murdoch children's research institute

Annual Report 2022

Joining the world's largest-ever birth and parent cohort studies

Dad Patrick, 11-month-old baby Violet and mum Paige joined GenV in June 2022 at Frankston Hospital when Violet was born.

Our cover: Professor Margie Danchin with dad Tim Evans, five-year-old Millie, seven-year-old Alice, one-year-old Senri and mum Miyuki Nakano.

Margie's work on encouraging maternal vaccinations is featured on page 25.

Murdoch Children's Research Institute acknowledges the Wurundjeri people, the traditional owners of the land on which the Murdoch Children's campus stands. We pay our respects to their Elders, past and present.

2022 Stories

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Director's Report

PROFESSOR KATHRYN NORTH AC

DIRECTOR

Hopefully, 2022 will come to be known as the year in which we threw off the shackles of the COVID-19 pandemic. Our staff and our community had clearly missed a critical sense of connection over the last three years but the energy around the Institute has been palpable these past few months, with 'corridor conversations' a vital touchpoint once more. It's great to be back!

Reconnecting with our supporters is also crucially important to us – keeping you up to date with the recent achievements of our brilliant researchers and future plans for the Institute.

As such, it gives me great pleasure to present the Murdoch Children's Research Institute Annual Report for 2022. This year's report highlights research successes such as the expansion of our program to eliminate scabies, the importance of our engagement across the community in decisions around genomic health, the value of rigorous clinical trials in solving the trickiest health problems, and the growing number of parents and children joining our state-wide Generation Victoria (GenV) family.

GenV will soon allow us, and researchers around the world, to answer a multitude of questions about preterm birth, mental health, obesity, learning, allergies and more. Such a significant resource requires significant investment, and we are proud to have invested strategically in this program. While this investment contributed to our financial deficit for the year, it will ensure that children reap the rewards of this ambitious initiative for decades to come.

Over the last 36 years, Murdoch Children's has continued to grow in size and scope. Building on the inspirational vision of our founders, Professor David Danks AO and Dame Elisabeth Murdoch AC DBE, we have expanded to become a truly global organisation.

Our researchers' work spans all major challenges that face children, and the adults they will become, across five major research areas: genomics; stem cell medicine; population health; infection, immunity and global health; and clinical translation. As we emerge from the pandemic, the Institute will continue to focus on the depth and excellence of what we do. We will consolidate our position of leadership in child health research and we will continue to deliver on our research goal – for all children to have the opportunity to live healthy and fulfilled lives.

Murdoch Children's aspires to be an impact organisation powered by research, a goal that gained significant momentum in 2022. This Annual Report includes many examples of our innovative approaches to increasing the 'real-world' impact of our research.

Together with our many translational partners, we have launched three outstanding products over the last nine months: the Decode Mental Health and Wellbeing tool to increase the mental health literacy of secondary school students, produced in partnership with Matterworks and Education Perfect; the *Sleep with Kip*™ storybook series, based on 20 years of the Institute's sleep research to help children (and their parents) sleep better; and the *Allergy Friendly Family Cookbook*, produced in partnership with HarperCollins, based on the Institute's decades of allergy and immunity expertise.

The impact of our work is not just the product of our ground-breaking research and clinical breakthroughs. Our impact relies on the ability to successfully leverage generous and dynamic philanthropy into significant funding from government, commercial and industry partners. For that trust and support, we are extremely grateful.

The year 2022 was not just one of re-emergence. Sadly, we also farewelled two giants of Australian science with Professors Ruth Bishop AC and George Patton AO passing away. This issue celebrates their immense contributions to the Institute and tireless passion for improving health outcomes for children and adolescents around the world.

I am so proud of the way our whole Institute pulled together in 2022 so that we continue to thrive. In addition to our wonderful staff, I would like to thank and acknowledge the members of our boards and subcommittees, and especially our Chair, Patrick Houlihan, and Co-Chair, Sarah Murdoch, for their unwavering support through these past three years.

I hope you enjoy this year's Annual Report.

Chair and Co-Chair Report

PATRICK HOULIHAN

CHAIR

On behalf of my fellow Board members, I am pleased and proud to share with you the Annual Report for 2022.

The behind-the-scenes stories captured in this edition reflect the Institute's continuing evolution in enabling children to live healthy and fulfilled lives through the power of research.

Today, children across the globe benefit from the ground-breaking discoveries made at Murdoch Children's. Together with our national and global collaborators, the Institute's scientific output ranks us in the top echelons of research endeavours.

We saw our impact embodied in the inaugural year's achievements of the reNEW Stem Cell Medicine consortium's multinational efforts and the first whole year of GenV recruitment. GenV is already capturing cell-to-society data on more than 70,000 Victorians to create the single-largest child and parent cohort asset in Australia, with nearly 30,000 newborns already enrolled.

The Institute's position as the largest child health research institute in Australia is laudable, as is its position alongside other leading global institutes, with whom we have deep collaborations that continue to strengthen. Key to that success is the leadership of the Institute's Director, Professor Kathryn North AC. 2023 marks a decade of Kathryn's astute, passionate and eminently capable leadership, and on behalf of my Co-Chair, Sarah Murdoch, our fellow Directors and the whole Institute, I express our deepest gratitude for this service.

I also wish to thank my fellow Board members and all the members of the Institute's subcommittees, who dedicate their time and resources to ensuring this Institute maintains and enhances its position among the global researchers in child health.

Finally, we warmly welcome The Honourable Nicola Roxon on to our Board. Her insights from her time in the Federal Health and Attorney General portfolios will be a valuable asset. We also thank departing Board members Professor John Prins and The Honourable Rob Knowles AO for their dedication and contributions over the years.

Please enjoy this year's Annual Report.

SARAH MURDOCH

CO-CHAIR AND GLOBAL AMBASSADOR

Echoing Patrick's comments, I would like to acknowledge and congratulate Kathryn's truly remarkable 10 years at the Institute. As many of you will know, Kathryn is an extraordinary leader — demonstrated by the exponential growth of Murdoch Children's over the last decade.

I also thank members of our Development Board and Global Advisory Board for their commitment to supporting the Institute and for so generously volunteering their time to expand our reach and funding opportunities both within Australia and internationally.

As the Institute continues to make world-leading discoveries in child health, reaching the most disadvantaged children globally, we rely on the generosity of our donors to do this work. Thank you to our supporters — those of you who we are so fortunate to have had with us for three generations and those who have recently joined us. We thank you all.

Pleasingly, as 2022 returned to some sense of normalcy, we were able to host and thank our supporters at events that included our annual Preview, the ever-successful Biennale, and the Dame Elisabeth luncheon at Cruden Farm.

At our Biennale event, we heard from Professor Enzo Porrello who leads our Stem Cell Medicine group. Funds raised there contributed to the new equipment needed to enable the advancement of the team's 'heart patch', which could one day prevent the need for heart transplants for children like Mia, who joined us at the event to tell her story. In further globally leading work, our genomic clinicians are now able to diagnose a critically ill child in under three days.

I wish I had the space here to describe all our life-changing research discoveries but know that, as children and families are at the heart of everything we do, Murdoch Children's continues to develop pioneering advances to give children globally the opportunity to live a healthy and fulfilled life.

The trust placed in us by our supporters is dear to our hearts and very much appreciated. I hope and believe that we repay that trust with the work that we do and the care and love that we demonstrate every day for our children, families and communities.

I commend this Annual Report to you and hope you enjoy reading about just some of the incredible work our people do for our most precious asset, our children.

Keeping watch on egg allergy

Moira, three, was diagnosed with an egg allergy six months after having a life-threatening allergic reaction to a tiny amount of scrambled eggs.

Nicole McEvoy, Moira's mum, said the family always had to remain vigilant around food but the latest research from Murdoch Children's was a welcome relief to her family.

"Knowing that 90 per cent of egg allergy resolves by six years old offers us a lot of hope for Moira and is hugely encouraging. It would be an enormous relief if the allergy had resolved by the time Moira started school and she wouldn't have to worry about avoiding egg for the rest of her life."

PICTURE: DAVID CAIRD / THE HERALD SUN

1 Research Impact

Our researchers are striving to make scientific discoveries and trial new interventions that will help all children live healthy and fulfilled lives. By translating research into real-life treatment outcomes, we aim to make a tangible difference to young people and their families.

Improving child health through stem cell research

Stem cells are important tools in biological research that help us better understand how our cells and tissues develop, and what happens when disease occurs. The widespread use of induced pluripotent stem cells (iPSCs) – that is, re-programmed stem cells that have exciting therapeutic potential – is paving the way for better treatments to improve child health.

EDITING GENES ON-SITE

Murdoch Children's is pioneering the use of iPSCs in its research. Our iPSC Derivation and Gene Editing Facility produces high-quality iPSCs (stem cells generated from a person's skin or blood cells) for research projects being conducted across the world.

The facility is headed by Dr Sara Howden, a recognised leader in human reprogramming and genome engineering technologies, who is committed to progressing research and treatments for the myriad of health conditions impacting children.

The facility is assisting researchers on a global scale by producing patient-derived iPSCs, including correcting genetic errors, using the CRISPR/Cas9 gene editing system.

The facility can also genetically engineer disease-specific genetic errors into normal iPSCs, giving researchers greater access to genetic disease models, which can be difficult to obtain but are particularly useful for identifying new genes and pathways that contribute to disease.

This will allow researchers to better understand if a disease is caused by an error in a gene and to make more informed research decisions towards helping all children live healthy and fulfilled lives.

This vital work is also paving the way for the development of new gene therapies for specific diseases and is an important step in the development of personalised medicines.

TURNING IPSCS INTO HEART ORGANOIDS

Around 80 per cent of children with cancer are successfully treated using chemotherapy agents called anthracyclines (antibiotics that damage the DNA in cancer cells, causing them to die). However, this necessary anti-cancer therapy can have a dangerous side effect that causes heart disease in many cancer survivors.

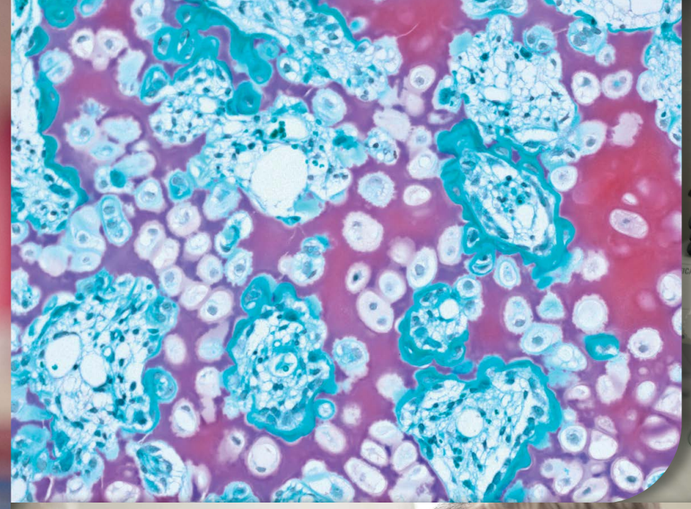
Childhood cancer survivors are 15 times more likely to have heart failure and eight times more likely to have cardiovascular disease than the general population.

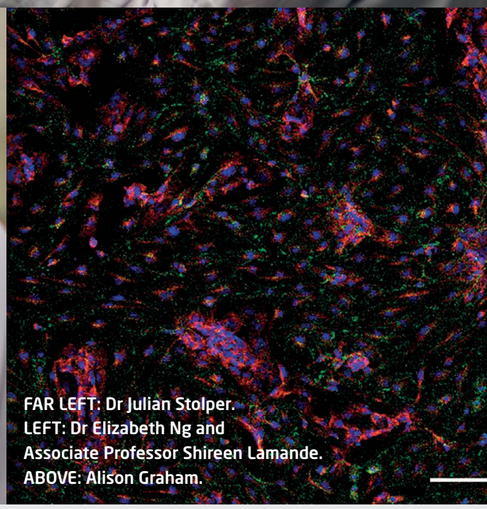
Murdoch Children's Associate Professor David Elliott, alongside researchers from the Netherlands' Leiden University Medical Center and oncology specialists from partner hospitals, are looking for drug compounds that can protect the heart from the effects of anthracycline-based chemotherapy, without any loss of anti-cancer activity. This research is supported by reNEW.

To do this, researchers have used iPSCs to engineer 3D models of heart muscle tissue in the laboratory, called organoids.

Associate Professor Elliott and his team will test how drug candidates affect heart organoids, measuring the level of protection the drugs provide to the heart tissue. "We aim to create a robust set of drug compounds that will serve as a strong foundation for the development of new therapeutic products," he said. "We will assess drugs that may stop the damage that occurs during chemotherapy, without any loss of anti-cancer activity."

Associate Professor Elliott said the potential benefits were threefold: to protect the hearts of childhood cancer patients, reduce the burden of the disease and improve the lives of cancer survivors.





FAR LEFT: Dr Julian Stolper.
LEFT: Dr Elizabeth Ng and Associate Professor Shireen Lamande.
ABOVE: Alison Graham.

PRODUCING STEM CELL-DERIVED CARTILAGE

Osteoarthritis is a painful cartilage disorder caused by injury and ageing, which mostly affects adults but can also affect children and adolescents.

There are currently no therapies that halt the onset or progression of osteoarthritis as cartilage has poor reparative capacity, and therefore many people require joint replacement surgery.

Murdoch Children's researchers, enabled by reNEW, are working to address the need for improved methods to efficiently regenerate cartilage. The Institute's Dr Elizabeth Ng, Associate Professor Shireen Lamande and Professor John Bateman have developed high-quality living cartilage using iPSCs that is similar to cartilage grown in the body.

They aim to evaluate the ability of the lab-grown cartilage to repair and regenerate damaged cartilage in a small animal model. They will also assess the impact on joint pain, which results from cartilage damage, in an effort to improve the lives of all children globally.

NEW APPROACH IN TREATING TYPE 1 DIABETES

Type 1 diabetes is a condition in which a person's immune system attacks and destroys their own beta cells, which make insulin – the hormone required to regulate the level of sugar in the blood.

It is one of the most common chronic childhood conditions, with children living with type 1 diabetes sometimes developing other conditions, reducing their quality of life or even lifespan.

To keep blood sugar at a safe level, people with type 1 diabetes need insulin, either delivered by injection or via an insulin pump. Although this treatment is life-saving, it does not replicate the fine control of blood sugar provided by insulin that is made by the body's beta cells.

However, stem cells offer the possibility of generating an unlimited amount of insulin-producing beta cells for transplantation, provided this can be done safely and efficiently.

Through reNEW, Professor Ed Stanley and his team at Murdoch Children's are collaborating with teams at the University of Copenhagen and Leiden University Medical Center to explore new ways to create improved beta cells from stem cells, which better mimic the beta cells created in the body.

Through their combined expertise, the researchers are looking to improve the quality and quantity of lab-grown beta cells and advance this important therapy for children living with type 1 diabetes.

This work forms part of a research effort across multiple laboratories at Murdoch Children's looking at the management, causes and treatment of type 1 diabetes.

Watch Associate Professor David Elliott explain how he and his team are engineering stem cells to help identify heart-protecting drugs for childhood cancer survivors.

Reaping the benefits of innovative biology

Murdoch Children's researchers are working towards new technological developments that aim to better treat severe heart and kidney disease in children and harness the power of stem cells to treat leukaemia and other blood disorders.

DEVELOPING NEW TREATMENTS FOR INHERITED AND CHRONIC KIDNEY DISEASE

In Australia, around 1.7 million people are affected by kidney disease and one in 15,000 children face a chronic kidney disease diagnosis before adulthood. Around half of childhood kidney disease diagnoses are genetic, however, the disease-causing mutation is often unknown.

Murdoch Children's Chief Scientist Professor Melissa Little AC, Dr Jessica Vanslambrouck and the Kidney Regeneration group aim to develop new treatments for inherited and chronic kidney disease.

Currently, researchers are using human stem cells (induced pluripotent stem cells) to create kidney organoids to model kidney tissue.

These kidney organoids are hoped to eventually develop into replacement organs for patients needing kidney transplants.

A new stem-cell technique developed by Dr Vanslambrouck has allowed researchers to create kidney organoids that are more mature and functional than previous organoids. These mature organoids may help expand our understanding of kidney development and disease and help researchers find better drug treatments.

This crucial research has been extended for another five years thanks to strengthened relationships with Novo Nordisk Foundation and Leiden University Medical Center through the reNEW partnership.

BIOENGINEERING PROSTHETIC HEART VALVES

Every year, around 2,400 babies in Australia are born with a heart defect, including heart valve disease which prevents one or more valves from opening and closing properly.

Heart valve disease is a significant health burden in Australia, with one in four children with a heart defect requiring heart valve surgery.

The surgery involves an open-chest operation that restores and maintains long-term heart function. An essential treatment, it uses animal tissue which unfortunately can cause new disease complications in patients.

Murdoch Children's and reNEW Drug Discovery Facility Manager Dr Alejandro Hidalgo-Gonzalez and his team have developed a new prosthetic prototype for the heart valve from bioengineered material, an advancement that could ultimately help treat children with heart disease all over the world.

The new, highly defined and sterile technology has the potential to shift treatment away from typical valve surgery, minimising surgeons' reliance on animal tissue and addressing production and supply chain issues.

"Currently, there is a lack of suitable implantable material for the surgical repair of valves in children with congenital diseases," Dr Hidalgo-Gonzalez said. "Our bioengineered heart valves could solve this problem and potentially become the preferred material for the fabrication of personalised bioprosthetic valves for all genders and age groups."

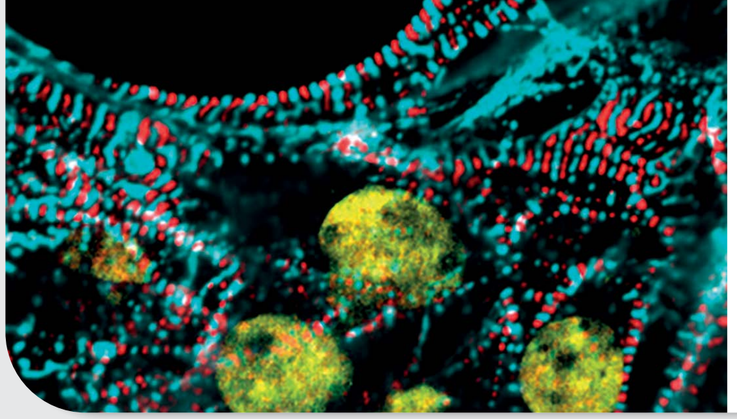
Dr Hidalgo-Gonzalez said he hoped the research would lead to the discovery of improved treatments and targeted therapies that help reverse valve tissue damage and improve the lives of all children living with heart disease.

PATCHING UP YOUNG HEARTS

Rheumatic heart disease affects 33 million people worldwide, disproportionally impacting children in low- and middle-income countries. In Australia, Aboriginal and Torres Strait Islander people are most likely to develop rheumatic heart disease.

The disease is caused by infections such as strep throat and scarlet fever, which are common in school-aged children, and can cause irreversible damage to the valves of the heart, preventing it from functioning properly.

Dr Holly Voges, of the Institute's Heart Regeneration group, recognises the urgent need to better understand rheumatic heart disease and identify early treatment options for patients.



A 3D model of heart muscle tissue called an organoid, which has been engineered in the lab using induced pluripotent stem cells.

She is leading stem cell research into the role the immune system plays during an infection that causes a child to develop rheumatic heart disease. Part of her vital research involves exploring disease mechanisms by using a new model of heart valve tissue that is developed from pluripotent human stem cells (skin or blood cells that are produced in a lab).

"I hope this research will help lead to improved treatments to reverse valve tissue damage, identify more targeted therapies and improve the lives of people with rheumatic heart disease," Dr Voges said.

It is hoped that the crucial research will one day help mend the broken hearts of children worldwide.

THE POWER OF HAEMATOPOIETIC STEM CELLS

Murdoch Children's researchers, led by Professor Andrew Elefanty and Dr Elizabeth Ng, are working towards creating blood stem cells (also known as haematopoietic stem cells or HSCs) from human induced pluripotent stem cells.

These in vitro-generated HSCs would help improve the treatment of leukaemia and other blood disorders. They would also allow researchers to better understand and study blood diseases to develop new treatment strategies that help children live healthier and more fulfilled lives.

Murdoch Children's and reNEW are enabling the Blood Development group to progress research towards better treatment for blood disorders.

Clayton Nelson, a 14-year-old patient at The Royal Children's Hospital (RCH), with Annette Gaulton, an RCH Wadja Aboriginal Case Manager and proud Kooma and Kunja woman. Clayton, from Ngaanyatjarra (Tjkurla community), received a double lung-heart transplant following a diagnosis of dilated cardiomyopathy and Annette was there to help smooth his journey. Scan this QR code to watch Clayton's story.

INNOVATION SUPPORTING RESEARCH IMPACT

The groundbreaking advancements in stem cell research present opportunities to develop new products, services and/or startup companies. Working with industry partners, collaborators and investors is integral to applying our research discoveries to create greater societal impacts.

Our expert in-house Innovation team enables this for our researchers. Protecting intellectual property (IP), finding entrepreneurial business mentors and investors and facilitating product development are some of the skills brought in by the Innovation team to accelerate our research ideas. Several stem cell researchers benefited from Murdoch Children's Innovation ecosystem, obtaining support and training through the aMoon program and the Ausbiotech Early-Stage Investment forum as well as seed funding.

To learn more about the social and clinical ideas that have come to life through Innovation or how you can be a collaborator and/or contributor to Murdoch Children's Innovation ecosystem, head to page 44.

Investigation drives better health outcomes

The Institute's Clinical Translation theme continued important research into cancer, hip dysplasia and pneumonia-related illness with the aim of improving health outcomes for all Australians.

BOOSTING RESOURCES FOR CANCER RESEARCH

Every year, at least 750 children are diagnosed with cancer in Australia, of whom almost half are under the age of five. Currently, this devastating disease claims the lives of around 100 children annually.

In 2022, the Victorian Government pledged $35 million to support the ongoing research being conducted by the Victorian Paediatric Cancer Consortium (VPCC) – a collaborative partner of the Institute. The consortium also received an additional $10 million from the Children's Cancer Foundation (CCF), taking the total pledge to $45 million.

The VPCC, which is funded by the Medical Research Future Fund (MRFF), is co-led by Murdoch Children's and the Hudson Institute and is overseen by Murdoch Children's Professor David Eisenstat and Hudson Institute's Professor Ron Firestein.

The funding was announced at the Melbourne Children's Campus by Premier Daniel Andrews, together with Medical Research Minister Jaala Pulford, and aims to help save lives by developing cancer therapies for the youngest cancer sufferers.

This funding is the biggest investment of its kind in Victoria and paves the way for improved childhood cancer survival rates, the development of cancer therapies and clinical trial programs for the youngest cancer sufferers.

The funding will also help childhood cancer survivors manage their long-term health so that they can lead long and fulfilling lives.

Murdoch Children's Associate Professor Rachel Conyers said she hoped to improve the quality of life of young people with cancer by reducing adverse drug reactions, and by predicting and preventing lifelong medical complications after they had undergone treatment.

Associate Professor Conyers will oversee a pharmacogenomics program at the VPCC that looks at how genes affect a person's response to a drug. This will help identify medication-related adverse effects and allow for more precise treatments for childhood cancer.

"Personalised medicine includes knowing a patient's predisposition to medication side effects from their DNA, known as pharmacogenomics," she said.

"Our new trial seeks to reduce unwanted side effects, improve quality of life and reduce healthcare costs through personalising supportive care medications for paediatric patients with cancer."

WORLD-LEADING HIP REGISTRY TO OFFER UNIQUE DISCOVERY OPPORTUNITY

Hip dysplasia is a condition where the hip joint does not form normally, resulting in abnormal hip development, instability or dislocation.

It is the most common childhood bone and joint birth defect and affects about 1.5 per cent of infants and children in Australasia each year. Hip dysplasia can cause substantial pain and disability, and compromise decreased quality of life in children with the condition.

To help improve outcomes for children and adolescents with painful congenital hip disease, Murdoch Children's Associate Professor Leo Donnan received $2.5 million in funding from the Medical Research Future Fund (MRFF).

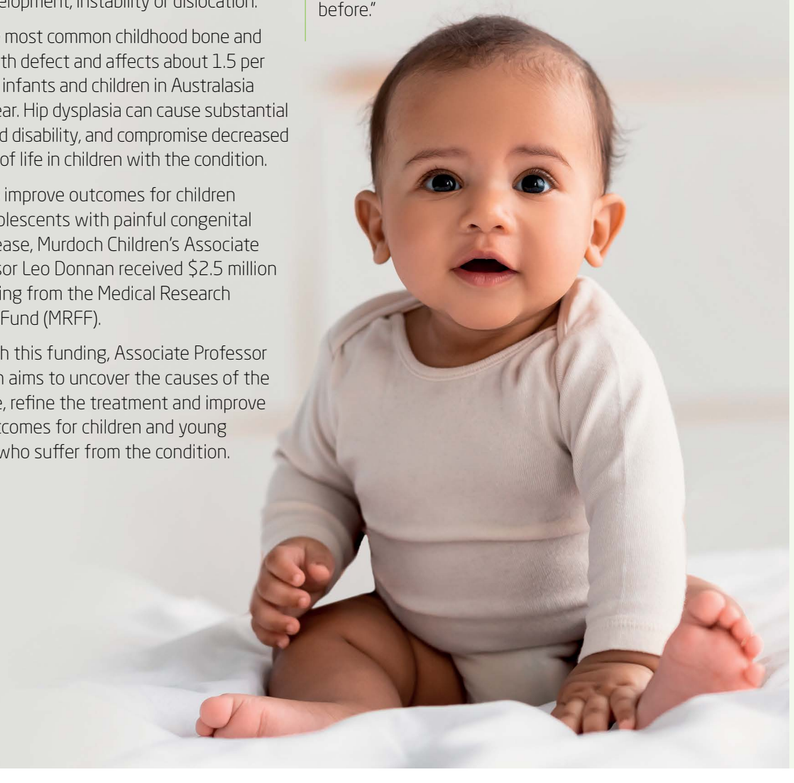
Through this funding, Associate Professor Donnan aims to uncover the causes of the disease, refine the treatment and improve the outcomes for children and young adults who suffer from the condition.

Currently, there are various programs in place to diagnose hip dysplasia. However, the rate of late presentation has not been reduced. This suggests that there are undiscovered factors responsible for dysplasia in this group of patients who present later.

The MRFF grant will allow Associate Professor Donnan to establish VicHip, which will collect data from multiple clinical sites and will be linked to both GenV and the International Hip Dysplasia Registry (IHDR).

"Our low-cost registry will enable many individuals to avoid a lifetime of invasive surgeries, pain and disability, and others to avoid unnecessary care and inconvenience. Better-targeted investigation and care will also reduce costs to society," Associate Professor Donnan said.

"With intentions to partner with GenV, this further offers an opportunity for discovery available to no other hip registry worldwide before."



Research effort delivers understanding

Simple solutions, made possible through research.

MIST TRIAL

Around 12 per cent of Australian children experience snoring and breathing difficulties during sleep, which can result in significant long-term behavioural and heart health issues, as well as cognitive function impairment.

As a result of sleep disordered breathing, 40,000 children each year undergo tonsillectomy (surgical removal of the tonsils). Most patients wait more than a year for surgery, which is painful for children and can place a financial burden on caregivers.

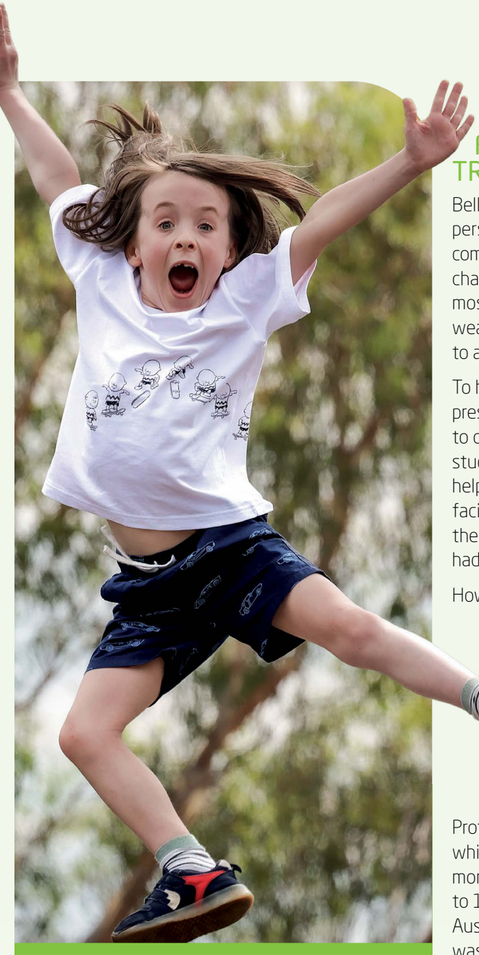
To investigate alternative treatments to surgery, Murdoch Children's Dr Alice Baker established the MIST trial which found a simple saline (salt water) nasal spray could help to significantly reduce snoring and breathing difficulties in children.

The trial, which recruited 276 children aged three to 12 years, found that both a saline nasal spray and an anti-inflammatory steroid nasal spray cleared breathing symptoms in 40 per cent of children while they slept.

The number of children assessed by a surgeon as needing their tonsils and/or adenoids removed was also reduced by half.

"A large proportion of children who snore and have breathing difficulties could be managed successfully by their primary-care physician, using six weeks of an intranasal saline spray as a first-line treatment," Dr Baker said.

By using the nasal spray, which is cheaper and more readily available than surgery, children with snoring and breathing difficulties can expect great improvement in their quality of life.



Thomas Graham started snoring at just three years of age. His parents, Stephen and Emily, feared that Thomas would eventually need surgery, as his breathing difficulties were causing problems in his day-to-day life.

After meeting with a specialist, the family's fears were confirmed when they were advised that Thomas would need his tonsils removed via potentially painful and costly surgery.

Fortunately, Stephen and Emily signed Thomas up for the MIST trial with the results proving a huge relief. He has since stopped snoring and no longer needs surgery, putting him on a path to a healthier and more fulfilled life.

PICTURE: IAN CURRIE / THE HERALD SUN

DISCOVERING A BETTER ALTERNATIVE FOR BELL'S PALSY TREATMENT

Bell's palsy, which causes one side of a person's face to droop, is the third most common condition causing a sudden change in nerve function in children. In most cases, the exact cause of the facial weakness is unknown but may be related to a viral infection.

To help manage recovery, doctors usually prescribe a steroid called prednisolone to children with Bell's palsy. But while studies have shown steroid use in adults helped improve symptoms by minimising facial nerve swelling and damage within the temporal bone, similar research hadn't been conducted in children.

However, new research led by Murdoch Children's and the Paediatric Research in Emergency Departments International Collaborative (PREDICT) found that treatment with prednisolone does not shorten a child's recovery time.

Professor Franz Babl led the study, which involved 187 children aged six months to 17 years who presented to 11 emergency departments across Australia and New Zealand. Each child was recruited within 72 hours of symptoms and was treated for 10 days with prednisolone or a placebo.

"The lack of evidence on the use of steroids in children with Bell's palsy has led to variable practice in their treatment," Professor Babl said.

"Discovering that early treatment with prednisolone doesn't speed up recovery will assist GPs, emergency physicians and paediatricians in their discussion with affected families and help them make better informed decisions."

COVID-19 and its effect on children and families

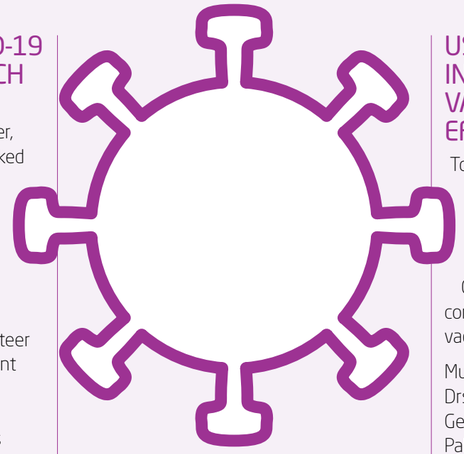
As the pandemic progressed, Murdoch Children's researchers led several studies into COVID-19's impact on long-term health.

FURTHERING GLOBAL COVID-19 KNOWLEDGE AND RESEARCH

The impact of COVID-19 on children and families is still being understood. However, Murdoch Children's researchers have worked to fill knowledge gaps in key areas, including the ongoing effects of long COVID, the pandemic's indirect effects on children and the impact the coronavirus has had on mothers.

Associate Professor Shidan Tosif and Professors Kathryn North AC, Andrew Steer and Sharon Goldfeld conducted important research into long COVID and repeat infections in children and adolescents. Based on their findings, the researchers made 10 recommendations to the House of Representatives Standing Committee on Health, Aged Care and Support on how to drive vaccine delivery and prevention strategies in the future.

The aim of these recommendations is to support Australians while there is no cure or defined treatment approach for children with long COVID. It is also hoped the recommendations lead to better vaccine delivery and prevention that minimise the indirect impact of COVID-19 on children.



Research undertaken by the COVID-19 Governance Group, led by Professors Goldfeld and Steer, found that the indirect impacts of COVID-19 such as changes to family life, school closures and compromised access to health and emergency care have all led to poorer mental and physical health outcomes in children.

Additional COVID-19 research led by Professor Stephanie Brown found that maternal wellbeing was profoundly impacted by the pandemic, with a third of women experiencing significant mental health problems, ongoing fatigue and parenting stress.

Professor Brown found that many mothers avoided seeking help for their mental health due to the cost, long waiting periods, a lack of confidence in telehealth and the need to prioritise their child's mental health over their own.

Across the Institute, research has shown that COVID-19 treatment should include a combination of infection prevention, care of acute COVID-19 illness for children and adolescents, and policies that focus on addressing the indirect and ongoing effects of the pandemic.

USING ARTIFICIAL INTELLIGENCE TO MONITOR VACCINE ADVERSE EFFECTS IN REAL-TIME

To help identify COVID-19 vaccine side effects in real time, the team at the Centre for Health Analytics and Surveillance of Adverse Events Following Vaccination In the Community (SAEFVIC) began monitoring conversations by mining Twitter posts for vaccine-related key words.

Murdoch Children's Professor Jim Buttery, Drs Sedigh Khademi, Muhammad Javed and Gerardo Luis Dimaguila, and Christopher Palmer used artificial intelligence (AI) to better identify genuine health complaints and demonstrate that social media can be a valuable data source for quickly detecting mentions of vaccine side effects.

"The AI method employs techniques that understand text in a similar way to humans, allowing it to identify language around personal health mentions in Twitter conversations," said SAEFVIC researcher and creator of the new AI method Dr Khademi.

With her team, Dr Khademi collected three million public tweets from 1.4 million Twitter users over a 12-month period during the pandemic and singled out vaccine-related personal health mentions to train the AI tool to detect adverse events from the dataset. The results were compared against SAEFVIC data and further validated in the Social Media Mining for Health (SMM4H) global competition, in which the team came runners-up.

Dr Khademi said the research complemented traditional reporting systems to improve the safety of future vaccine rollouts by reducing the wait time for vaccine side effects data and emerging safety issues.

In support of vaccination

- Research by Professor Andrew Steer and Associate Professor Paul Licciardi found that vaccinated children demonstrated higher levels of protective immunity compared to their unvaccinated peers
- Unvaccinated children showed lower antibody responses to the Omicron variant, potentially increasing the risk of repeated infections and impacting long-term health
- Vaccination in children was recommended to enhance protective immunity based on stronger antibody responses observed in vaccinated children

Upping the fight against food allergies

Murdoch Children's researchers have taken a leap forward in better understanding allergies, paving the way for improved treatments and, ultimately, fewer deaths.

Food allergies are among the fastest-growing chronic conditions globally and they are particularly prominent in Australia where over five million people live with allergic diseases.

Food allergy impacts around 10 per cent of Australian infants and 5-8 per cent of children, and deaths caused by anaphylaxis have been increasing by 10 per cent each year.

To address this growing epidemic, several teams across the Institute are working towards accelerating research and treatment to improve the lives of children with food allergy.

PAVING THE WAY FOR LIFE-CHANGING ALLERGY RESEARCH

Murdoch Children's, alongside Australia's Assistant Minister for Health, The Hon Ged Kearney, and allergy experts, launched the National Allergy Centre of Excellence (NACE) and the National Allergy Council (NAC) in 2022.

The groups are working together to develop hubs for allergy research, repository and discovery, evidence and translation, and training and innovation.

Professor Kirsten Perrett, who leads Murdoch Children's Population Allergy Group and has been appointed NACE Director, said, "This centre will give consumers, clinicians and policymakers access to the latest evidence-based research into allergy preventions, intervention and treatment."

She said the introduction of NACE and NAC would have a life-changing impact on children and adults living with food allergies in Australia and worldwide.

ACHIEVING PEANUT ALLERGY REMISSION

In a breakthrough for peanut allergy, food allergy research pioneer Professor Mimi Tang and her team, in collaboration with lead researchers from Telethon Kids Institute, discovered the key immunological changes that support the remission of peanut allergy in children.

Prior to the randomised-controlled trial, which involved 62 peanut-allergic children aged one to 10, the immunological changes leading to remission of peanut allergy were largely unknown.

The trial involved giving the children a combination treatment of a probiotic and oral immunotherapy (the gradual introduction of the allergenic food) or a placebo. It found that in the 18 months after treatment, 74 per cent of children who took the combination treatment achieved remission compared with 4 per cent in the placebo group.

"Understanding the complex immune processes that support remission will provide greater insight into key drivers of treatment success and potentially identify novel targets for more effective treatments that deliver long-term solutions for patients," Professor Tang said.

The findings may help future developments that bring allergy immunotherapy treatment into clinical practice for children with life-threatening peanut allergies.

Stella's life after allergy remission

Stella was just 18 months old when she was diagnosed with a peanut allergy, after breaking out in hives from eating a meal that contained traces of nuts.

Stella's mother, Ju Lee, avoided peanuts for the next several years, but hoped Stella wouldn't have to live with the burden of peanut allergy forever.

After taking part in Murdoch Children's allergy trial, Stella has been in clinical remission from peanut allergy for almost four years and eats peanuts regularly.

"Stella's quality of life has improved considerably since the trial," Ju Lee said. "Her level of anxiety has reduced dramatically, and she has the freedom to enjoy different types of food – she can even dig in and enjoy a bag of peanut M&Ms."

Ju Lee said that research undertaken at Murdoch Children's would give much hope to families whose children have peanut allergy.

"We hope other families can experience the same sense of comfort we now have with a child who can eat peanuts freely without fear of a reaction."

Addressing the rise in childhood asthma cases

Our researchers are working to improve outcomes for the most chronic paediatric illness and leading cause of preventable hospital admissions.

HELPING AURORA BREATHE BETTER

Aurora Snelgrove (pictured), now 10, was diagnosed with hypersecretory asthma (which presents differently from the typical asthma conditions) when she was four years old. After her diagnosis, Aurora was readmitted to hospital two or three times a year to get her asthma under control.

Aurora's mum Megan said that, initially, it had been challenging to navigate the system because of Aurora's specific type of asthma, which required treatment beyond the standard Ventolin therapy.

Aurora's complicated asthma meant a lot of trial and error with her treatment but since being followed up by The Royal Children's Hospital respiratory team, things had improved.

The follow-up appointments have allowed clinicians to monitor Aurora's condition and tailor her care, which is helping Aurora manage her asthma and breathe more easily.

GOING BACK TO HOSPITAL

Hospital readmissions for asthma are increasing among children, according to a Murdoch Children's-led study highlighting current gaps in healthcare.

Asthma is the most common chronic paediatric illness, with around 8 to 10 per cent of children living in industrialised countries developing asthma during their early years. In Australia, the illness is a leading cause of preventable hospital admissions.

The study, which was headed by Dr Katherine Chen, found that about one in three children, mostly pre-schoolers, are readmitted to hospital for asthma compared to one in five a decade ago.

However, Dr Chen said most asthma hospital presentations were preventable, emphasising the need for a holistic evaluation of each child's asthma management to prevent future readmissions.

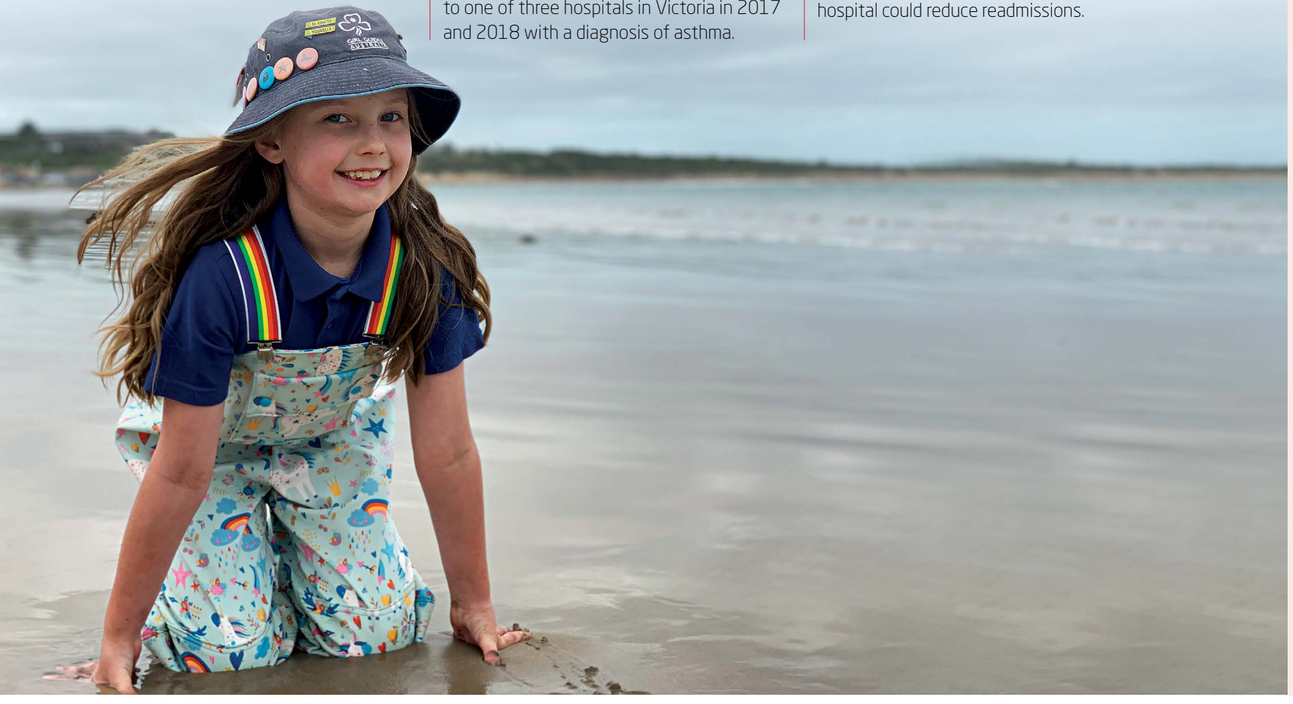
The study involved 767 children and youths, aged three to 18 years, who were admitted to one of three hospitals in Victoria in 2017 and 2018 with a diagnosis of asthma.

It found that more than a third of the participants were readmitted to hospital for asthma, with those aged three to five years accounting for 69.2 per cent of readmissions. Overall, 20.6 per cent of participants were readmitted once, and 13.7 per cent had two or more readmissions within 12 months.

"Our study highlighted gaps in the children's asthma care," Dr Chen said. "Over a third of children hadn't had a review of their inhaler technique, and only about a quarter were prescribed a preventer or asked to continue using it.

"Almost three-quarters were discharged without a preventer medication, and over 80 per cent did not have a follow-up clinic booked at the hospital, often reserved for children with difficult-to-control asthma. Most families, therefore, need to navigate their child's asthma follow-up with their GP."

Murdoch Children's Professor Harriet Hiscock said the findings confirmed the important role of GPs in paediatric asthma management and how targeted interventions at each hospital could reduce readmissions.



The race to eliminate strep throat

With Strep A infections on the rise, Murdoch Children's researchers are working to identify the causes of sore throats and develop the world's first Strep A vaccine.

Strep A is a common bacteria that causes a sore throat and school sores (a highly infectious skin condition), predominantly in school-aged children. In most cases, people who contract the germ experience a mild infection. However, it can develop into life-threatening infections and rheumatic heart disease if left untreated, which together cause more than 500,000 deaths globally each year.

Currently, the bacteria causes more deaths per year than influenza, typhoid and whooping cough combined, and disproportionately affects young children, the elderly, pregnant women and Aboriginal and Torres Strait Islanders.

STAMPING OUT SORE THROATS

To learn more about sore throats, Murdoch Children's researchers are working with the Australian Strep A Vaccine Initiative (ASAVI) and Telethon Kids Institute in Perth to conduct the STAMPS study.

The study is recruiting 1,050 healthy children aged three to 14 who live in Melbourne and Perth and will help identify the most common causes of sore throats, the impact of seasonal changes and how best to prevent the illness.

TOWARDS THE WORLD'S FIRST STREP A VACCINE

Murdoch Children's researchers have joined an international network to accelerate the development of an mRNA vaccine for Strep A.

Led by The University of Queensland and in partnership with Moderna, the research could help prevent severe Strep A bacterial infections and reduce incidences of rheumatic heart disease.

The network aims to assess the efficacy of the new vaccine thanks to the development of the world's only strep throat human challenge model developed by Murdoch Children's researchers. The model will see healthy adult volunteers exposed to Strep A and carefully monitored to see if the vaccine protects them from developing strep throat.

The Institute's Dr Joshua Osowicki said that because Strep A only naturally infects humans, researchers were limited in what they could learn in the lab and through preclinical models.

"Human challenge models can be used to test vaccines, drugs and diagnostic tests, as well as learning more about how diseases work and how to stop them," he said. "We're excited to use our Strep A model as a platform to give the earliest possible signal that an mRNA vaccine can stop Strep A."

Working together to progress Strep A research

Emily, nine, and Thomas, six, are taking part in the STAMPS study. Their mother, Barbara Cross, enrolled her children as participants after knowing two families who had been affected by serious Strep A infections.

One family had siblings who became extremely ill with Strep A and required medically induced comas, exploratory surgery and extended hospital stays. The other family's child had a painful infected leg which required them to spend several nights in hospital and resulted in a significant loss of strength.

"In both cases, it took an incredible physical and mental toll on both the children and their parents," Barbara said. "Taking part in this study is a small way we can help others avoid the trauma our friends experienced."

Murdoch Children's Professor Andrew Steer, who is leading the project, hopes that the information collected in the STAMPS study will help inform how a vaccine could be used to prevent a wide range of illnesses caused by Strep A.

"A vaccine for Strep A would save hundreds of thousands of lives every year and prevent millions of infections that send children and adults to the hospital or doctor," Professor Steer said.

The study will periodically monitor the children's health over 12 months and will collect vital information from study participants if they experience signs or symptoms of a sore throat.

PICTURE: JAKE NOWAKOWSKI / THE HERALD SUN

Research with an eye on the Global South

Murdoch Children's researchers are working hard to improve child health across the globe.

CHAMPIONING THE VACCINE CAUSE IN THE ASIA-PACIFIC REGION

Researchers from the Institute have begun boosting the vaccine rollout in Vietnam and across the Pacific through a comprehensive Vaccine Champions Training Program.

The program, which was co-designed by Professor Margie Danchin, Dr Jessica Kaufman and Ms Belle Overmars, trains trusted people in the community to deliver vaccine information sessions and become vaccine champions.

People who attend the vaccine information sessions may then become community advocates, who are empowered to answer questions, talk about their experiences and advocate for vaccination in their community.

This ongoing program is expected to create a ripple effect in communities, resulting in increased uptake of COVID-19 and routine vaccines, ultimately leading to improved health outcomes for people across the globe.

DEVELOPING A NEW HUMANITARIAN DISASTER GUIDE FOR THE WORLD HEALTH ORGANIZATION

Murdoch Children's Dr Hamish Graham oversaw the creation of a humanitarian disaster guide to better manage child and adolescent health during global disasters such as the Pakistan floods in 2022 and the Türkiye earthquake in early 2023.

The guide, which was launched by the World Health Organization in 2022, was developed alongside researchers Dr Patrick Walker and Dr Mariam Tokhi from the University of Melbourne and covers all aspects of humanitarian disaster support from prevention to acute crisis response and recovery.

It provides critical information for a variety of humanitarian emergencies, including floods, earthquakes, famine, armed conflict, political instability, the large-scale displacement of people, severe food shortages and the destruction of economic, political and social institutions.

Dr Graham said the guide aimed to ensure that the needs and concerns of children and adolescents were properly considered in emergency preparedness and response efforts.

ABOVE: A World Scabies Program nurse hands medication to a seven-year-old in the Solomon Islands scabies mass drug administration roll out. BELOW: A World Scabies Program team member helps a child in the Solomon Islands.

REDUCING SCABIES INFECTION RATES ACROSS FIJI

Scabies is a highly contagious, extremely itchy skin condition that affects children across the globe. Scabies is caused by tiny mites that burrow under the skin and can result in common bacterial infections such as impetigo and, in severe cases, blood poisoning, kidney failure and rheumatic heart disease.

Over several years, Murdoch Children's Dr Daniel Engelman and Dr Li Jun Thean led the BigSHIFT Trial which aimed to decrease the rates and impact of scabies infection in Fiji. The before-after trial involved mass drug administration for scabies control in 2019 and population research between 2018 and 2020.

The trial found that mass drug administration can substantially reduce scabies and impetigo rates in endemic settings. Following this course of action in Fiji, the number of hospitalisations due to skin infections and scabies fell by 21 per cent and the crude community prevalence of scabies declined from 14.2 per cent to 7.7 per cent.

The BigSHIFT Trial found no difference in the incidence of childhood invasive infections and post-streptococcal sequelae (a condition which is the consequence of a previous disease or injury) but determined that mass drug administration could be an effective strategy for reducing scabies-associated bacterial complications in endemic settings.

Dr Engelman hopes that mass drug administration will help prevent scabies and associated bacterial complications in countries like Fiji in the future.

ACFID STATEMENT

Murdoch Children's Research Institute is a signatory to the ACFID Code of Conduct, which is a voluntary, self-regulatory sector code of good practice. As a signatory we are committed to, and fully adhere to, the ACFID Code of Conduct, conducting our work with transparency, accountability and integrity.

Watch Ms Nester Thugea, head teacher at Gizo Primary School in the Solomon Islands, talk about how the scabies mass drug administration has treated around 600 children at the school.

Advancing Australian Genomics

Working across the Institute's Genomics theme, Murdoch Children's researchers are helping translate genomic research into clinical practice.

Australian Genomics, led by Murdoch Children's Director Professor Kathryn North AC, is a national collaboration that supports the translation of genomic research into clinical practice.

Australian Genomics has more than 100 national and international partners and collaborators who are committed to more accurately diagnosing and treating people with rare diseases and cancers.

Researchers at the Institute are working on several initiatives with Australian Genomics and the Victorian Clinical Genetics Services (VCGS) to improve the lives of children worldwide.

In 2022, the Federal Government announced $28.1 million for a new national body to build on the last six years of work by Australian Genomics, with Professor North co-chairing the Expert Advisory Committee for the new entity.

Sharing genetic information and speeding up results

- Australian Genomics, in collaboration with other organisations, developed Shariant – a national communication and diagnostic platform for laboratories to share genetic evidence – which has helped to standardise interpretations nationally, and resulted in more accurate diagnoses for patients regardless of their location
- VCGS Professor Zornitza Stark said sharing this information between laboratories would play a key role in improving test results through faster turnaround times and more accurate diagnosis
- An Australian Genomics-led study of critically-ill children found that faster turnaround times for genomic results led to substantial economic and personal benefits – with ultra-rapid testing potentially saving the health system $7.3 million per year and saving $3.3 million in annual welfare

CREATING A DIVERSE GENETIC DATABASE THAT REPRESENTS ALL AUSTRALIANS

Murdoch Children's and the Garvan Institute of Medical Research have received a combined $10 million to develop a new DNA database called OurDNA, which includes the DNA of more than 20,000 Australians. This database will better reflect the genetic makeup of our diverse population and improve genomic data for under-represented groups including Aboriginal and Torres Strait Islander peoples.

This funding is in addition to a further $5 million allocated for the development of a National Indigenous Genomics Network that will help ensure Aboriginal and Torres Strait Islander people benefit from genomic medicine.

DECREASING THE RATE OF UNDIAGNOSED GENETIC DISEASES IN AUSTRALIA

Currently, 50 per cent of people living with a rare genetic disease do not have a diagnosis. However, Murdoch Children's Professor John Christodoulou is working to change this.

Professor Christodoulou has formed the Australian Undiagnosed Diseases Network (UDN-Aus) as part of a three-year study that will recruit around 600 participants who have an undiagnosed genetic disease. UDN-Aus aims to raise the diagnostic rate of participants from 50 per cent to 70 per cent, while giving clinicians the tools required to re-analyse their undiagnosed patients.

"UDN-Aus has the potential to change the outcome for hundreds of individuals and their families who live without knowing what caused their condition," said Professor Christodoulou.

"Families will be given greater certainty about what the future may hold for their affected child, and it will restore reproductive confidence for these families. We hope that, at least in some cases, these new findings may translate to more targeted treatments for affected individuals."

PROGRESSING GENOMICS IN SOCIETY

The Institute's Professor Clara Gaff continues to play an integral role in advancing the public's acceptance of genomics and its benefits for society.

Professor Gaff is the Executive Director for Melbourne Genomics and leads the Genomics in Society group at Murdoch Children's, which is devoted to conducting research that promotes understanding of genetics and genomics (and informs evidence-based practice) among families, health professionals and the community.

The group includes people from various backgrounds such as genetics education, ethics and genetic counselling to explore and evaluate the provision and impact of genomic technologies and genetic services. This unique blend of expertise has led to the Genomics in Society group becoming a world leader in researching the clinical and social implications of genomics.

HARNESSING THE POWER OF LONG-READ SEQUENCING

Long-read sequencing is a DNA sequencing technique that orders millions of pieces of DNA in parallel and allows clinical geneticists to sequence the whole human genome, including areas that were previously blind spots.

VCGS Associate Professor Sebastian Lunke said long-read sequencing had a very high potential to improve healthcare worldwide.

This next-generation sequencing will enable geneticists to study and read epigenetic signals (behavioural and environmental signals that change how your body reads a DNA sequence) at the same time as DNA, and give genetic counsellors much more context than short-read sequencing.

Associate Professor Lunke said the technology would increase diagnostic yield and reduce wait times for diagnosis.

"I hope that long-read sequencing will also broaden and change treatment options for genetic conditions and make it easier to diagnose more difficult conditions."

Empowering expecting parents through genomics

The Institute has led research and influenced changes that will see future parents give birth to healthier, happy babies.

VOTING IN FAVOUR OF MAEVE'S LAW

Mitochondria are the powerhouses of the cell, providing the body with over 90 per cent of the energy it needs to sustain life. When the mitochondria are not working properly, cells begin to die until, eventually, whole organ systems fail.

Each week, at least one child is born in Australia who will develop a mitochondrial disease that has no effective treatment. Children with mitochondrial diseases typically suffer severe illness affecting their brain, heart or other organ systems. Sadly, these children are also more likely to die prematurely.

In 2022, a proposal known as Maeve's Law was passed that legalised access to new assisted reproductive techniques to reduce the risk of parents passing on mitochondrial disease to their children.

Maeve's Law will allow couples to access mitochondrial donations, a specialised IVF treatment that replaces faulty mitochondria with healthy mitochondria, enabling affected families to increase their chances of having a healthy child.

Murdoch Children's Professor David Thorburn played a key role in getting the public's support for Maeve's Law and was delighted with the outcome.

"By developing a robustly regulated approach to this new form of technology, Australia will become the second country in the world [after the UK] to offer this new form of assisted reproductive technology to women at high risk of having a child with mitochondrial disease," he said.

Colleague Professor John Christodoulou said the vote in favour of Maeve's Law was a great leap forward for the families of individuals suffering from severe mitochondrial disorders.

"The carriage of this legislation gives families real hope that they will be able to have what most of us take for granted, namely being able to have a happy and healthy baby."

Maeve's Law is named after six-year-old Victorian girl Maeve Hood, pictured with her parents Joel and Sarah, who has Leigh syndrome – a disorder in which the body's cells fail to produce the energy she needs to thrive. This disorder is caused by mutations in mitochondrial DNA and could be avoided through mitochondrial donation.

HELPING PARENTS MAKE PRENATAL DECISIONS FOR THEIR BABIES

Several researchers from Murdoch Children's and James Cook University worked together to create YourChoice – an online tool to support expectant parents with prenatal testing decisions for chromosome conditions that may affect unborn babies.

Changes in the number or structure of chromosomes are common and can cause a range of conditions including Down syndrome, cystic fibrosis, Huntington's disease, Duchenne muscular dystrophy, fragile X syndrome and more.

The interactive website features a 15-minute decision aid that guides the user through a series of questions and suggests a preferred testing pathway based on their answers. It aims to guide pregnant women through the available prenatal testing options and saves the results so that they can be discussed with a health professional.

Murdoch Children's Professor Jane Halliday said the website was designed to ensure parents could have informed discussions with their maternity care provider.

"Prenatal screening tests provide information to pregnant women about the health of their unborn baby and the chance of chromosome conditions," Professor Halliday said.

"Our decision aid asks women about their values and preferences and provides them with suggested options to discuss with a health professional."

This decision tool provides comprehensive information in an accessible way and will be a very useful resource in supporting people to make the right testing decision for their baby, whether this be taking one or several tests, or no test at all.

Reshaping the genetics landscape

Around 8 per cent of Australians (two million people) live with a rare disease – many of them children and many of them undiagnosed. About 80 per cent of rare diseases are genetic.

Making a genetic diagnosis is challenging, with many families experiencing a protracted process and children often undergoing invasive procedures in pursuit of an answer.

Victorian Clinical Genetics Services (VCGS) is Victoria's leading provider of prenatal, childhood and adult clinical genetics services. As a wholly owned subsidiary of Murdoch Children's, what differentiates VCGS from other providers is the co-location of key disciplines in genetic health and care – clinical genetics, genetic counselling and medical pathology services.

Since opening its doors in 1988, VCGS Chief Executive Officer Dr Meg Wall said VCGS has reshaped the landscape for what is possible in genetics. In 2022 alone, VCGS completed more than 175,000 tests for children, individuals and families across the world.

THE HEEL PRICK TEST

The developer of the first newborn bloodspot screening (NBS) test, Dr Robert Guthrie, once said that "no child should die or suffer disabilities if a simple blood spot can prevent it".

Following the introduction of routine bloodspot screening (also known as the heel prick test) in Victoria in 1966, there have been continual advances and improvements in NBS technology.

VCGS has screened 3.6 million Victorian babies over 57 years, and by 2022 was able to screen for 26 different conditions in newborns, including rare, but serious medical conditions such as cystic fibrosis and hypothyroidism. About one in 1,000 babies will be found to have one of these serious conditions.

In 2021, the Victorian Department of Health announced a $1 million NBS program to develop a pilot project to screen for congenital adrenal hyperplasia (CAH).

After launching the pilot program in July 2022, it successfully uncovered two cases for the year.

NEW DISCOVERIES AWAIT

The future of genetics and genomics promises to bring equally significant changes.

Work currently being conducted within VCGS aims to develop and assess new screening tests to support thousands of families across multiple generations with life-altering health information.

Looking ahead, it is truly exciting what possibilities might be achieved in making genetics and genomics universally accessible for life-long health.

ABOVE: Two-week-old Jack in the intensive care unit of The Royal Children's Hospital. FAR RIGHT: A picture of health: Jack mountain-biking in Bright.

Jack's story: before the 'heel prick' tested for CAH

Bendigo mum Jo Wall is sure her son Jack would not have survived had she not taken the then lethargic two-week-old to hospital after he had failed to regain his birth weight.

"He was slipping away in front of us," Jo said. "In the [emergency department], they couldn't figure out what the problem was, and what they needed to do to make him better."

Upon transfer to The Royal Children's Hospital, Jack was diagnosed with congenital adrenal hyperplasia (CAH), a disorder in which the adrenal glands cannot produce the right balance of hormones needed to regulate the immune system, stress response and metabolism. If left untreated, newborns with CAH can be left critically ill or die suddenly in the first few weeks of life.

Now six, Jack is thriving and healthy, but relies on tablets to manage his lifelong condition. Jo believes the addition of CAH to the newborn screening test will help other families avoid similar heartache.

"It was the most traumatic event to date in my life because no one knew what was wrong," she said. "That uncertainty could be totally eliminated with a test because the condition is so easy to manage."

VCGS Chief Executive Officer Dr Meg Wall said, "It brings great satisfaction to me and the scientists, clinical and laboratory staff within VCGS to know that we are playing a vital role in detecting life-threatening and life-altering conditions in newborn babies across our state.

"The successful addition of CAH to the NBS program is another example of how VCGS is working to improve the lifelong health of children and families."

Transforming the health and wellbeing of an entire generation

A national asset led from the state of Victoria, Generation Victoria (GenV) aims to create parallel, whole-of-state birth and parent cohorts for discovery and interventional research. It will provide translatable evidence to improve future wellbeing and reduce the disease burden for children and adults.

GenV is a research project with a simple but hugely important goal: To transform the health and wellbeing of an entire generation of Victorians.

Over a two-year period, we're asking parents of every newborn to be a part of GenV by safely and securely sharing information about themselves and the health and wellbeing of their newborn. This information could help researchers, services and policy makers find new solutions to many of today's most common childhood conditions.

GenV Scientific and Cohort Director Professor Melissa Wake said, "GenV is open to all 150,000 Victorian newborns born from October 2021 to October 2023 and their parents. Already Australia's largest-ever life course initiative, by the end of 2022 it had recruited over 74,916 participants, including 29,197 infants, that are representative of Victoria on ethnicity, disadvantage metrics, and urban/regional domicile.

"GenV is specifically designed to create the 'solutions system' for children and families. Despite only starting cohort recruitment in 2021, GenV is already working as it should – it has generated $27 million for research mostly from highly competitive national schemes.

"GenV stands alone in being able to show how today's tumult and existential challenges are shaping this generation of young children. Its value is amplified as the only mega-birth cohort launched worldwide during the COVID-19 pandemic, and by the 15-year void left by the failed attempts at comparable cohorts in the US and the UK in the 2010s. No other studies are expected in North America, Europe or the UK until the late 2020s," Professor Wake said.

The project was made possible by large grants from the Paul Ramsay Foundation, the Victorian Government and the Royal Children's Hospital Foundation. It is supported by families, all birthing hospitals and 10 pathology providers across Victoria, and by numerous peak bodies and institutions. At the time of publication, it is already supporting research with 140 collaborators and partners from 59 institutions across Australia and internationally.

Ongoing GenV research could significantly improve the life chances of young children. Four of our exemplar projects include:

CONGENITAL CYTOMEGALOVIRUS (CCMV)

ASSOCIATE PROFESSOR VALERIE SUNG

Using data from from GenV, Associate Professor Valerie Sung aims to test new technology aimed at diagnosing congenital cytomegalovirus (cCMV), the leading infectious cause of hearing loss and neurodevelopmental disability. The research aims to establish Australia's first rapid bedside newborn cCMV screening test to enable early treatment and improve cCMV outcomes in children.

MATERNAL VACCINE STUDY

PROFESSOR MARGIE DANCHIN

The GenV Maternal Vaccine Study will explore COVID-19 and influenza vaccine safety by examining data on pregnancy and infant outcomes in the first year of life. The large-scale study of GenV mothers and their babies will deliver rapid results and provide data on the longer-term health and developmental outcomes following maternal vaccination.

Professor Margie Danchin said many women held concerns about maternal vaccinations or subsequent infant complications and remained under-vaccinated and vulnerable.

"Communicating these research findings to pregnant women, their families and health-care providers will build vaccine confidence and ensure high maternal vaccine uptake," she said.

ALLERGY STUDY

PROFESSOR KIRSTEN PERRETT

Professor Kirsten Perrett is leading a multi-centre study investigating whether one dose of 'whole cell' pertussis (whooping cough) vaccine given at two months of age instead of the current 'acellular' (containing no cells) pertussis vaccine can help protect young children against allergic outcomes. Vaccines work by training the immune system to recognise what certain germs look like. Researchers believe some vaccines might also help to prevent allergy by making the immune system less likely to react to things that are not harmful, like food. Babies aged between six and 12 weeks are invited to take part. The research involves three study visits over 18 months.

RARE DISEASE SCREENING

ASSOCIATE PROFESSOR DAVID GODLER

In partnership with GenV, Associate Professor David Godler's EpiGNs program takes the next step towards an inexpensive genomic addition to current newborn screening programs. In addition to the conditions currently detectable by newborn screening, such as cystic fibrosis, EpiGNs will target eight developmental disorders typically not evident at birth.

"Working with GenV enables us to establish 'real-life' screening parameters for implementation and to compare this program's likely cost-effectiveness with current costly diagnostic approaches. This project will culminate in a fully developed program that could be implemented universally within 12 months of completion," Associate Professor Godler said.

GenV at a glance

29,197 babies signed up to GenV (74,716 participants overall)

6,533 babies from regional Victoria (16,253 participants overall)

70 languages spoken by GenV participants

5,713 parents (12.5%) speak a language other than English at home

857 twin or multiple births

9,243 parents have completed GenV and Me Assessments

61,831 saliva samples collected

202,530 pregnancy samples stored by our pathology partners including the VCGS

57 of 57 hospitals offering GenV recruitment (23 metro and 34 regional)

23 Studies implemented in or working alongside GenV

15-month-old Lorenzo and seven-month-old Havana who both joined GenV in 2022.

Sangita with baby Maddie.

Meet new mum and GenV supporter Sangita

Why did you decide to become a part of GenV?
I think it's important for children's health, now and later on, that we gather as much information from as many parents as possible. The more information researchers have, the more they can find. It's important to get as many people as possible into this kind of study.

What types of health conditions would you like to see GenV help with?
For me personally autism is something I'd really like to know more about – it's something that there's currently no way of knowing about until kids are slightly older. If there's anything that could be done during pregnancy to identify if there's an issue, that's something I would like to see happen.

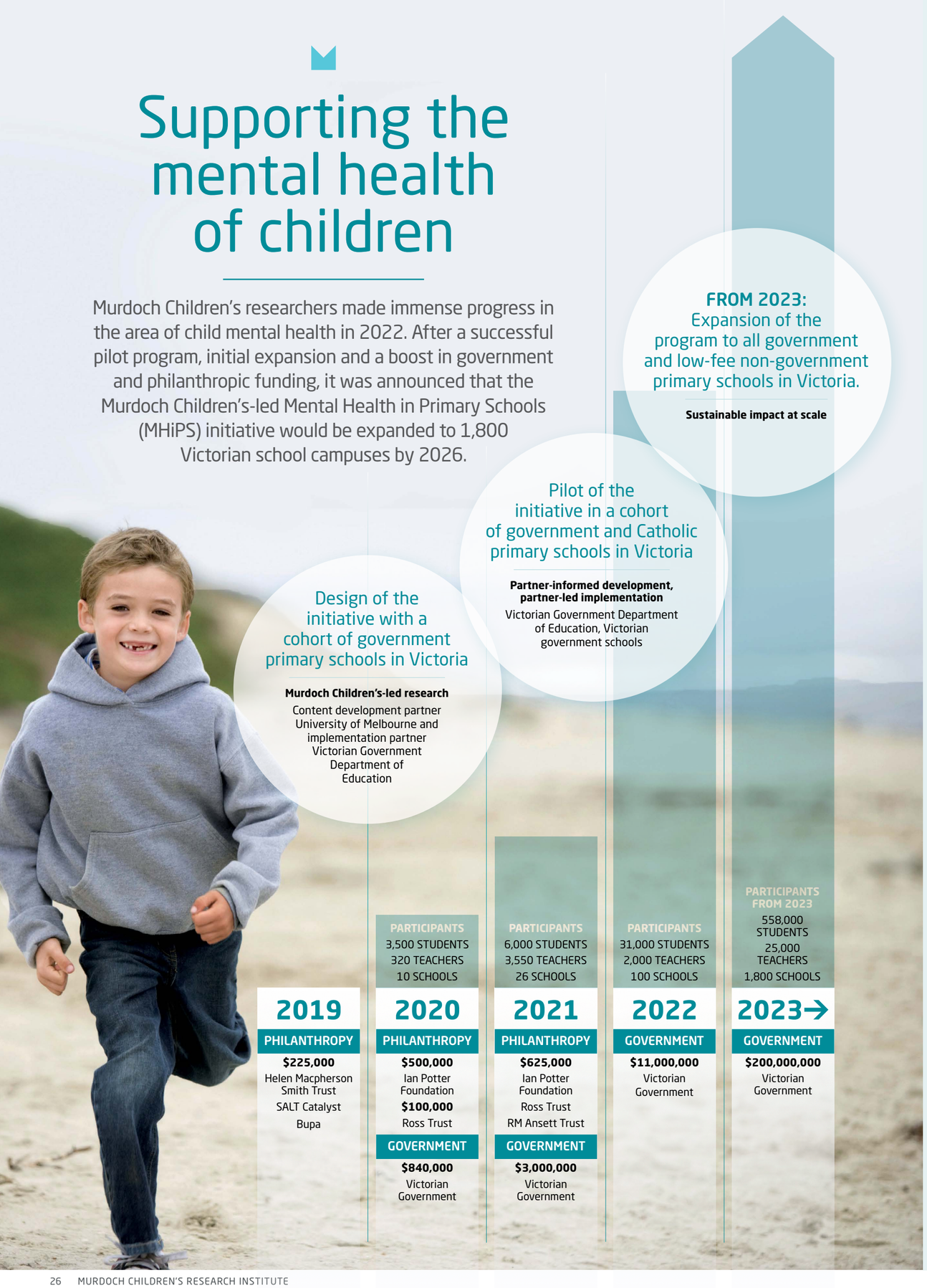
Diabetes is the other condition because it's hereditary in my family. I had gestational diabetes during my last pregnancy, so it would be good if there were ways to identify these types of conditions early on.

What sort of experience have you had with GenV so far?
In the hospital everything was done on an iPad that GenV provided. They did a swab of Maddie's cheek, and the questions were all easy to understand and very straightforward. Overall, the process was really simple.

What would you say to other parents who are thinking about being a part of GenV?
The more information we can get the more valuable the whole program will be – if not enough people join then the information isn't as valuable. You need that large amount of information to see the links with certain conditions. I'm surprised nothing like this has been done before!

Supporting the mental health of children

Murdoch Children's researchers made immense progress in the area of child mental health in 2022. After a successful pilot program, initial expansion and a boost in government and philanthropic funding, it was announced that the Murdoch Children's-led Mental Health in Primary Schools (MHiPS) initiative would be expanded to 1,800 Victorian school campuses by 2026.



2019

PHILANTHROPY

$225,000
Helen Macpherson Smith Trust
SALT Catalyst
Bupa

Design of the initiative with a cohort of government primary schools in Victoria

Murdoch Children's-led research
Content development partner University of Melbourne and implementation partner Victorian Government Department of Education

2020

PARTICIPANTS
3,500 STUDENTS
320 TEACHERS
10 SCHOOLS

PHILANTHROPY

$500,000
Ian Potter Foundation
$100,000
Ross Trust

GOVERNMENT

$840,000
Victorian Government

Pilot of the initiative in a cohort of government and Catholic primary schools in Victoria

Partner-informed development, partner-led implementation
Victorian Government Department of Education, Victorian government schools

2021

PARTICIPANTS
6,000 STUDENTS
3,550 TEACHERS
26 SCHOOLS

PHILANTHROPY

$625,000
Ian Potter Foundation
Ross Trust
RM Ansett Trust

GOVERNMENT

$3,000,000
Victorian Government

2022

PARTICIPANTS
31,000 STUDENTS
2,000 TEACHERS
100 SCHOOLS

GOVERNMENT

$11,000,000
Victorian Government

FROM 2023:
Expansion of the program to all government and low-fee non-government primary schools in Victoria.

Sustainable impact at scale

2023→

PARTICIPANTS FROM 2023
558,000 STUDENTS
25,000 TEACHERS
1,800 SCHOOLS

GOVERNMENT

$200,000,000
Victorian Government

Leading the way in social equity and inclusion

Researchers at Murdoch Children's are working with communities of refugee and migrant backgrounds to co-design and culturally adapt research processes to engage culturally diverse communities.

In 2021, half of the Australian population was born overseas or had a parent born overseas. More than one in five people in Australia now speak a language other than English at home. Despite this, many research studies systematically exclude families of refugee and migrant backgrounds who are not fluent in English or familiar with research processes.

Language is not the only barrier. Undertaking research with communities of refugee and migrant backgrounds requires research teams to appreciate different values, life experiences and perspectives. For communities that have fled persecution and war-related trauma to find safety in Australia, there may be additional barriers, including lack of familiarity with consent processes, fear of authority due to experiences of forced migration and the potential for past trauma to be triggered by participation in research.

ENGAGING CULTURALLY DIVERSE COMMUNITIES IN RESEARCH

For the past 10 years, researchers in the Intergenerational Health group at Murdoch Children's have been working in partnership with the Victorian Foundation for Survivors of Torture (Foundation House) to co-design, implement and evaluate approaches to community engagement in a variety of research studies working with women, children and families of refugee and migrant backgrounds. The employment and training of a team of community researchers culturally and linguistically matched to communities taking part in each research study has been critical to the team's success.

KNOW OUR STORY TOOLKIT

Leveraging their experience of working in partnership with communities of refugee and migrant backgrounds over the past decade, the Intergenerational Health group has developed an innovative 'Know Our Story' toolkit to support clinical and public health researchers to co-design and adapt research processes to engage culturally diverse communities. The toolkit has been designed to inspire, encourage and support clinical and population health researchers to work towards greater social inclusion and equity in research practices.

Scan here for further information about the Know our Story toolkit.

FROM LEFT: Intergenerational Health Community Researchers Maryaan Essa, Shogoufa Hydari, Akuc Deng and Shadow Toke, and Project Coordinator Rowena Coe.

Helping Aurora breathe better

Aurora Snelgrove was diagnosed with hypersecretory asthma when she was four years old. Her complicated asthma case has been difficult to treat – requiring much trial and error.

Learn more about Aurora's story on page 16.

PICTURE: WAYNE TAYLOR / THE HERALD SUN

2

Research Excellence

Our innovative technologies, leading-edge facilities and brilliant minds put Murdoch Children's at the forefront of child health research. Every day, our people work towards making meaningful contributions to research excellence.

Prizes and awards

Murdoch Children's researchers were again recognised with multiple state, national and international awards in 2022. The Institute congratulates our talented researchers who are dedicated to conducting ground-breaking research that will give all children the opportunity to live a healthy and fulfilled life.

PROFESSOR MARTIN DELATYCKI AM

Australia Day Honours Member of the Order of Australia (AM) for significant service to medicine, genetic research and education.

THE LATE PROFESSOR GEORGE PATTON AO

Australia Day Honours Officer of the Order of Australia (AO) for his distinguished service to psychiatry and developmental epidemiology, to youth health and wellbeing, and to mental health research. His extensive child and adolescent mental health research in Australia and global adolescent health work was ranked in the top 1 per cent worldwide in the **Clarivate Highly Cited List**. This marked the fourth consecutive year his work appeared on the list.

Read more about Professor Patton's legacy on page 40.

PROFESSOR MELISSA LITTLE AC

Australia Day Honours Companion of the Order of Australia (AC) for eminent service to medical research through pioneering contributions to regenerative therapies for kidney disease and to stem cell medicine.

DR DAVID BURGNER

Elected to the **Australian Academy of Health and Medical Sciences Fellowship** for research that looks at factors that increase the chances of infection and inflammation in childhood.

PROFESSOR FRANK OBERKLAID AM

Victorian Senior of the Year for his internationally recognised research and advocacy for children's health, with a focus on helping those with developmental and behavioural problems through research-based programs.

DR HOLLY VOGES

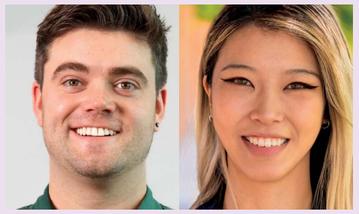
National Heart Foundation Postdoctoral Research Fellowship to explore how stem cells could help better understand and treat severe heart disease.

RITIKA SAXENA

Arrow Bone Marrow Transplant Foundation PhD scholarship for her stem cell research project aiming to help patients with blood cancers or bone marrow failure. **Victorian International Student of the Year - Research award** for her contributions to the Victorian community as a medical researcher and international student.

ASSOCIATE PROFESSOR NGAIRE ELWOOD

Inducted into the **Victorian Honour Roll of Women** for her outstanding contributions to cellular therapies and cancer research in Victoria.

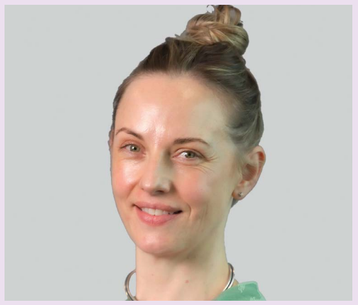


MATT COLEMAN AND EMILY UNITY

Out For Australia's 30 Under 30 Awards for their tangible contributions to the LGBTQIA+ community, success in their field, and the qualities they exhibit as inspirational role models.

PROFESSOR MIMI TANG

Her pioneering research in the immunology field was ranked in the top 1 per cent worldwide in the **Clarivate Highly Cited List**.



ELEANOR NEAL

Robert Austrian Research Award for research aiming to improve overall health outcomes for children in Fiji by reducing the number of doses of the pneumococcal conjugate vaccine (PCV) from three to two - which could save about $2.15 billion over 10 years in low- and middle-income countries.

DR MOHAJER HAMEED

Inducted into the first-ever **Victorian Multicultural Honour Role** for his exceptional and long-lasting contributions to multiculturalism in Victoria.

DR ELISSAVET NIKOLAOU

Robert Austrian Research Award for research that aims to improve the diagnosis of a severe complication of pneumonia and better inform vaccine strategies and programs in Asia.

Three pioneers

Murdoch Children's is strongly committed to diversity, equity and inclusion and we are proud to be a workplace that fosters female scientists and helps them flourish. We have a large cohort of female scientists who are leading ground-breaking research that impacts children and families.

FROM LEFT: Professor Kathryn North AC, Professor Melissa Little AC and Professor Ruth Bishop AC.

Despite their remarkable discoveries, female scientists represent just one-third of researchers globally. Less than 4 per cent of Nobel Prizes for science have been awarded to women, while just 11 per cent of senior research roles in Europe are held by women.

In Australia, only a third of medical research funding is awarded to projects led by women. In addition, although women make up 75 per cent of early-stage researchers, only 25 per cent of professors are women.

A ratio of four female academics for every male across the Institute demonstrates Murdoch Children's commitment to providing greater opportunities for women, enabling our female scientists to grow and excel in their careers.

This strong female representation ensures our eligibility for key programs including the mRNA Research Acceleration Fund and the Victorian Medical Research Acceleration Fund, both of which include a gender equality provision in their guidelines to help address the under-representation of women in health and medical research.

FOSTERING FEMALE LEADERS

Murdoch Children's fosters female leaders across the Institute – and we are proud to have three female scientists among our ranks who have been awarded Australian honours in recognition of their research achievements.

Institute Director Professor Kathryn North AC, Rotavirus vaccine pioneer Professor Ruth Bishop AC and Murdoch Children's Chief Scientist and reNEW Director Professor Melissa Little AC have been made Companions of the Order of Australia (AC).

They are pushing the envelope in their respective research fields and providing mentorship and leadership to younger generations.

Their contributions to the Institute, their teams and the scientific community is invaluable, and we thank them for their tireless work over the years.

EMPOWERING THE NEXT GENERATION OF FEMALE SCIENTISTS

Stem Cell Biology researcher and PhD candidate Ritika Saxena is one of our rising stars who has spent the past year making her mark on the scientific community. Ritika received the Arrow Bone Marrow Transplant Foundation PhD scholarship for her stem cell research project which aims to help patients with blood cancers or bone marrow failure. She has received awards and accolades including the International Student of the Year – Research award as part of the Victorian International Education Awards 2021-22, and a commendation in the Premier's Award for International Student of the Year. She was also named in the *Herald Sun's* Top 20 researchers under 40 in 2022.

Watch Ritika talk about her research and what it means to be part of the international student community in Victoria.

Murdoch Children's and VCGS staff awards

Recognising excellence across all areas of the Institute.

Murdoch Children's and VCGS staff are forever making critical and often unheralded contributions to the health and wellbeing of children and adolescents. Such contributions can have a major impact on the lives of individuals, families, communities and populations far and wide. Each year, staff are invited to nominate peers in recognition of their dedication, excellence and commitment to making a difference.

From the nominees, the VCGS Employee of the Year was selected by VCGS leadership, while the Research Excellence Award recipients in 2022 were selected by the Murdoch Children's Director.

WINNERS OF THE MURDOCH CHILDREN'S AND VCGS STAFF AWARDS FOR 2022

Above and Beyond in Research
For outstanding contribution made by a mid-level career researcher through research that enhanced the impact of their group or wider team.
Georgie Rose Clinical Sciences
Darren Ong Infection and Immunity

Above and Beyond in Service Excellence – VCGS
Given to a VCGS employee who demonstrated depth of care to patients and a commitment to high quality of service.
Dr Chern Lim TGU Clinical Genomics
Nilusha Kularatne Laboratory Services

Inspiring Others Award
Presented to a Murdoch Children's or VCGS employee who has demonstrated excellent leadership qualities.
Tiffany Boughtwood Australian Genomics & Genetics
Arnaud Dumont VCGS Laboratory Management

Leading and/or Contributing to Large Projects and Teams Award
Recognises and promotes project/program coordinators and managers playing a key role in the organisation and the smooth running of large projects and/or teams of people.
Anthony Marty VCGS Laboratory Management
Trish Barber Stem Cell Biology

Professor Mimi Tang, Head of Allergy Immunology Research and Director of the Allergy Translation Centre, with a patient.

Mentor Award
Recognises an outstanding mentor, supervisor, manager or colleague who has supported and guided others in an exceptional way.
Dr Emma Baker Genetics
Helen Czech Population Health
Dr Justine Marum VCGS Reproductive Genetics

Research Associates Award for Professional Excellence
Recognises staff members below postdoctoral level, such as project and research assistants, whose roles do not involve team leadership but contribute directly to research activity.
Michael See Stem Cell Biology

Safety, Health and Wellbeing Award
Recognises an individual who has shown outstanding initiative to promote, enhance or protect the safety, health and wellness of staff and students.
Tiffany Poynder Operations

Innovation Award
Recognises research that has been translated into a 'real-world application' that will impact children and their families.
Dr Steffi Eggers VCGS TGU Research Genomics

Rising Star Award – Student
Presented to a student based on their exceptional participation in the Institute community, as well as research outcomes for the year.
Kayla Parker Biobanking Facility, Operations

VCGS Employee of the Year
Presented to a VCGS staff member who has gone 'above and beyond'.
Taryn Charles VCGS Strategy and Support

Discovery Award
Recognises outstanding early and mid-career researchers for realised and future potential.
Dr Rheanna Mainzer Population Health
Dr Boris Novakovic Infection and Immunity

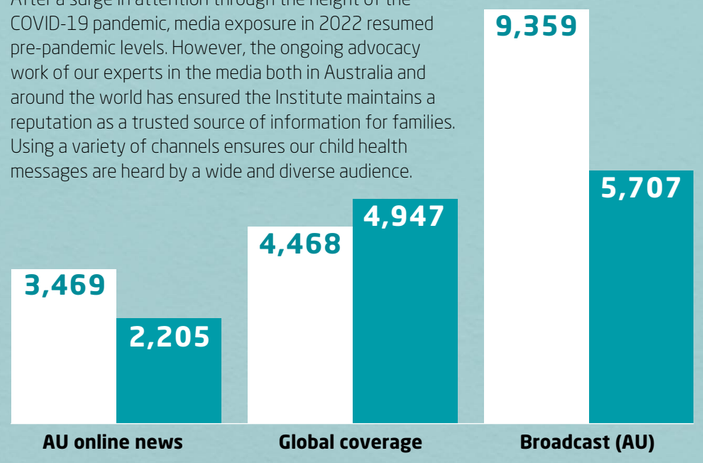
Measuring impact

The activities and research of Murdoch Children's are keenly followed.

Media mentions

2021 2022

After a surge in attention through the height of the COVID-19 pandemic, media exposure in 2022 resumed pre-pandemic levels. However, the ongoing advocacy work of our experts in the media both in Australia and around the world has ensured the Institute maintains a reputation as a trusted source of information for families. Using a variety of channels ensures our child health messages are heard by a wide and diverse audience.



Social media/digital

Engagement with the Institute's social media channels continued to grow as increasing numbers of parents, carers and friends turned to Murdoch Children's for trusted health information.

Cross-profile performance overview
Impressions: **6,934,656**
Engagement: **160,773**

Facebook
Impressions: **3,806,890**
Engagement: **99,642**

Twitter
Engagement: **22,482**
Impressions: **818,376**

LinkedIn
Impressions: **698,322**
Engagement: **33,523**

YouTube
Views: **34,332**
Impressions: **439,882**

Instagram
Impressions: **1,611,068**
Engagement: **5,126**

Website
Unique visitors: **534,931**

Research metrics

Again, our researchers and collaborators excelled, consolidating our position among the world's top three child health research institutes. Publication data metrics again underscored the breadth and quality of their endeavours, and the impact and ongoing influence of their research output.

Papers
1,524 items in total
3,324 total citations
H-index = 21
21 of our 2022 papers have been cited 21 times or more

Altmetrics
Altmetrics is a system that tracks the online attention that Murdoch Children's research outputs receive.
366,432 mentions
4,824 research outputs
2,698 policy mentions
5,597 patent mentions
5,927 Wikipedia mentions

Collaboration
54.59% of papers (832) involved an international collaboration
Co-authors came from **137** countries and **1,798** different institutions

Highly cited papers by
Professor George Patton AO
Professor Mimi Tang
Professor Ingrid Scheffer

Highly cited papers*
7 papers are hot. (Hot papers are papers published in the last two years that received citations quickly after publication. These papers have been cited enough times in the most recent bimonthly period to place them in the top 0.1 per cent when compared to papers in the same field.)
28 papers are highly cited. (Highly cited papers are papers that perform in the top 1 per cent based on the number of citations received in the previous two months when compared to other papers published in the same field in the same year.)
42 papers are in the Top 1 per cent of papers in their field for that year*
186 papers are in the Top 10 per cent of papers in their field for that year*
* Source: Web of Science (Clarivate).

Awards
After revamping and relaunching our website in 2022, Murdoch Children's won the Website Redevelopment award in the 2022 Web Excellence Awards. We were also listed as a finalist in the Annual Reporting Awards for our 2021 Annual Report.

Murdoch Children's rising stars

Our young researchers are empowered with the knowledge and resources needed to improve child and adolescent health both now and into the future. Working across all areas of the Institute, these researchers embody the mission, vision and values of Murdoch Children's.

LEFT-HAND PAGE FROM LEFT

DR ELENA TUCKER

REPRODUCTIVE DEVELOPMENT TEAM LEADER / SENIOR RESEARCH OFFICER

"I hope to better understand the genetic causes of ovarian disease to improve outcomes for young women with reproductive disorders such as premature ovarian insufficiency."

DR DARYL CHENG

SAEFVIC CLINICAL RESEARCH FELLOW / CONSULTANT PAEDIATRICIAN AND CLINICAL INFORMATICIAN

"My goal is to learn more about COVID-19 vaccination related adverse events, and utilise surveillance data to inform public health recommendations around the use of these vaccines in the paediatric and adolescent age groups."

DR SHIVANTHAN SHANTHIKUMAR

RESPIRATORY CLINICIAN-SCIENTIST FELLOW

"I hope my research and clinical work will help improve the respiratory health and wellbeing of all children and young people."

RITIKA SAXENA

PHD STUDENT / RENEW ECR COMMITTEE CHAIR

"I aim to help patients needing a Haematopoietic Stem Cell (HSC) transplant by generating an alternative source of perfectly matched HSCs in the laboratory."

THIS PAGE FROM LEFT

DR HOLLY VOGES

HEART REGENERATION SENIOR RESEARCH OFFICER / RENEW ECR COMMITEE REPRESENTATIVE

"I aim to use stem cells to better understand the role of the immune system in regulating heart valve disease."

YARA-NATALIE ABO

TROPICAL DISEASES PHD STUDENT

"My research aims to advance the development of a Strep A vaccine and help prevent rheumatic heart disease which disproportionately affects children."

DR HAMISH GRAHAM

INTERNATIONAL CHILD HEALTH TEAM LEADER / CLINICIAN-SCIENTIST FELLOW

"I'm working to help improve access to medical oxygen in low- and middle-income countries, which could potentially prevent over half a million child deaths every year."

Treating scabies on a mass scale

Glenson Junior and his mother with a scabies cream she received during the scabies mass drug administration at Komuni Samu in Solomon Islands.

PICTURE: ZAHIYD NAMO / Murdoch Children's Research Institute 2022

Read more about our global health work on page 18.

3 Living Our Values

Diversity in our people, our research and our participants helps drive better outcomes for children. We concentrate our efforts to provide a truly inclusive workplace where all staff are supported and are able to use their unique experiences, skills and knowledge to reach their full potential.

Vale Professors Ruth Bishop and George Patton

The Institute lost two brilliant minds in 2022 – Professor Ruth Bishop AC and Professor George Patton AO, who devoted their lives to improving child health.

PROFESSOR RUTH BISHOP AC BSC MSC PHD DSC

Professor Rush Bishop AC was internationally acclaimed for her significant rotavirus discovery in 1973 which identified the major cause of gastroenteritis in infants and children.

Professor Bishop's discovery – and the legacy of rotavirus vaccination – has saved the lives of thousands of children around the world, especially in low-income countries.

During her career, Professor Bishop worked tirelessly to understand gut bacterial changes in children with a variety of intestinal diseases and the causes of childhood gastroenteritis. Her studies, which included using the emerging technology of electron microscopy (a technique used to obtain high-resolution images of biological specimens) at the University of Melbourne, led to the discovery of rotavirus.

Following her landmark discovery, Professor Bishop dedicated herself to preventing rotavirus infection which kills half a million children each year worldwide. Her tireless research led to the introduction of oral rotavirus vaccines into the routine immunisation schedule for all Australian children in July 2007, and the vaccine has been licensed in more than 110 countries.

Throughout her career, Professor Bishop co-supervised and mentored several paediatric gastroenterologists who went on to make major clinical and research contributions in their own right – including Professor Julie Bines, who is continuing this important work.

Professor Bishop's research group at Murdoch Children's developed the oral RV3 vaccine, which can be administered soon after birth, unlike existing rotavirus vaccines. With ongoing development and assessment under the leadership of Professor Bines, the RV3 vaccine aims to save many more lives.

Professor Bishop's eminent work in rotavirus made her an international icon in the field of diarrhoeal diseases in children. She was a member of and chaired several World Health Organization committees and was cited by Bill and Melinda Gates as being a major influence on the establishment of their global health foundation.

There have been few Australian scientists or clinicians who have had such an impact on child health worldwide. The Melbourne Children's Campus has lost a truly great scientist who leaves a wonderful legacy for each of our partner institutions.

PROFESSOR GEORGE PATTON AO MB BS MD FAAHMS FRANZCP FRCPSYCH

Professor George Patton AO was an eminent adolescent psychiatrist and psychiatric epidemiologist whose career focused on improving the health of adolescents across the world.

After his passing, Professor Patton was appointed an Officer of the Order of Australia (AO) for his distinguished service to psychiatry and developmental epidemiology, youth health and wellbeing, and mental health research.

Professor Patton's work brought global attention to adolescence as a unique developmental stage and defined the unmet needs of young people.

In 2022, Professor Patton was ranked in the top 1 per cent of researchers worldwide in the Clarivate Highly Cited List for his

extensive child and adolescent mental health research in Australia and global adolescent health work. This marked the fourth consecutive year he appeared on the list.

His recent career was defined by the Lancet Commission on Adolescent Health and Wellbeing. The commission proved remarkably influential, not only in shaping how people think about the significance of adolescents and their health, but also in galvanising the nature of investments made to advance their health and wellbeing.

Professor Patton's research interests also focused on disadvantaged young Australians including those in youth justice settings, those experiencing homelessness and young people of Aboriginal and Torres Strait Islander heritage.

Professor Patton's 30 years of research leadership at the Centre for Adolescent Health saw it emerge as the place to study adolescent health globally. It continues to welcome scores of visiting academics, clinicians and students from overseas each year.

The rigour and innovativeness of Professor Patton's research and those he trained will be a lasting influence on the field for generations to come.

A culture of caring

Murdoch Children's has grown to become the largest and most impactful child health research institute in Australia. Our work is centred around our passion for improving the health and wellbeing of children and our people are integral to our mission, which is why we continue to invest in their engagement.

Murdoch Children's staff at our inaugural Midsumma Pride march in February 2022, proudly bearing our official Institute Pride banner, incorporating the Murdoch Children's logo and Progress Pride flag.

In 2022 we conducted our organisation-wide People Experience survey – the first engagement survey since 2009. We measured employee engagement in detail and assessed a broad range of contributing factors such as leadership, communication and collaboration, as well as some more unique contributing factors such as work and life blend, social responsibility and feedback and recognition.

We were pleased that our engagement score was above the industry average and that it provided our people with the opportunity to share their experiences and give feedback to the Institute.

ENABLING THE SUCCESS OF OUR PEOPLE

The Institute's total headcount across Murdoch Children's and VCGS for paid employees, honorary fellows and students increased by 13 per cent between 1 January 2022 (2,761 people) and 1 January 2023 (3,141 people).

Enabling success of our people is a high priority for Murdoch Children's/VCGS. The leadership program, Leading for Impact, which commenced in 2019, is designed to help leaders inspire others and lead effectively across different teams and roles, to maximise their impact on people and performance. Whilst our Beyond mentoring program, which commenced in 2016, has been designed to focus on building mentoring capability and foster successful peer group and institute relationships through facilitated group coaching.

OUR COMMITMENT TO DIVERSITY AND INCLUSION

At Murdoch Children's, we are proud of our diversity and believe it drives our innovation. We are committed to creating a culture of inclusivity, equity and respect that celebrates the many genders, ages, ethnicities, cultural backgrounds, abilities, religions and sexual orientations within our organisation. As part of this commitment, the Institute enrolled in the Science in Australia Gender Equity (SAGE) program in 2021.

Through this program, Murdoch Children's has undergone a rigorous self-assessment process to identify the barriers to attraction, retention and progression for all our people over the last 18 months.

Following data analysis this year, we have identified our six priority areas and are working together to co-design a seven-year Action Plan to address the gaps to gender equity and diversity in our workplace to continue building an inclusive and dynamic culture. The Institute will submit an application and action plan based on the above priority areas to SAGE and will be awarded a Bronze Athena Swan if successful.

New stem cell leaders

Our Stem Cell Medicine researchers are driving the development of therapies for currently incurable diseases, including kidney, heart and skeletal-muscle diseases, leukaemia, brain cancer, respiratory diseases and juvenile diabetes. These stem cell superstars are helping to advance research, unlock discoveries and open pathways to new treatments and possibilities.

DR JAMES MCNAMARA

Team Leader/Senior Research Officer - Heart Disease group

Dr McNamara is passionate about improving the health of children affected by genetic heart disease. He uses state-of-the art human pluripotent stem cells and genetic engineering techniques to create beating human heart cells in a dish, to better understand why errors in the genetic code cause heart disease.

"My vision is to use the knowledge gained from these beating human heart cells in a dish to develop more effective therapies for these children."

DR RHIANNON WERDER

Team Leader/ Senior Research Officer - Immune Development group

Dr Werder received her PhD from the University of Queensland in 2017 investigating early-life respiratory viral infections. She then received a NHMRC CJ Martin fellowship to undertake postdoctoral studies at the Center for Regenerative Medicine at Boston University, using cutting-edge stem cell tools to investigate genetic causes of lung disease. Dr Werder's laboratory is generously supported by the Stafford Fox Medical Research Foundation.

"My research focuses on applying induced pluripotent stem cell-derived lung models to investigate respiratory infections, and chronic lung diseases," Dr Werder said. "With this research, I hope to develop new therapies for childhood infections and lung diseases."

ASSOCIATE PROFESSOR RICHARD MILLS

Group Leader - Muscle Bioengineering group

Associate Professor Mills is the principal investigator at the reNEW Melbourne node, and the group leader of the Murdoch Children's Muscle Bioengineering Laboratory. He holds a PhD in biomedical engineering from the University of Queensland, and completed post-doctoral training at The Karolinska Institute, Stockholm, and QIMR Berghofer Medical Research Institute, Brisbane.

"My research is focused on generating lab-made muscle tissue, which acts and functions like the muscle in your body, to understand disease and find new treatments. I hope my work will help realise the potential of stem cells by using stem-cell models to find new treatments for muscle disease."

DR MARIA GIOVANNA GARONE

Research Officer - Neural Stem Cell group

Dr Garone is a research officer in the Neural Stem Cells group at Murdoch Children's with seven years' experience modelling nervous system diseases using human-induced pluripotent stem cells (iPSC). She was awarded the Human Frontier Postdoctoral Fellowship in 2022, which supports young scientists in broadening research skills and potentially transformative research in the life sciences.

"My goal is to generate stem cell-derived organoid models of the human hippocampus and amygdala to investigate brain development and childhood conditions affecting the cortex-limbic axis."

DR SEAN HUMPHREY

Group Leader - Functional Phospho-proteomics group

Dr Humphrey was recently recruited by the Institute and is an honorary senior research fellow of the University of Sydney and the University of Melbourne with over a decade of expertise studying cell signalling. He has made significant contributions to the field, developing innovative mass spectrometry-based technologies such as the widely used 'EasyPhos' approach. At Murdoch Children's, Dr Humphrey's group will apply these cutting-edge technologies to make breakthrough discoveries and to identify effective drugs to treat childhood diseases including brain cancers and muscular dystrophy. Dr Humphrey's laboratory is generously supported by the Stafford Fox Medical Research Foundation.

"Murdoch Children's is an inspirational institute to be a part of and I look forward to the discoveries we will make together."

Campaigning to keep children out of prison

Children do their best when they are supported, nurtured and loved. But currently children across Australia as young as 10 can be arrested by police, charged with an offence, taken to court and locked away in a prison.

Over half (56 per cent, or 461 of 818) of all young people in detention on an average night in the June quarter 2022 were Aboriginal or Torres Strait Islander people. Indigenous Australians made up just 6 per cent of the Australian population aged 10–17.

The rate of young Indigenous Australians aged 10–17 in detention on an average night decreased over the four-year period, from 34 per 10,000 young Indigenous Australians aged 10–17 in the June quarter 2018 to 29.4 per 10,000 in the June quarter 2022.

However, young Indigenous Australians aged 10–17 were 26 times as likely as young non-Indigenous Australians to be in detention on an average night in the June quarter 2022, and this fluctuated at 16–26 times the non-Indigenous rate over the four-year period.

Murdoch Children's Director Professor Kathryn North AC said, **"We were proud to join the national Raise the Age Campaign. Our research had clearly shown the detrimental impacts of incarcerating young people, which disproportionately impacts Aboriginal and Torres Strait Island People."**

Impact through Innovation

Murdoch Children's actively seeks partnerships with stakeholders who will help accelerate the translation of the Institute's discoveries into real-world applications.

Our current partners come from a range of government and industry sectors, including universities, and health and medical research institutes, as well as community and social enterprises. Together, we are improving the lives of children, families and future generations by amplifying our ground-breaking discoveries and world-class innovations.

DECODING MENTAL HEALTH AND WELLBEING

To improve the mental health literacy of young children, adolescents and teachers, the Innovation team together with our expert researchers, and in collaboration with Matterworks and Education Perfect, worked to create the Decode Mental Health and Wellbeing program.

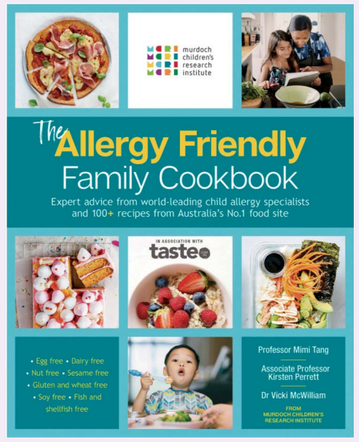
Also known as Decode, the program was created to address the growing challenge of mental health issues in children and adolescents by delivering evidence-based information in a novel, engaging way that resonates with children and adolescents.

"Schools are currently facing a mental health crisis, with 14 per cent of four to 17-year-olds living with a diagnosable mental health condition," said Murdoch Children's Professor Harriet Hiscock.

"It's critical to start the process of building students' mental health literacy from a young age so they feel armed with knowledge and tools to build resilience.

"Decode has been designed to do exactly that, using content creators with lived experiences who can deliver authentic messaging in language students understand."

Decode is hosted by TikTok star JasmineXO and features a range of diverse young people. Aimed at years 5-8 students, it is hoped the program will provide actionable learning outcomes that improve the lives of children across Australia.



ALLERGY FRIENDLY FAMILY COOKBOOK

In 2022, Professors Mini Tang and Kirsten Perrett, and Dr Vicki McWilliam turned the Insititute's world-leading allergy research into *The Allergy Friendly Family Cookbook*, published by HarperCollins*Publishers* Australia, which hit bookshelves in March 2023. Launched in association with TASTE.com.au, the book aims to help families living with food allergies take back control in the kitchen.

Currently, Melbourne is considered the allergy capital of the world, with one in 10 infants in Australia diagnosed with a food allergy and almost 3 per cent of children allergic to peanuts.

"People with food allergies can often find themselves following overly restrictive diets unnecessarily," Professor Tang said.

"While essential to avoid the foods that their child is allergic to, it's also important to maintain a healthy, diverse, balanced diet that is nutritionally adequate. We hope the book will help address this."

Professor Perrett hopes the translation of food allergy research into the cookbook will have an immediate impact on children and families living with food allergies.

EXPANDING THE HEADCHECK APP TO ADULTS

Murdoch Children's developed HeadCheck in partnership with the Australian Football League (AFL) and Curve Tomorrow to help parents, coaches and teachers recognise concussion in children and help them recover.

With one in five children experiencing concussion by the age of 16, HeadCheck has helped people all over Australia identify when an ambulance, hospital or GP visit is needed for childhood concussion care.

The success of HeadCheck led it to expand in 2022 to also cover adult concussions. This involves adding adult-specific clinical tools to the app, including a symptom checklist, and important recovery considerations for adults experiencing concussion.

The HeadCheck app will help adults and their loved ones make more informed decisions on the best time to return to work or study or get back on the road.

Over the next few years, HeadCheck will continue to play an important role in research led by Murdoch Children's to improve concussion detection and treatment for children and adults.

SLEEP WITH KIP™ + COTTON ON

Sleep with Kip™ is an innovative, clinically validated and evidence-based children's storybook series that is backed by over 20 years of infant and child sleep research.

Murdoch Children's Professor Hiscock, the lead researcher of the Sleep with Kip™ series, said the project teaches sleep hygiene skills that can help us all get a better night's sleep.

"We've been treating families with behavioural sleep issues for decades and know just how exhausting and depleting it can be for the entire family when sleep is difficult," she said.

"We have a thorough understanding of the treatments and strategies that work and are excited that Australian families and other health professionals will have access to our knowledge and solutions through these fun bedtime books."

Sleep with Kip™ has resulted in a significant improvement in sleeping patterns in more than 75 per cent of children who have used the books as part of their bedtime routine.

To further support the impact of this innovative book series, Murdoch Children's partnered with Cotton ON Group to create a sleepwear and accessories range to support a good night's sleep. Featuring the characters from the Sleep with Kip™ books, the range includes drink bottles, pyjamas, weighted blankets and a Snuggle Kip toy.

2022 Innovation at a glance

47 active projects in the Innovation program

66 researchers engaged in the Innovation program

19 new patents and trademarks

3 innovation awards received

3 products launched

2 spin-outs established

14,000+ Sleep With Kip™ books sold

30,000+ downloads for Murdoch Children's-developed apps and websites

16 countries in which our innovations are actively used

The Innovation Team's Mission

Empower and connect people at the Melbourne Children's campus to help them develop and translate their research ideas into real-world applications that benefit children and their communities.

Get in touch to partner with leaders in health innovation and make a difference in the lives of children everywhere.

Giving hope to immunocompromised children like Wade

Wade Regan, 11, has cystic fibrosis and developed an infection caused by mycobacteria which caused his lung function to drop to 63 per cent. His mother Rachell said the treatment process was extremely difficult, but recent Murdoch Children's research – which engineered human immune cells to model an infection common among immunocompromised children – gave her hope that a successful treatment would be found. "The stem cell results are very reassuring that one day the right treatment will be discovered, which will be life-changing for Wade and other children who not only have a severe lung condition but have to grapple with infections, too."

PICTURE: TIM CARRAFA / THE HERALD SUN

4

Securing their futures

Our supporters help the Institute develop and translate vital child health research into health solutions for individuals, families and communities, in Australia and worldwide. Thanks to the combined strength of our researchers, partnerships and generous supporters, we've accelerated research discoveries, advanced global knowledge and transformed children's lives.

Honouring Dame Elisabeth Murdoch's legacy for generations to come

Dame Elisabeth Murdoch AC DBE at Cruden Farm in 2008.

Since founding Murdoch Children's Research Institute with Professor David Danks AO in 1986, the late Dame Elisabeth Murdoch AC DBE has inspired many members of her family to support the Institute in tackling some of the biggest health issues facing children around the world.

Founding donor, philanthropist and daughter of Dame Elisabeth Murdoch, Janet Calvert-Jones AO, shares her mother's passion for the Institute and says Dame Elisabeth would be thrilled with how far the Institute has come since its inception almost four decades ago.

"Like Mum, I was involved with the Institute from the very start," Janet said.

"It is incredible to see how much the Institute has grown over the years. I mean, we are now among the top three child health research institutes in the world, which is just fantastic. Mum would be very proud."

Over the last 36 years, Janet has served as an ambassador and Board member of the Institute, garnering support and funding for research across clinical sciences, genetics, infection and immunity, population health and stem cell biology.

INTERGENERATIONAL GIVING

Since Dame Elisabeth's passing in 2012, this passion and drive for positive change has not ceased, with many of her extended family and friends inspired by her legacy to support child health research projects around the world.

"Mum was just amazing," said Janet.

"I still bump into people who tell me how inspirational she was. You know, she was interested in everything and wanted to support in any way she thought she could.

"When Mum wanted to establish the Institute, our family all wanted to support her – and our family and friends have continued that support ever since.

"When I retired from the Board in 2014, Sarah Murdoch was already an ambassador and I asked if she would take my place on the Board, which she did, and she has done an amazing job. Since then, she and [her husband] Lachlan have given so much, including the Sarah and Lachlan Murdoch Fellowship. Everything she does is just incredible."

"It is so important to pass the act of giving on to the next generations. Giving is necessary and it is up to individuals to contribute as much as they can."

Janet Calvert-Jones AO with John Calvert-Jones AM and Dame Elisabeth Murdoch AC DBE at Cruden Farm in 2006.

Janet Calvert-Jones AO and Penny Fowler at the Dame Elisabeth Murdoch Lunch in 2019.

Janet Calvert-Jones AO and Co-Chair and Global Ambassador Sarah Murdoch at the 2022 Dame Elisabeth Murdoch Lunch.

LUNCHEON IN HONOUR OF DAME ELISABETH MURDOCH

Each year, Murdoch Children's hosts its annual Dame Elisabeth Murdoch Luncheon. The event is an opportunity for supporters of the Institute to come together and acknowledge Dame Elisabeth's legacy and pay tribute to her generosity and passion for improving children's health.

"The lunch is a lovely way of celebrating the Institute and my mother's involvement," said Janet. "It is always a very happy occasion with friends."

In 2022, the lunch was held at Cruden Farm, the home of Dame Elisabeth until her death.

"Cruden Farm means a tremendous lot to the family – it is the centre for our family, really," Janet said.

"My childhood there was a very happy one. We lived at Cruden Farm during the war and then came back to Melbourne after the war. But my memory there is just being very happy. I was a lucky child – I was probably spoiled as I was the youngest, too. We were all so lucky though. We spent a lot of time in the gardens as children."

It is these sorts of childhood memories that inspire Janet to ensure more children can have happy childhoods.

"Today, we honour my mother's wish of keeping Cruden Farm open for people to enjoy, especially children, just as we did. All children deserve a happy childhood."

Janet Calvert-Jones is a member of the Council of Ambassadors, an ongoing supporter and long-time friend of Murdoch Children's Research Institute.

To find out more about supporting Murdoch Children's, please contact philanthropy@mcri.edu.au

Celebrating 20 years of partnership and connection

Bruce Lefroy, above, and with his parents Dr George Lefroy AM and Joan Lefroy AM.

For more than 20 years, the Lefroy family has provided generous support to Murdoch Children's to advance research into genetic diseases and help countless children and their families.

George Lefroy AM and Joan Lefroy AM, along with their four children – Fran, Marj, Nichola and Bruce – are the founding donors to Murdoch Children's Bruce Lefroy Centre, named after Bruce, who was diagnosed with Pitts-Rogers-Danks Syndrome in his mid thirties. The Pitts-Rogers-Danks Syndrome condition is named after Dr David Pitt, Dr John Rogers and Professor David Danks AO from Murdoch Children's and VCGS.

Since its inception, the Bruce Lefroy Centre has launched several ground-breaking studies and contributed to the worldwide knowledge of genetics. "For us, our relationship with Murdoch Children's Research Institute is incredibly precious and one we feel honoured to have had for so long," Nichola said on behalf of the family.

"Its origins run deep. Bruce was born with a spontaneous deletion on his fourth chromosome resulting in an intellectual disability, though it was many years before we knew and understood that.

"We were incredibly motivated by the idea that better research and treatment would help families like ours navigate what can be really challenging – and, at times, mystifying – circumstances. We began with a promise to provide seed funding for seven years and our friends and family have helped us continue to do so ever since."

The Lefroy family, along with their close friends and other family members, have supported Murdoch Children's for more than 20 years, giving their time, expertise, networks and generosity towards advancing child health research.

The Bruce Lefroy Centre is co-directed by Murdoch Children's Professors Martin Delatycki AM and Paul Lockhart, whose team have made many major discoveries throughout the years, as well as developed better treatments for genetic conditions such as Ataxia, Brain Malformations, Friedreich Ataxia and Haemochromatosis.

Their results are helping to diagnose genetic conditions faster, developing new treatments and providing better, more comprehensive counselling to families.

"Over time, we have been thrilled to see how much the team at the Bruce Lefroy Centre has achieved, with such persistence and dedication," said Nichola. "It is a living legacy for our brother, and we hope the research will continue to provide answers for families affected by genetic health conditions for decades to come."

(Left to right) Fran Lefroy, Nichola Lefroy, Professor Martin Delatycki AM, Dr George Lefroy AM, Bruce Lefroy (portrait), Joan Lefroy AM, Professor Paul Lockhart, Professor Kathryn North AC and Marj Lefroy. Bruce unfortunately was unable to attend the luncheon acknowledging the 20 years of support by the Lefroy family, his portrait now sits proudly outside the Bruce Lefroy Centre.

Dr George Lefroy AM, Murdoch Children's Professor Kathryn North AC and Joan Lefroy AM at Murdoch Children's Preview event in 2011.

Co-Chair and Global Ambassador Sarah Murdoch, with Joan Lefroy AM and Dr George Lefroy AM at the Dame Elisabeth Murdoch Lunch in 2022.

For the Lefroy family, Bruce remains their greatest inspiration when it comes to giving.

"Mum and Dad always felt a great sense of pride at Bruce's abilities, big heart and generosity of spirit, even as he faced challenges with development milestones that many of us take for granted," Nichola reflected.

"Many people in our networks felt this too, so he was the inspiration for them as well.

"Bruce was born with many challenges, but he is one of the most enthusiastic people we know. He cares about other people and loves playing with kids. He is always up for an adventure. He is social. He loves a dance floor, especially if ABBA is playing.

"He actively contributes to the lives of those around him. His presence has a way of revealing who people really are. Importantly, he taught us to see beyond the 'cover' of another person to their heart."

To find out more about the Bruce Lefroy Centre and how to support Murdoch Children's research, please visit our website.

Scan here to learn about life-changing research made possible thanks to the generosity of donors.

Hearts and Minds diabetes fundraising ball

Local community comes together for Hearts and Minds Diabetes Ball to raise awareness and funds for type 1 diabetes.

ABOVE: Sons Brayden Filippone, Tristan Doody and Lachlan Comito.
BELOW: Mothers Joanne Filippone, Jude Comito and Karen Doody at the Hearts and Minds Diabetes Ball in 2019.

The Victorian communities of Aberfeldie, Essendon and Strathmore have come together for their 10th Hearts and Minds Diabetes Ball to raise awareness and vital funds for type 1 diabetes, after three local mothers, Jude Comito, Karen Doody and Joanne Filippone, discovered a son in each of their families had been diagnosed with the chronic condition at childhood.

Currently affecting more than 6,500 children under the age of 14 in Australia, type 1 diabetes is a condition mostly diagnosed in childhood and requires life-long insulin therapy to manage.

In 2011, the three mothers of Lachlan, Tristan and Brayden, joined forces and established the annual ball to raise funds for type 1 diabetes research at Murdoch Children's Research Institute.

"Karen and I met in 2004 at a primary school in Aberfeldie, where some of our older children went," said Jude Comito. "Karen's son Tristan was diagnosed in 2003 at age six, and my son Lachlan was later diagnosed in May 2004 at age two.

"We always spoke about doing 'something' and we wanted our efforts to be fun, bringing our amazing friends and families together to support and raise money for research and awareness. We were fortunate to be introduced to Joanne whose son was diagnosed at age 12 in 2011 when we were in the process of organising our first ball.

"We wanted to improve the management of this awful, all-consuming chronic disease and the lives of those who suffer with it. We also wanted to unite other families afflicted by this disease, those who may have been struggling or feeling isolated. Now, we have about 16 other families involved."

2022 HEARTS AND MINDS DIABETES BALL

Since 2011, the Hearts and Minds Ball has raised over $500,000 for Murdoch Children's Diabetes Professor Fergus Cameron's research, which focuses on the impact of diabetes on the developing brain and immunotherapy/stem cell cures for type 1 diabetes.

"Raising funds for research is the main aim of the ball, as it would be our greatest wish for a cure to be found or, at the very least, prevention of diagnosis for others. While we all impatiently wait for a cure or prevention to be discovered, we have seen with our own eyes how research evolves to improving the day-to-day lives of our children," Jude said.

To learn more about diabetes research and the annual Hearts and Minds Diabetes Ball, please visit our website (mcri.edu.au) or contact philanthropy@mcri.edu.au.

Addressing family adversity

A generous grant from the Brian M. Davis Charitable Foundation is helping to avert lifelong ill-health for families hit by adversity.

The Murdoch Children's Researcher in Residence Program (RiR) has received a transformational grant from The Brian M. Davis Charitable Foundation to help Victorian Community Health Services (CHS) better detect and respond to family adversities across the state.

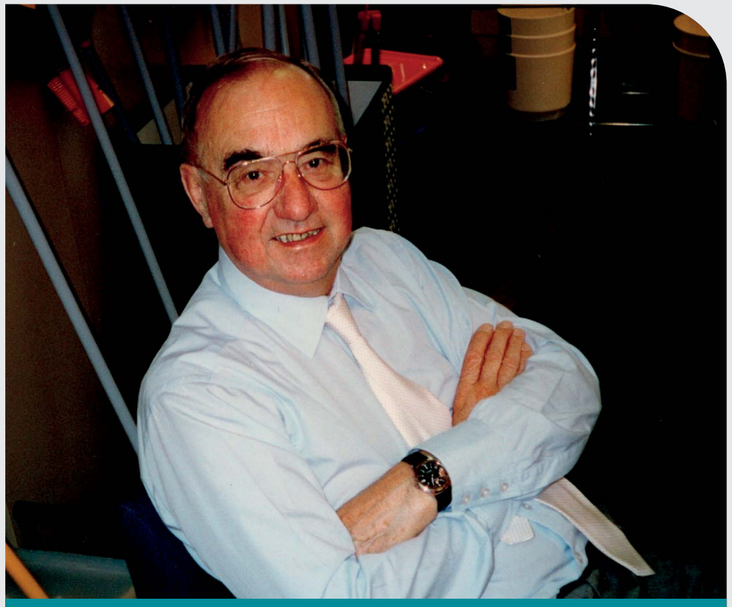
From April 2023, the RiR program will embed two researchers across three Victorian Community Health Services to support the development and growth of Child and Family Hub models and address family adversities that include financial and housing difficulties, intimate partner violence, child maltreatment and parenting difficulties.

"Family adversities worsen the health and wellbeing of families and their children across the life course," said Dr Suzy Honisett, Co-Director of the Murdoch Children's RiR program. "They increase the lifetime risk of anxiety, depression, suicidality, obesity, cancer, and heart disease. Most of these adversities go undetected and unaddressed in our healthcare system, which is why this program is so critical to better detect and respond to family adversities, while also generating new knowledge for decision makers as how best to mitigate the effects of family adversities," she said.

Program Co-Director Lauren Heery added, "Integrated Child and Family Hubs are an innovative and promising solution to the inequities faced by children and families in Australia. Designing, implementing and evolving such models however is complex work. We are very grateful for the generous contribution from the Brian M. Davis Charitable Foundation which has catalysed our RiR program."

The Brian M. Davis Charitable Foundation was established by the late design pioneer, businessman and philanthropist Brian Myddleton Davis.

Brian Davis was the founder of the homewares company Décor and ran the company for 55 years. He had a passion for design and quality, incorporating innovation and creativity into all Décor products. Despite never having children of his own, Brian had a lifelong desire to help children facing adversity and youth.



Late design pioneer, businessman and philanthropist Brian Myddleton Davis.

Brian never sought recognition for his generosity and often donated anonymously.

In 2012, Brian established the Brian M. Davis Charitable Foundation to continue his philanthropy after his passing. Thanks to Brian's generosity, his Foundation is able to positively impact the lives of many under the Foundation's major focus on disadvantaged individuals, particularly children, and medical research.

"The Board of the Brian M. Davis Charitable Foundation were delighted to support Murdoch Childrens on this project", said Trevor Stringer, Chair of the Brian M. Davis Charitable Foundation.

"We consider Murdoch Children's Research Institute, as a world leader in developing solutions to the challenges faced by disadvantaged families, to be a valued strategic partner, strongly aligned with the Foundation's mission of achieving transformational change in the lives of disadvantaged young Australians.

"We champion community-driven initiatives, supporting innovative strategies that bring people, resources, and ideas together. The Researchers in Residence project is a wonderful example of this," he said.

Brian's lifelong passion to help children facing adversity and youth across Australia continues today through his Foundation, which is committed to supporting children and young people as they strive to overcome disadvantage or ill health.

To find out more, please visit our website.

Murdoch Children's Director Professor Kathryn North AC thanks all supporters who made so many research achievements possible in 2022.

Giving GenV a go

GenV participants Ms Saada Houli and baby Mya, with son Ali Taleb.

A helping hand

Our advancements in child health research throughout 2022 were made possible thanks to various government grants that impacted all areas of Murdoch Children's. The Institute is extremely grateful for these vital contributions to our research endeavours and to Australia's future.

Government funding in 2022 came from a combination of federal and state grants, comprising National Health and Medical Research Council (NHMRC) grants (Investigator Grants, Ideas Grants, Centres of Research Excellence (CREs), Targeted Call for Research into Hearing Health, NHMRC-EU Collaborative Research); Medical Research Future Fund (MRFF) grants (Genomics Health Futures and Stem Cell Missions); and State Government grants (through the Department of Jobs, Precincts and Regions and the Victorian Medical Research Acceleration Fund).

Among the many grants received, Associate Professor Sebastian Lunke received a $3 million MRFF Genomics Health Futures Mission grant for his project, which aims to improve child health through new genomic newborn screening methods.

Associate Professor Lunke said the results of this study would lay the foundation for an innovative future model of genomic newborn screening with national scale and international applicability.

"Using a comprehensive testing method called whole genome sequencing, we hope to detect hundreds of childhood conditions, which would enable us to help more children faster than is currently possible," he said.

Professor Kirsten Perrett received a $10.2 million Federal Government investment to launch a world-first allergy centre – the National Allergy Centre of Excellence, hosted at Murdoch Children's – which will work to prevent and treat allergies.

Professor Perrett said the funds would help facilitate embedded, national, large-scale allergy studies in routine clinical care, establish a National Allergy Biorepository, launch living systematic reviews on drug, food, insect and respiratory allergic disease, train the next generation of allergy researchers – and more.

"With these tools and resources to accelerate allergy research, we are keeping Australia at the forefront of evidence-based management of allergic disease which, ultimately, will save lives."

Associate Professor Valerie Sung received a $1.4 million NHMRC grant to establish the first whole-population hearing research program in Australia – the Australian National Child Hearing Health Outcomes Registry (ANCHOR).

ANCHOR is designed to minimise inequities in hearing health service access for Aboriginal and Torres Strait Islander children and culturally and linguistically diverse families and determine a national Core Outcomes Set for child hearing loss.

Associate Professor Sung said, "ANCHOR will help strengthen the evidence base for effective, robust screening and preventive therapies for deaf or hard-of-hearing children. It will be a step closer to providing equitable health services to deaf or hearing-impaired children across Australia."

Thank you for your support

Murdoch Children's acknowledges with gratitude the support and dedicated work of former Health Minister, The Hon Greg Hunt, who retired from federal parliament in 2022, ending a distinguished 21-year political career.

The Institute also thanks outgoing Victorian MP The Hon Jaala Pulford who made an invaluable contribution to the medical research community particularly through her time as Minister for Innovation, Medical Research and the Digital Economy.

TOP, FROM LEFT: Professor Melissa Little AC, Professor Andrew Sinclair, The Honorable Greg Hunt, Professor Kathryn North AC and Professor Enzo Porrello.

BOTTOM: The Honorable Jaala Pulford with baby Daniel at the GenV 10,000 babies milestone, Royal Women's Hospital.

Our donors

With life-changing support from our donors, together we have made a positive impact around the world this year.

Our purpose

We want all children to have the opportunity to live a healthy and fulfilled life.

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Kenneth Allardice & Julie Roy
Andrew Alston
The Andrews Family Trust Charitable Fund
Australasian Society of Clinical Immunology and Allergy
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Sam and Ange Baillieu
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Suzi Carp Postdoctoral Scholarship
George & Freda Castan and the Suzi & Barry Carp families
Steven Casper and Ilana Wald
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Narelle Curtis and Nicholas Tyshing
Cystic Fibrosis Australia
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Georgia Danos and Julian Dunne
Matthew Danos and Georgia Geminder
Datt Family Foundation
Robyn and James Davis
Gerry Davies and Jessica Mariani
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Charles Day and Elise Everest
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Vanessa Fennell
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Finkel Foundation
Flicker of Hope Foundation
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Michael Forsdick
The Fox Family Foundation
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Tim Hovey
Human Frontier Sciences Program
Ian Potter Foundation
In celebration of Alex Holland
In celebration of James & Miffany Blythe
In celebration of Kevin Costa
In celebration of Lauren Thurin & Oliver Howard's Wedding
In celebration of Matthew Danos & Georgia Geminder's Wedding
In celebration of Riley Witcombe
In lieu of birthday gifts for Faye Haskin-Dubrowin
In memory of Astrid Fok
In memory of Brianna Kate Smith
In memory of Brodie Beetham
In memory of Kate Amelia Jane Asquith
In memory of Matthew R Paikos
In support of BPAN research
In support of Diabetes research
In support of Dr Ravi and his team
In support of Epilepsy research
In support of NF1 Barney Fund
International Society of Pneumonia and Pneumococcal Diseases - Kenes
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Marj Lefroy and Tim Wilkinson
Nichola Lefroy and Sam Riggall
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The Marian & E.H. Flack Trust
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Judy A Matear
Edwina McCann
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Sarah and Lachlan Murdoch Fellowship
Muscular Dystrophy Australia
The Myer Foundation
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Cr Ken Ong OAM and Li Lih Lam
James Orloff and Kirsten Macleod
The Orloff Family Charitable Trust
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The late David Penington AC and Sonay Hussein
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The Sylvia and Charles Viertel Charitable Foundation
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Angie and Vidoja Tasic - Will's Wish
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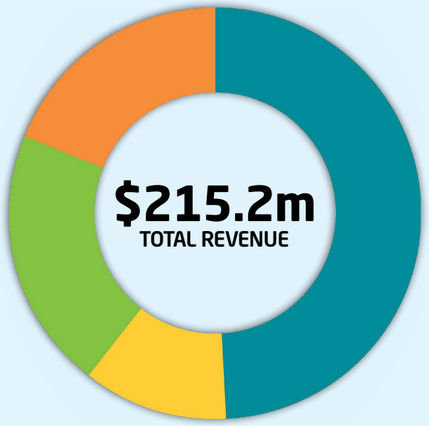
Shirley and Geoffrey Williams
Martin Xuereb
Mandy and Edward Yencken
Eppie Yiu
Zagora Foundation represented by the Clifford and Widdup families

The year at a glance

Murdoch Children's Research Institute financials for 2022



$106.1m
RESEARCH AND GOVERNMENT GRANTS

$24.3m
DONATIONS, FUNDRAISING AND BEQUESTS

$44.6m
CONTRACT RESEARCH, CLINICAL TRIALS AND OTHERS

$40.2m
VCGS

Statement of profit or loss and other comprehensive income

for the year ended December 31, 2022

	Consolidated		Company	
	2022	2021	2022	2021
	$'000	$'000	$'000	$'000
Revenue from research and clinical activities	190,548	180,399	150,554	146,770
Depreciation and amortisation	(9,115)	(8,665)	(7,808)	(7,612)
Other expenses for research and clinical activities	(228,396)	(198,692)	(189,844)	(165,988)
Surplus/(deficit) from research and clinical activities	**(46,963)**	**(26,958)**	**(47,098)**	**(26,830)**
Donation, estates, bequest and fundraising income	24,366	33,240	24,363	33,235
Fundraising expense	(2,920)	(2,066)	(2,920)	(2,066)
Net surplus obtained from fundraising activities	**21,446**	**31,174**	**21,443**	**31,169**
Finance income	333	9,157	122	8,996
Finance costs	(80)	-	(80)	-
Net finance income	**253**	**9,157**	**42**	**8,996**
Share of profit/(loss) in associates	(96)	-	(96)	-
Total comprehensive surplus/(deficit) for the period	**(25,360)**	**13,373**	**(25,709)**	**13,335**

Statement of cash flows

For the year ended December 31, 2022

	Consolidated		Company	
	2022	2021	2022	2021
	$'000	$'000	$'000	$'000
Cash flows from operating activities				
Patient fees received	32,824	31,694	-	-
Government and other grants received	119,078	134,207	108,363	124,354
Donations received	24,365	33,240	24,363	33,235
Net finance income received	1,748	356	1,615	320
Other receipts	42,370	27,694	46,364	35,859
Advances to (from) related parties	-	-	(321)	(269)
Cash paid to suppliers and employees	(232,906)	(201,218)	(194,753)	(167,984)
Net cash provided from/(used in) operating activities	**(12,521)**	**25,973**	**(14,369)**	**25,515**
Cash flows from investing activities				
Investment income received	2,896	8,801	2,733	8,676
Acquisition of property, plant and equipment and intangibles	(9,708)	(7,673)	(7,938)	(5,487)
Acquisition of investments	(29,644)	(24,482)	(30,600)	(24,877)
Net cash provided from/(used in) investing activities	**(36,456)**	**(23,354)**	**(35,805)**	**(21,688)**
Cash flows from financing activities				
Payment of lease liabilities	(99)	-	(99)	-
Net cash provided from/(used in) finance activities	**(99)**	**-**	**(99)**	**-**
Net increase/(decrease) in cash and cash equivalents	**(49,076)**	**2,619**	**(50,273)**	**3,827**
Cash equivalents at January 1	**68,417**	**63,279**	**67,817**	**61,471**
Effect of foreign exchange on opening cash balances	2,394	2,519	2,393	2,519
Cash equivalents at December 31	**21,735**	**68,417**	**19,937**	**67,817**

Statement of financial position

As at December 31, 2022*

	Consolidated		Company	
	2022	2021	2022	2021
	$'000	$'000	$'000	$'000
Current Assets				
Cash and cash equivalents	21,735	68,417	19,937	67,817
Trade receivables and other assets	19,217	17,814	15,444	14,030
Other investments	94,675	67,866	88,375	60,458
Total Current Assets	**135,627**	**154,097**	**123,756**	**142,305**
Non-Current Assets				
Trade receivables and other assets	50,976	52,317	50,976	52,317
Other investments	77,346	79,054	71,845	73,623
Other Non-Current Assets	19,243	14,564	15,335	11,118
Total Non-Current Assets	**147,565**	**145,935**	**138,156**	**137,057**
Total Assets	**283,192**	**300,032**	**261,912**	**279,362**
Trade and other payables and Lease Liability	118,361	111,810	114,471	107,945
Employee benefits	24,984	24,846	17,619	17,597
Total Current Liabilities	**143,345**	**136,656**	**132,090**	**125,542**
Non-Current Liabilities	5,398	3,567	4,475	2,762
Total Liabilities	**148,743**	**140,223**	**136,565**	**128,304**
Net Assets	**134,449**	**159,809**	**125,347**	**151,058**
Total Members' Funds	**134,449**	**159,809**	**125,347**	**151,058**

* To view the full set of Murdoch Children's accounts, visit the ACNC (Australian Charities and Not-for-profits Commission) at **acnc.gov.au/charity/charities**

2022 Board of Directors

Patrick Houlihan

Murdoch Children's Board Chair,
Nominations & Remunerations Committee Chair

Sarah Murdoch

Murdoch Children's Board Co-Chair, Global Advisory Board Chair, Global Ambassador, Nominations & Remunerations Committee Member

Miffany Blythe

Development Board Chair,
Global Advisory Board Member

Dr Brandon Carp

VCGS Board Chair, Translation and Commercialisation Committee Member

Steven Casper

Translation and Commercialisation Committee Member

Dr Rowena Coutts

Joined October 2022

Professor Jane Gunn

Bernadette McDonald

Professor Kathryn North AC

Murdoch Children's Director, VCGS Board Member, Nominations & Remunerations Committee Member

Paul Rayner

Audit, Finance & Risk Committee Chair,
Investment Committee Member

Simon Rothery

Investment Committee Chair, Nominations & Remunerations Committee Member

The Hon Nicola Roxon

Joined January 2023

Dominic Stevens

Andrew Wilson

Audit, Finance & Risk Committee Member, Nominations & Remunerations Committee Member

The Hon Rob Knowles AO

Retired June 2022

Professor John Prins

Retired October 2022

Other Boards and Committees

Names of members only

Audit, Finance and Risk Committee
Paul Rayner (Chair)
Stuart Boxer
Elise Elliot
David Gillespie
Andrew Wilson

Investment Committee
Simon Rothery (Chair)
Adrian Redlich (Deputy Chair)
Ariane Barker
Craig Dandurand
Paul Rayner

Global Advisory Board
Sarah Murdoch (Chair)
Trent Blacket
Miffany Blythe
David Calvert-Jones
Suzi Carp AO
Sarah Harden
Steve Hasker
Tristen Langley
Chelsey Martin
Kate Mohr
Katie O'Reilly
Erica Packer
(Joined July 2022)
Nicholas Stone
Lauren Thurin

Global Ambassadors
Suzi Carp AO
Sarah Murdoch

Development Board
Miffany Blythe (Chair)
Anna a'Beckett
(retired March 2022)
Vicky Alexiou
Trent Blacket
Genevieve Brammall
(retired November 2022)
Elizabeth Briskin
Georgia Danos
Marcus Freeman
Tanya Hamersfeld
Vas Katos
Clark Kirby
Tamara Lasky
Peter Mastos

Translation and Commercialisation Committee
Geraldine Farrell (Chair)
Brandon Carp
Steven Casper
Andrew Cox
Melinda Griffith
David Link
Steve Pask
Jenny Petering

Nominations and Remuneration Committee
Patrick Houlihan (Chair)
Sarah Murdoch
Kathryn North AC
Simon Rothery
Andrew Wilson
(Joined April 2023)

Marketing Council
Ian Rowden (Chair)
Joanne Smith
Martin Ward

Council of Ambassadors
The Hon Dame Quentin Bryce AD CVO
Janet Calvert-Jones AO
Paula Fox AO
Jean Miller
Kathryn North AC
Jeanne Pratt AC
Lady Primrose Potter AC
Frances Underwood

Victorian Clinical Genetics Services Board
Brandon Carp (Chair)
David Gillespie
Helen Kurincic
(retired September 2022)
Kathryn North AC
Andrew Sinclair

Our manifesto

We believe that for every question there's an answer.

For every child's illness there must be a cure.

For every obstacle there must be a way around.

What inspires us is asking the big questions – Why is it so? Why does it happen? How can we fix it?

What excites us is tackling the big issues affecting children's health.

Children are at our heart, in our blood, and in our bones.

We believe every child deserves a healthy start to life.

And a happy and prosperous community needs healthy children.

We believe in the power of curiosity, cleverness and cutting-edge research.

We are excited by discovery and new knowledge to make a difference.

The future is purchased by the present, we can shape the future, we can change the world.

So every child can have a childhood.

So every child can grow to reach their full potential.

Children are at the heart of everything we do.

Scan here to access a digital copy of the annual report on your phone.

GenV participants Meg with baby Isabelle.

murdoch children's research institute

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