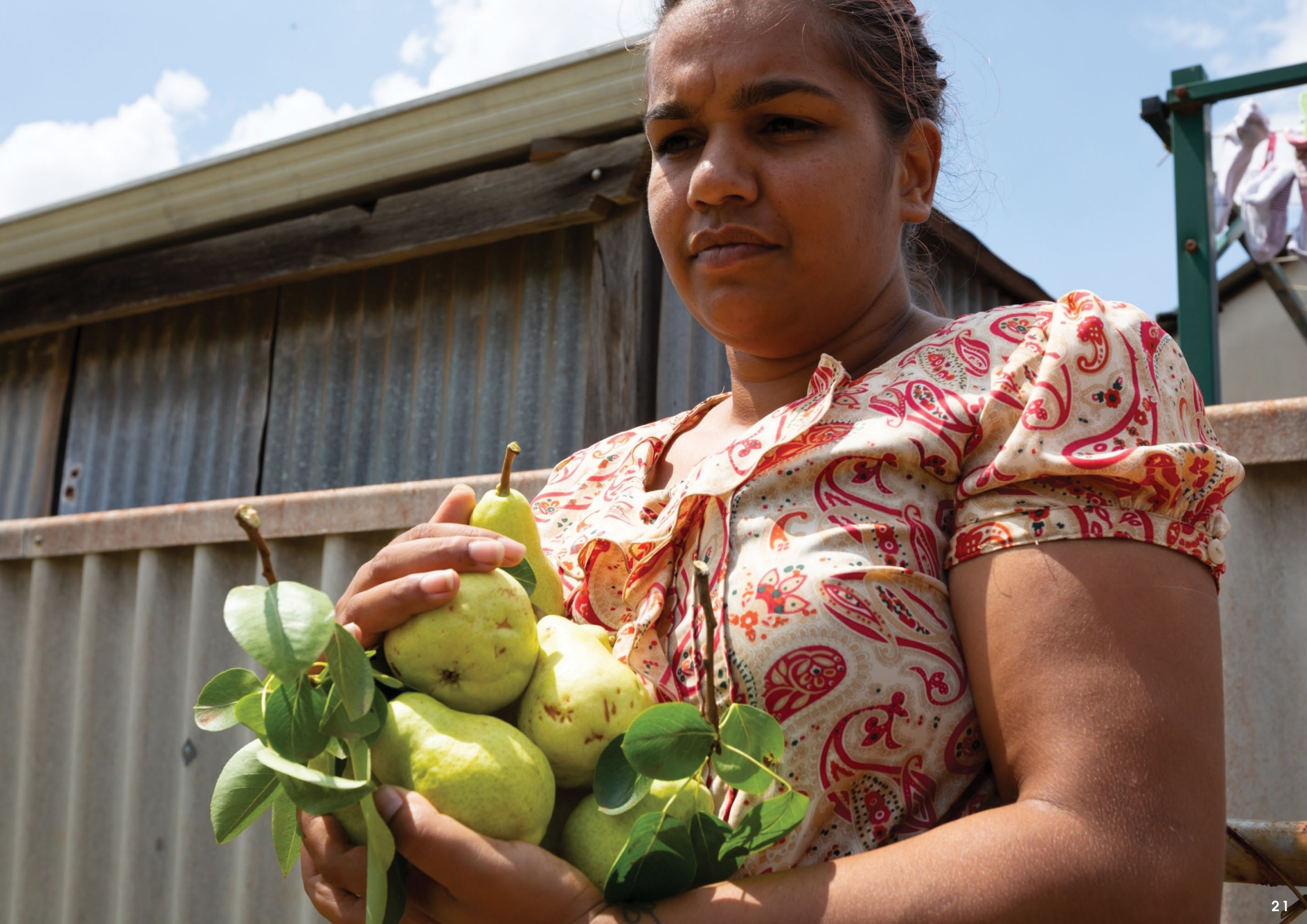
Acute rheumatic fever is an autoimmune disease caused by infection with group A streptococci. If left untreated, acute rheumatic fever can progress to become RHD. RHD has high rates of morbidity and mortality, particularly among Aboriginal and Torres Strait Islander peoples, especially those living in regional or remote communities[52].

First Nations heart health is a significant concern, as outcomes for Aboriginal and Torres Strait Islander peoples remain much poorer[53]. First Nations peoples have a higher risk of RHD[54], which often requires lifelong management and ongoing interaction with the healthcare system. Due to the inter-generational trauma experienced by Aboriginal and Torres Strait Islander peoples, these healthcare interactions can be particularly distressing.

A/Prof Wade's work focuses on addressing the social and emotional toll of RHD on young Aboriginal and Torres Strait Islander peoples and gaining a better understanding of their needs It also explores cultural identity and its role in strengthening social and emotional wellbeing[55].

Additionally, her research aims to build the capacity of First Nations community researchers as part of the Heart Foundation Aboriginal and Torres Strait Islander Award. Importantly, she seeks to empower First Nations peoples to advocate for their own needs in cardiovascular care.

The findings from her current Heart Foundation-funded work will be summarised and provided to clinicians as an educational resource. The resource will include insights into existing support patterns (e.g. referrals to psychological services and community groups), and recommendations for health system improvements to better serve Aboriginal and Torres Strait Islander communities. This work is essential to providing high-quality, culturally appropriate care to First Nations peoples.



References

1. Libby P, Nahrendorf M, Swirski FK. Leukocytes link local and systemic inflammation in ischemic cardiovascular disease. *J Am Coll Cardiol.* 2016;67(9):1091-1103.
2. Ruparelia N, Chai JT, Fisher EA, Choudhury RP. Inflammatory processes in cardiovascular disease: a route to targeted therapies. *Nat Rev Cardiol.* 2017;14(3):133-144.
3. Alfaddagh A, Martin SS, Leucker TM, et al. Inflammation and cardiovascular disease: from mechanisms to therapeutics. *Am J Prev Cardiol.* 2020;4:100130.
4. Tan RP, Ryder I, Yang N, et al. Macrophage polarization as a novel therapeutic target for endovascular intervention in peripheral artery disease. *JACC Basic to Transl Sci.* 2021;6(8):693-704.
5. Henein MY, Vancheri S, Longo G, Vancheri F. The role of inflammation in cardiovascular disease. *Int J Mol Sci.* 2022;23(21):12906.
6. Maiorana A, Ntoumanis N. Physical activity in patients with cardiovascular disease: challenges in measurement and motivation. *Heart Lung Circ.* 2017;26(10):1001-1003.
7. To QG, Green C, Vandelanotte C. Feasibility, usability, and effectiveness of a machine learning–based physical activity chatbot: quasi-experimental study. *JMIR Mhealth Uhealth.* 2021;9(11):e28577.
8. Tran S, Deacon N, Minokadeh A, et al. Frequency and survival pattern of in-hospital cardiac arrests: the impacts of etiology and timing. *Resuscitation.* 2016;107:13-18.
9. Dennis M, Southwood TJ, Oliver M, Nichol A, Burrell A, Hodgson C. Extracorporeal membrane oxygenation and extracorporeal membrane oxygenation cardiopulmonary resuscitation (ECPR) research priorities in Australia: a clinician survey. *Aust Crit Care.* 2023;36(5):828-831.
10. Linke NJ, Fulcher BJ, Engeler DM, et al. A survey of extracorporeal membrane oxygenation practice in 23 Australian adult intensive care units. *Crit Care Resusc.* 2020;22(2):166-170.
11. NSW Agency for Clinical Innovation. *ECMO (extracorporeal membrane oxygenation) services – adult patients: organisational model of care.* 2020. https://aci.health.nsw.gov.au/__data/assets/pdf_file/0004/624280/ACI-ICNSW-ECMO-adult-patients-model-of-care.pdf
12. Dennis M, Shekar K, Burrell AJ. Extracorporeal cardiopulmonary resuscitation for refractory cardiac arrest in Australia: a narrative review. *Med J Aust.* 2024;220(1):46-53.
13. Ostadal P, Rokyta R, Karasek J, et al. Extracorporeal membrane oxygenation in the therapy of cardiogenic shock: results of the ECMO-CS randomized clinical trial. *Circulation.* 2023;147(6):454-464.
14. Lebreton G, Schmidt M, Ponnaiah M, et al. Extracorporeal membrane oxygenation network organisation and clinical outcomes during the COVID-19 pandemic in Greater Paris, France: a multicentre cohort study. *Lancet Respir Med* 2021;9(8):851-862.
15. Sharma V, Sharma V, Shahjouei S, et al. At the intersection of gut microbiome and stroke: a systematic review of the literature. *Front Neurol.* 2021;12:729399.
16. Vermeij J, Westerndorp WF, van de Beek D, Nederkoorn PJ. Post-stroke infections and preventive antibiotics in stroke: update of clinical evidence. *Int J Stroke.* 2018;13(9):913-920.
17. Brea D. Post-stroke immunosuppression: exploring potential implications beyond infections. *Eur J Neurosci.* 2023;58(11):4269-4281.
18. Peh A, Dinakis E, Nakai M, et al. Gut bacteria translocation to the brain after ischaemic stroke occurs via the sympathetic nervous system. *bioRxiv.* 2023.
19. Kumar KP, McKay LD, Nguyen H, et al. Sympathetic-Mediated intestinal cell death contributes to gut barrier impairment after stroke. *Transl Stroke Res.* 2023.
20. Fiuza-Luces C, Santos-Lozano A, Joyner M, et al. Exercise benefits in cardiovascular disease: beyond attenuation of traditional risk factors. *Nat Rev Cardiol.* 2018;15(12):731-743.
21. Blume GG, Mcleod CJ, Barnes ME, et al. Left atrial function: physiology, assessment, and clinical implications. *Eur J Echocardiogr.* 2011;12(6):421-430.
22. Hedberg P, Selmeryd J, Leppert J, Henriksen E. Long-term prognostic impact of left atrial volumes and emptying fraction in a community-based cohort. Heart. 2017;103(9):687.
23. Ariyaratnam JP, Elliott AD, Mishima RS, et al. Structural, functional, and electrical remodeling of the left atrium associated with reduced cardiorespiratory fitness: implications for atrial fibrillation. *Heart Rhythm.* 2024;21(5):S485.
24. Ariyaratnam JP, Mishima RS, McNamee O, et al. Exercise echocardiography to assess left atrial function in patients with symptomatic AF. *Int J Cardiol Heart Vasc.* 2024;50:101324.
25. Um KJ, McIntyre WF, Healey JS, et al. Pre- and post-treatment with amiodarone for elective electrical cardioversion of atrial fibrillation: a systematic review and meta-analysis. *Europace.* 2019;21(6):856-863.
26. Elliott AD, Middeldorp ME, Van Gelder IC, Albert CM, Sanders P. Epidemiology and modifiable risk factors for atrial fibrillation. Nat Rev Cardiol. 2023;20(6):404-417.
27. Elliott AD, Verdicchio CV, Mahajan R, et al. An exercise and physical activity program in patients with atrial fibrillation. *JACC Clin Electrophysiol.* 2023;9(4):455-465.
28. Joglar JA, Chung MK, Armbruster AL, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association Joint Committee on clinical practice guidelines. *Circulation.* 2024;149(1):e1-e156.

29. Weng L, Preis SR, Hulme OL, et al. Genetic predisposition, clinical risk factor burden, and lifetime risk of atrial fibrillation. *Circulation.* 2018;137(10):1027-1038.

30. Khera AV, Kathiresan S. Genetics of coronary artery disease: discovery, biology and clinical translation. *Nat Rev Genet.* 2017;18(6):331-344.

31. Lacaze P, Woods R, Zoungas S, McNeil J. The genomic potential of the Aspirin in Reducing Events in the Elderly and Statins in Reducing Events in the Elderly studies. *Intern Med J,* 2017;47(4):461-463.

32. Yu, C., et al., Genome-Wide Association Study of Cardiovascular Resilience Identifies Protective Variation in the CETP Gene. J Am Heart Assoc, 2023. 12(21): p. e031459.

33. Schwarz PEH, Timpel P, Harst L, et al. Blood sugar regulation for cardiovascular health promotion and disease prevention. *J Am Coll Cardiol.* 2018;72(15):1829-1844.

34. Kuo T, McQueen A, Chen T, Wang J. Regulation of glucose homeostasis by glucocorticoids. *Adv Exp Med Biol.* 2015;872:99-126.

35. van der Sluis RJ, Hoekstra M. Glucocorticoids are active players and therapeutic targets in atherosclerotic cardiovascular disease. *Mol Cell Endocrinol.* 2020;504:110728.

36. Paragliola RM, Papi G, Pontecorvi A, Corsello SM. Treatment with synthetic glucocorticoids and the hypothalamus-pituitary-adrenal axis. *Int J Mol Sci.* 2017;18(10):2201.

37. Oray M, Samra KA, Ebrahimiadib N, Meese H, Foster CS. Long-term side effects of glucocorticoids. *Expert Opin Drug Saf.* 2016;15(4):457-465.

38. Chen AX, Radhakutty A, Drake SM, Kiu A, Thompson CH, Burt MG. Cardiovascular risk markers in adults with adrenal incidentaloma and mild autonomous cortisol secretion. *J Clin Endocrinol Metab,* 2024;109(3):e1020-e1028.

39. Chen AX, Radhakutty A, Zimmermann A, Stranks SN, Thompson CH, Burt MG. Clinical determinants of insulin requirements during treatment of prednisolone-induced hyperglycaemia. *Diabetes Res Clin Pract.* 2023;197:110557.

40. Moreno C, Allam Z, Chabaud D, Gall C, Pratlong F. Introducing the “15-Minute City”: sustainability, resilience and place identity in future post-pandemic cities. *Smart Cities,* 2021;4(1):93-111.

41. Evans JT, Stanesby O, Blizzard L, et al. Is public transport a promising strategy for increasing physical activity? Evidence from a study of objectively measured public transport use and physical activity. *Int J Behav Nutr Phys Act.* 2024;21(1): 91.

42. Evans JT, Buscot M, Gall S, Dwyer T, Venn A, Cleland V. Determining pathways of effect between correlates and outcomes of transport-related physical activity at differing timepoints across the lifecourse: a structural equation modelling approach. *Prev Med.* 2024;179:107825.

43. Cleland VJ, Zhao T, Stanesby O, et al. A single-blinded randomised controlled trial incentivising adults to increase public transport for health gain: The trips4health study. *Travel Behav Soc,* 2024;35:100732.

44. Bromberg M, Cardaci N, Trapp G, Luong K. Have a (non-energy) drink on me - modifying the laws regarding energy drinks in Australia. *Food Drug Law J,* 2019;74(3):440-477.

45. Tran HA, Gibbs H, Merriman E, et al. New guidelines from the Thrombosis and Haemostasis Society of Australia and New Zealand for the diagnosis and management of venous thromboembolism. *Med J Aust.* 2019;210(5):227-235.

46. Akther F, Fallahi H, Zhang J, Nguyen N, Ta HT. Evaluating thrombosis risk and patient-specific treatment strategy using an atherothrombosis-on-chip model. *Lab Chip.* 2024;24(11):2927-2943.

47. Fithri NA, Wu Y, Cowin G, et al. Gold-iron oxide nanoparticle: A unique multimodal theranostic approach for thrombosis. *Appl Mater Today.* 2023;31:101750.

48. Nestel PJ, Beilin LJ, Clifton PM, Watts GF, Mori TA. Practical guidance for food consumption to prevent cardiovascular disease. *Heart Lung Circ.* 2021;30(2):163-179.

49. Australian Bureau of Statistics. *Dietary behaviour.* 2022. https://www.abs.gov.au/statistics/health/health-conditions-and-risks/dietary-behaviour/latest-release

50. Connolly EL, Liu AH, Radavelli-Bagatini S, et al. Cruciferous vegetables lower blood pressure in adults with mildly elevated blood pressure in a randomized, controlled, crossover trial: the VEgetableS for vaScular hEaLth (VESSEL) study. *BMC Med.* 2024;22(1):353.

51. Australian Institute of Health and Welfare. *Health and wellbeing of First Nations people.* 2024. https://www.aihw.gov.au/reports/australias-health/indigenous-health-and-wellbeing

52. Ralph AP, Noonan S, Wade V, Currie BJ. The 2020 Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease. *Med J Aust.* 2021;214(5):220-227.

53. McGee M, Sugito S, Sverdlov AL. Cardiovascular outcomes in Indigenous Australians: a national gap. *Heart Lung Circ.* 2019;28(6):825-826.

54. Stacey I, Seth R, Nedkoff L, et al. Rheumatic heart disease mortality in Indigenous and non-Indigenous Australians between 2010 and 2017. *Heart*, 2023;109(13):1025-1033.

55. Sivak L, O’Brien M, Paolucci O, et al. Improving the well-being for young people living with rheumatic heart disease: a peer support pilot program through Danila Dilba Health Service. *Health Promot J Australia,* 2022;33(3):696-700.

Heart Foundation 13 11 12
heartfoundation.org.au

Heart Foundation
Fighting for Australian hearts

Suggested citation: National Heart Foundation of Australia. Research impact report 2023. Melbourne: National Heart Foundation of Australia, 2024.

HH-RES-026.1.1124