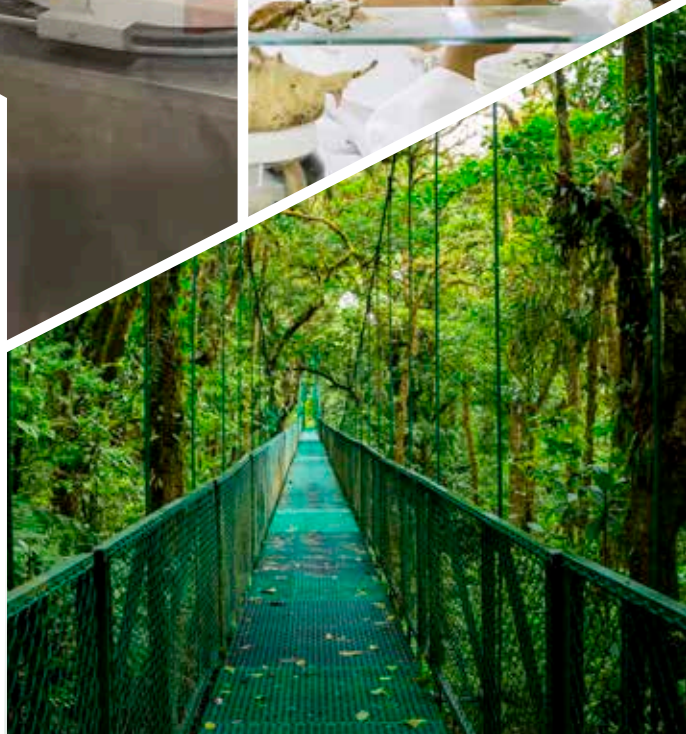
Annual Report 2020
Australian Institute of Tropical Health and Medicine



AITHM | AUSTRALIAN INSTITUTE OF TROPICAL HEALTH & MEDICINE

JAMES COOK UNIVERSITY AUSTRALIA | Celebrating 50 YEARS 1970 - 2020

Acknowledgements

AITHM gratefully acknowledge the funds received from the Queensland Government and the Commonwealth Government through the Australian Research Council Special Research Initiative and from the Division of Tropical Health and Medicine at James Cook University. This funding has enabled AITHM to build essential capacity in tropical health and medicine, delivering benefits for Australia and the Tropics.

At JCU, we acknowledge the Australian Aboriginal and Torres Strait Islander peoples as the Traditional Owners of the lands and waters where we operate our business. We pay our respects to ancestors and Elders past, present and future. JCU and the Australian Institute of Tropical Health and Medicine is committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters, and seas and their rich contribution to the University and society.

Australian Government
Australian Research Council

Queensland Government

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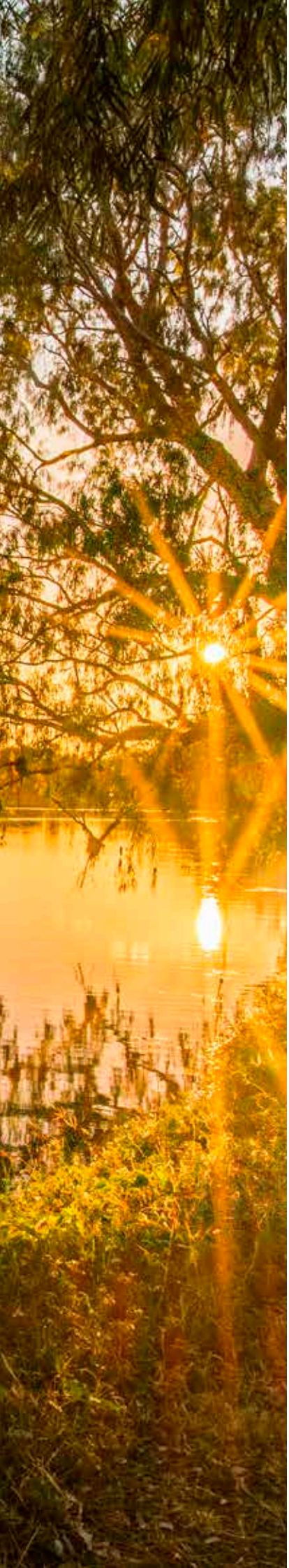
Ross River, Townsville



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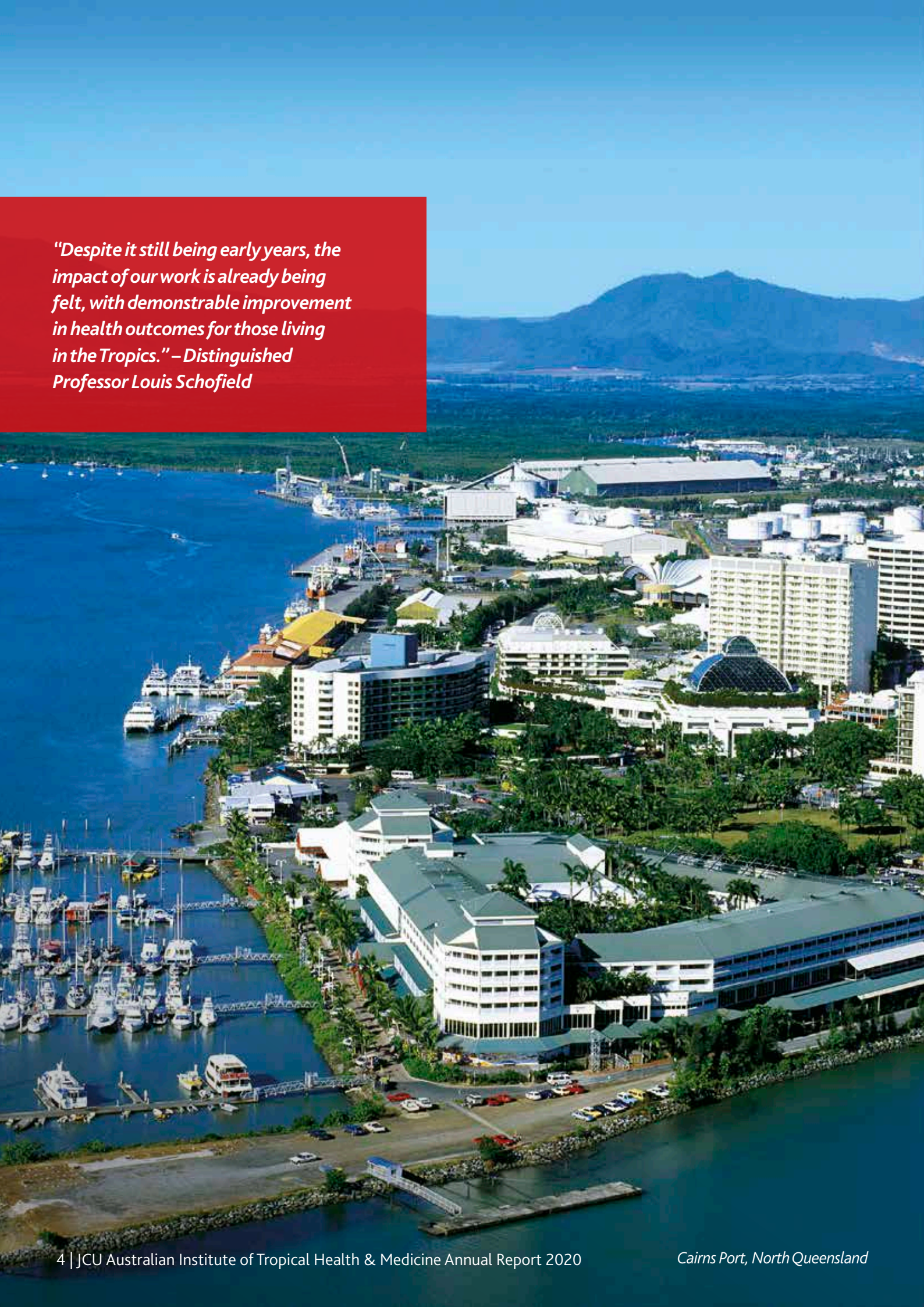


Cairns Port, North Queensland

Message From the Director

The Australian Institute of Tropical Health and Medicine (AITHM) has remained focussed on leveraging the momentum delivered in its first seven years.

We have continued to develop stronger ties with industry, health and hospital services, and all levels of government, to do important research for the benefit of people living in the Tropics.

Our research continues to tackle tropical Australia's poorer health outcomes, confront health security risks at our northernmost borders, develop better ways to deliver health services to rural and remote communities, and contribute to Northern Australia's development.

State and Federal Government funding in 2013 was critical for what is recognised today as world-class tropical health research infrastructure, among the best research facilities in Australia for marine and terrestrial toxinology, PC3 facilities for pre-clinical screening, and mosquito facilities with unique large-scale flight cages.

Our research acknowledges and supports the vision of State and Commonwealth leaders who recognised the need to address the very real challenges and priorities in tropical health and medicine, relevant to people living in the Tropics.

The Institute has attracted a highly-skilled workforce into our locations in Townsville, Cairns, Mackay and Thursday Island, where we proudly nurture emerging thought leaders, and support the research activities of the Institute's 404 professional members and 199 Higher Degree Research students.

Despite it still being early years, the impact of our work is already being felt, with demonstrable improvement in health outcomes for those living in the Tropics.

Northern Australia is now close to the elimination of mosquito-borne dengue fever thanks to our partnership in the Eliminate Dengue program, offering access to our world-class insectary facilities, and our expertise providing a critical element for the program's success.

Our researchers have several exciting new candidate vaccines designed to tackle major global diseases including tuberculosis, malaria, tick fever, and Pan influenza, some of which are currently progressing to clinical trials.

During 2020, our infectious diseases and epidemiology team led by Professor Emma McBryde, was at the forefront of informing policymakers on ways to minimise damage and contain the COVID-19 pandemic.

McBryde's team moved quickly to repurpose the 'Global Pandemic Map', an online modelling tool it had developed for Australia's Department of Foreign Affairs and Trade (DFAT), to map the risk of Ebola.

This award-winning research team was able to use it to demonstrate the crucial value of early international border closures, and to correctly anticipate staff presenting to workplaces as a key problem in controlling the epidemic in Australia.

Their research on the low impact of reopening schools was also effective in supporting a shift in policy, away from prolonged school closures.

We are committed to building capacity within our region and translating solutions through co-designed research that continues to improve health and healthcare.

The Institute has also supported the work of renowned Townsville Oncologist and AITHM Member Professor Sabe Sabesan in his clinical trials to deliver rural cancer and health care closer to home for people living in regional and remote areas. The resultant Tele-Health initiative is now funded for roll-out across Australia.

Future priorities for the Institute include further basic discovery, mining the reef and rainforest biota of Northern Queensland to discover and develop novel drugs and vaccines.

The establishment of a medical biotechnology industry in North Queensland is high on my list, along with continued public health and health security, health system-wide gains in productivity and efficiency.

I will also be working towards gains in the widespread promotion of evidence-based healthcare, and improved connectivity and networks of regionally-based skilled professionals across the health sciences and biotech industries.

We will continue to bring high-value knowledge-based jobs to the North, and we are looking towards the development of a regionally based commercial clinical trial network, to further strengthen Queensland's reputation as a global research leader in tropical health and medicine.

Distinguished Professor Louis Schofield
Director, Australian Institute of Tropical Health and Medicine

Our People

Delivering thought leaders in research

Our research teams continue to build and maintain long term strategic alliances, working with our stakeholders to develop multi-year programs of work that provide solutions to address challenges at regional and national scales.

119

Highly-skilled jobs in North Queensland

603

Institute members - health and medical professionals, scientists and students

138

Higher Degree Research students in Cohort

Delivered – THOUGHT LEADERSHIP in RESEARCH to North Queensland's HOSPITAL and HEALTH SERVICES

Trusted Advisors to Northern Australia's Health Security

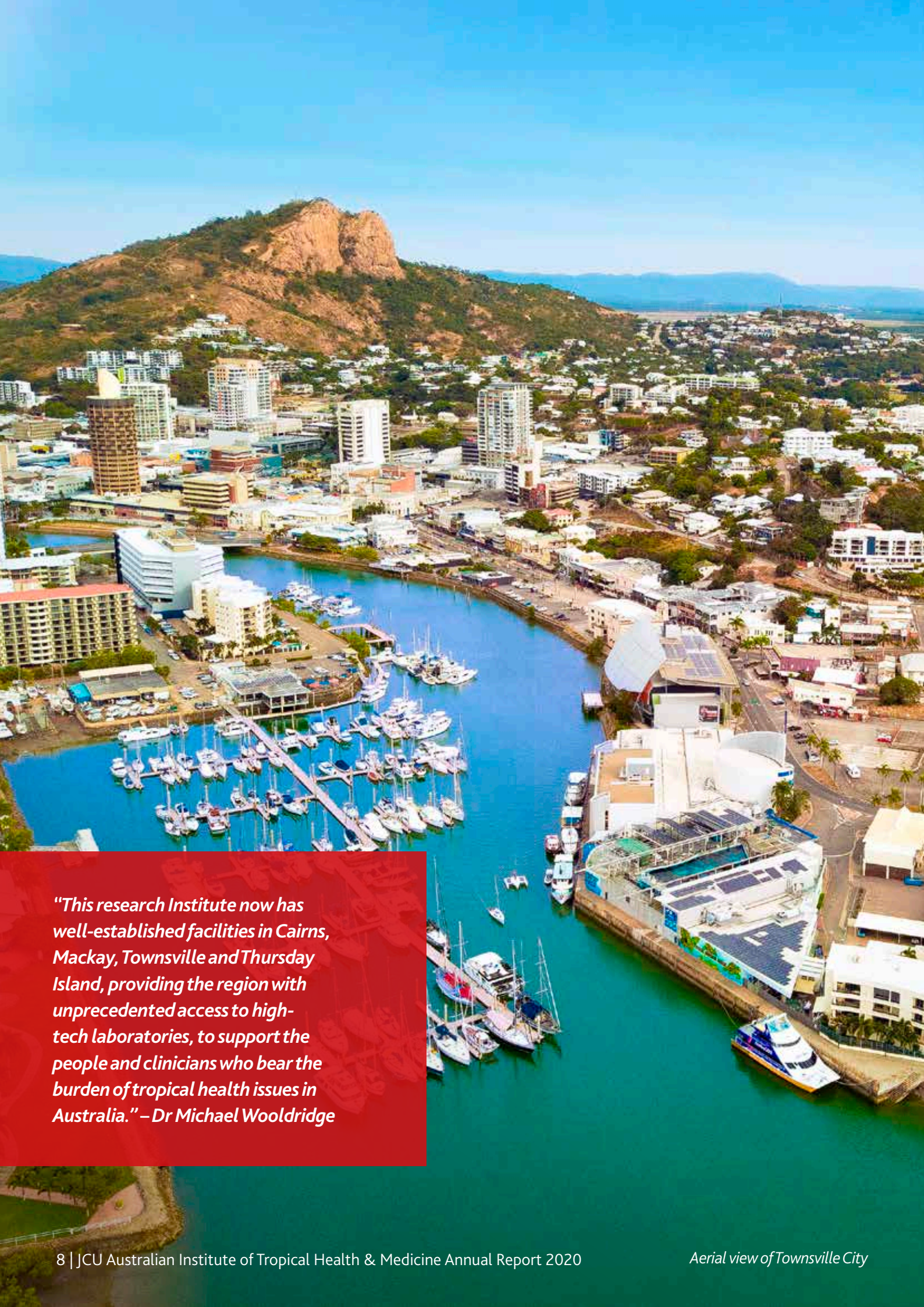
The Australian Institute of Tropical Health and Medicine is Australia's only scientific research institute based in the Tropics, dedicated to tropical health security.

Our researchers live and work in the Tropics, and are committed to improving the health and security of Northern Australia and our neighbouring tropical nations.

We partner with key stakeholders including the Defence Medical Technology Centre to support national health security, and we have close ties with communities across the Pacific and Torres Strait.

We directly advise policy makers, leaders in their field, and the World Health Organization, to ensure maximum utilisation of important research outcomes.

The Institute undertakes major research contracts for both Queensland, and Commonwealth departments including the Australian Department of Foreign Affairs and Trade, and the Departments of Health, and Science.



"This research Institute now has well-established facilities in Cairns, Mackay, Townsville and Thursday Island, providing the region with unprecedented access to high-tech laboratories, to support the people and clinicians who bear the burden of tropical health issues in Australia." – Dr Michael Wooldridge

Aerial view of Townsville City

Message From the Chairman

The regional towns where James Cook University is established, have supported tropical health research over many years, in response to the health concerns of those living and working in the Tropics.

The growth of JCU's Medical School and the resulting development of state-of-the-art scientific research facilities such as the Australian Institute of Tropical Health and Medicine, is now reflected in the vibrant cities in which they have grown.

During 2020, the JCU Medical School celebrated its 20 year anniversary, and I returned to join the celebrations.

In 2000, I was the Federal Health Minister and I was invited to officially open the school. At the time Townsville was a sleepy regional centre.

The growth and improved health facilities we have seen in the region since both the JCU Medical School and the Australian Institute of Tropical Health and Medicine opened, is unmatched anywhere. It is a change led by health sciences that has attracted, trained and retained a highly-skilled labour workforce.

In the years after the Medical School opened, both the Queensland Government, and the Federal Government's Australian Research Council (ARC), recognised the need to further the focus on finding solutions to disease and health care in the Tropics, each committing $42 million to establish the Australian Institute of Tropical Health and Medicine.

I am honoured to Chair the Advisory Board of the only dedicated tropical health and medical research institute based in Australia's Tropics, and to continue the pioneering legacy of Dr Anton Breinl and Emeritus Professor Ian Wronski.

If JCU is to achieve its potential as Australia's leading regional university of excellence and stand proudly in international comparisons, it will continue to promote and support health and medical science.

This research Institute now has well-established facilities in Cairns, Mackay, Townsville and Thursday Island, providing the region with unprecedented access to high-tech laboratories, to support the people and clinicians who bear the burden of tropical health issues in Australia.

During 2020, the Institute successfully procured $10.9 million in competitive grant income across important projects spanning vaccine research, vector-borne diseases, COVID-19 and other emerging tropical diseases.

The Advisory Board I chair is made up of individuals from around Australia and overseas who make a contribution to demonstrating that great research is not limited to major centres.

The growth of any relatively new institution is always challenging, but with immense pride in our scientific leadership under the Institute's Director Distinguished Professor Louis Schofield, our research and our achievements to date, I believe we can look to the future with immense opportunity.

Dr Michael Wooldridge
Chairman
Australian Institute of Tropical Health & Medicine Advisory Board

Where We Work

Thursday Island

Our Impact

Making a real difference in North Queensland

Cairns

The Australian Institute of Tropical Health and Medicine is developing vaccines, protecting Australia from disease crossing its far northern borders, and finding answers to some of the most difficult questions impacting the health of people living, working and playing in the Tropics.

- The institute is a hub of research excellence for tropical health and biological health security for Northern Australia, and our nearest neighbours in the Pacific, delivering $65m in capital infrastructure, including:
    - PC2 and PC3 (Physical Containment) laboratory facilities for infectious disease research, approved arrangement facilities and tissue culture suites.
    - The only PC3 rated facilities between Brisbane and Singapore, including two independent suites, used for current tuberculosis vaccine research.
    - Biobank can store 80,000 biological samples.
    - PC2 Invertebrate laboratory.
    - Tropical Medicine Mosquito Research Facility for the dengue vector *Aedes aegypti* programs including the Verily Debug Project, and the Eliminate Dengue Project.
    - Our Translational Research Facility (TRF) utilising science to discover new ways to prevent, diagnose and treat major health issues, translating the findings to hospitals and clinics for better health care delivery for those living in the Tropics.
- AITHM's research facilities in Cairns, Townsville, Mackay, and the Torres Strait have accrued total revenue of $168m in the seven years since opening, including grant funding valued at more than $50m.

Townsville

Mackay

A Snapshot on 2020

$10.9M
Grant Funding Awarded

24
Research Grants

>$13.9M
Reinvested into the local economy

402
publications

>78
Senior Positions held

199
Higher Degree Research Supervisions

1750
Number of commentaries across print, television, radio and online sources

Online **1234**

TV/Radio **366**

Print **150**

Media Releases **52**

Cohort Doctoral Studies

Thesis (completions)
16

Research and Development

Biomedicine:

Vaccine development for some of the most important infectious diseases in the world including malaria, tuberculosis (TB), parasitic worms, influenza and COVID-19, with clinical trials for a number of vaccines in various stages of maturity.

Developing preventions and cures for chronic non-communicable diseases prevalent in tropical populations including: diabetes, mental illness, inflammatory bowel disease, respiratory inflammation, allergy, cardiovascular disease, wounds, age-related disease, and occupational diseases.

Health security:

Vector control including mosquito, tick and bat-borne disease, with a focus on diseases that impact tropical regions including dengue and malaria.

Analytical and computational modelling of disease to inform containment and protection against disease outbreak. In 2020 our team contributed to the national COVID-19 pandemic transmission modelling which informed the Commonwealth's response to border closures.

Monitoring against biological and infection risk across the border between Queensland and Papua New Guinea.

Bio-discovery:

We are working with Traditional Owners and bringing Aboriginal and Torres Strait Islander People's knowledge together with science to better understand the flora and fauna of tropical Northern Australia's reef and rainforest. These include research into toxins, venoms, and parasitic worms to identify novel treatments for chronic disease such as cancer, serious pain, gut diseases, and wound healing.

Australian Institute of Tropical Health and Medicine's natural products chemist is using high-tech mass spectrometry to analyse specific molecules of tropical flora in the search for new modern medicines to treat complex disease.

Health system development:

Supporting the training of health professionals in science, and the development of health systems across Northern Australia and in the Western Pacific, including advancing telehealth practice, to meet the needs of under-served regional, rural and remote areas.

Supporting our Industry Partners

The Australian Institute of Tropical Health and Medicine bridges the gap from the research and science, which allows our industry partners to deliver advances at the bedside in medicine, new treatments, medical devices, drugs, and new policies which improve clinical practice.

Our science and research, extends from the earliest phase of discovery to the development of new diagnostics, treatment protocols and approaches to health-care delivery and preventive medicine.

Our research teams have created and participated in multiple joint ventures, strategic alliances and significant collaborations that maximise our ability to deliver the highest quality research.

These arrangements increase the critical mass and diversify the skills base that can be applied to answer complex questions affecting health in the Tropics.

During the year, many of our projects received external co-investment and investment from stakeholders and partners who participated actively in research design, implementation and dissemination of knowledge.

"The Australian Institute of Tropical Health and Medicine has created and participated in multiple joint ventures, strategic alliances and significant collaborations that maximise our ability to deliver the highest quality research."

Professor Jamie Seymour

Dr Sabe Sabesan

Dr Hayley Letson

Well-connected experts keep Australian commuters safe during COVID-19

Associate Professor Roslyn Hickson

CSIRO and James Cook University's Associate Professor Roslyn Hickson is one of the quiet achievers whose work has helped keep Australia's public transport commuters safe during the pandemic.

During 2020, Associate Professor Hickson and interdisciplinary experts from CSIRO's Disease Networks and Mobility Project, joined forces to develop a disease spread model for NSW Transport, which identified potential risks and strategies to keep public spaces safe.

Modelling and simulation were used to determine the impacts of non-pharmaceutical interventions for COVID-19 transmission on public transport, to help ensure the health and safety of passengers during the pandemic.

Associate Professor Hickson's role was to develop a SARS-CoV-2 (or COVID-19) transmission model, which captured the complexity of disease spread directly between passengers, and via surfaces.

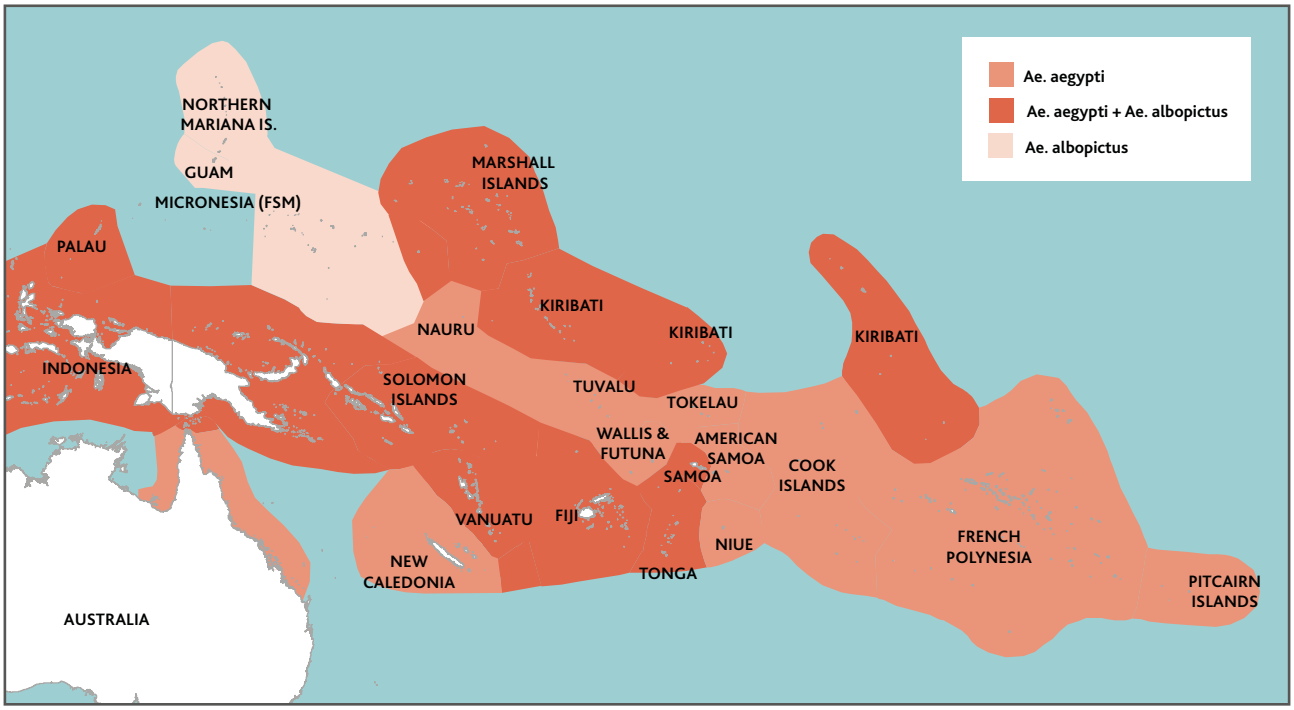
The 'SAFE Transport' model is among the first in the world to combine a detailed transport simulation with cutting-edge epidemiological modelling.

This research has allowed transport authorities to identify transmission risk hotspots and spread patterns to support their strategic and operational decision making, through mitigation options such as cleaning regimes.

The award-winning research was applauded for Excellence in Research and Development at the Intelligent Transport Systems Australia awards.

Tropical Health Security

World-leading mosquito expert Professor Tom Burkot and his team are heading the PacMOSSI project with 12 partners, in a bid to bolster vector surveillance and halt transmission of deadly diseases into Australia's neighbouring island countries.



Distribution of Ae. aegypti and Ae. albopictus in the Pacific.

PacMOSSI Stopping Mozzies in Their Tracks

Professor Tom Burkot and Dr Tanya Russell

Mosquito-control is known to be the most efficient and economical way of controlling the transmission of malaria, dengue, Zika and chikungunya, but our research shows these disease-carrying insects are changing their biting habits, developing resistance to insecticides and relocating to new areas.

"The focus of this project is on helping nations improve their surveillance of mosquitos to stop transmission of these deadly diseases in Australia's neighbouring island countries," Professor Burkot said.

"There have been more frequent and intense outbreaks of these diseases in Pacific Island countries in recent years, with 800 million human cases of malaria and dengue globally each year."

"The ultimate beneficiaries will be the people of the countries involved, particularly women and children who are most vulnerable to outbreaks."

Vector control is complicated because as the research has shown, many species of virus and parasite carrying mosquitos evolve constantly and adapt their behaviour to beat interventions.

"Some species have become resistant to insecticides, and so an effective intervention for one species may not work with others."

However, while controlling vector-borne diseases is challenging, we have seen malaria case numbers reduced by around 40 per cent over the past 15 years due to communities engaging in effective control methods.

The project is funded by Australia's Department of Foreign Affairs and Trade, in response to the World Health Organization's call to action after upgrading mosquito surveillance to, `core intervention status'.

Professor Burkot said COVID-19 had delayed the start of the Pacific Mosquito Surveillance Strengthening for Impact (PacMOSSI) project, but the research team is reaching out to the ministries of health in each Pacific country, to ensure the roll-out is a success.

In 2021, the PacMOSSI Program will assess the capacity, strengths and weaknesses of each Pacific nation's existing surveillance and control programs for malaria and dengue vectors.

"To do this, we are adapting an online survey instrument we developed with the support of a 2018 Gates Foundation grant to determine the effectiveness of malaria control interventions in 35 African and Asia-Pacific countries," Dr Tanya Russell said.

Dr Russell said they would utilise online platforms for capacity building, providing a complete set of 11 training modules on different aspects of vector surveillance.

Another component is software development and management, so countries can collect and easily visualise and share data on aspects such as the number of vector-borne disease cases, pharmaceutical supplies, identifying which insecticides local mosquitoes are resistant to, and which work.

Collaborating research partners on the PacMOSSI project include the Papua New Guinea Institute of Medical Research, Queensland Institute of Medical Research Berghofer, Queensland Health, universities of Queensland and New South Wales, Australian Red Cross, Beyond Essential Systems, Burnet Institute, Australian Defence Force Malaria and Infectious Diseases Institute, The Pacific Community, the Asia Pacific Malaria Elimination Network and the World Health Organization.

Leading with Science to Inform Policy on COVID-19

Professor Emma McBryde

From the onset of the global pandemic in Australia, the infectious diseases modelling team at JCU's Australian Institute of Tropical Health and Medicine has been at the forefront of informing policymakers on ways to minimise damage and contain COVID-19.

The researchers led by the Institute's Professor Emma McBryde, demonstrated the crucial value of early international border closures for pandemic control, and developed a system for considering the wide-ranging impacts.

They also correctly anticipated staff presenting to workplaces as a key problem in controlling the epidemic in Australia, and alerted jurisdictions to the need to compensate casual workers for sick leave.

Their research on the low impact of reopening schools was also effective in supporting a shift in policy, away from prolonged school closures.

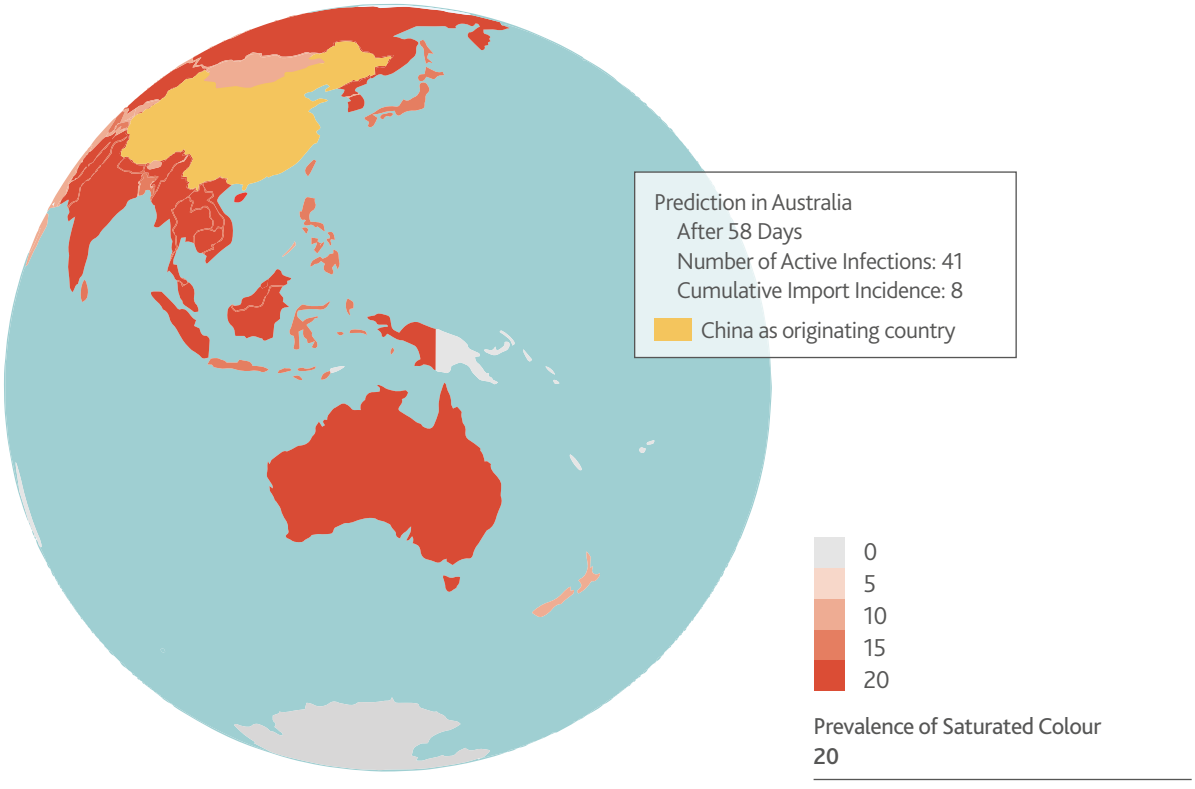
Their invaluable work has also won them the 2020 Research Excellence Award from James Cook University for the impact of their COVID-19 research on informing government policy throughout the pandemic.

Professor McBryde's team was able to mobilise fast, early in the year, producing a Global Pandemic Map from a modelling tool initially developed to determine the risk of spread of Ebola and other similar diseases.

"As a regionally-based team, we were able to move quickly to produce internationally recognised, high-quality research relevant to Australians," Professor McBryde said.

"We were able to extend and re-purpose existing modelling methodologies and technologies and develop new methodologies, with the aim of assessing the severity and transmissibility of COVID-19."

Example of Global Pandemic Map



Global Pandemic Map developed by the Australian Institute of Tropical Health and Medicine's modelling team http://pandemic.org.au/v2/#/

Trusted advisors: Professor Emma McBryde and Dr Michael Meehan modelling COVID-19 Pandemic

As the epidemic proceeded, the team produced reports estimating COVID-19 transmissibility across Australian jurisdictions, which were used to assess progress of State and Federal Government policies.

Within the first months of 2020, the Institute's research team backed up their work with nearly 20 published papers, with a further seven under review, two of which have received reviews in the prestigious Nature Communications journal.

The Institute's applied mathematician and infectious diseases modeller Dr Adeshina Adekunle developed the Global Pandemic Map website, used to predict how quickly and where an emerging epidemic caused by a virus or pathogen would spread from a source country to other nations around the globe.

The tool could be programmed for different diseases by varying factors like the incubation period, rate of infection and death rates, and it could also demonstrate how travel restrictions would slow the spread.

The Institute's clinical research biostatistician Dr Oyelola Adegboye assessed the risk of the global spread of COVID-19 in the early phase of the pandemic, and how international border closures were crucial in the control of the disease.

The team's infectious diseases physician and epidemiologist Dr Diana Rojas Alvarez, is engaged in vaccine development with the World Health Organization in Geneva, while AITHM mathematician and infectious diseases modeller Dr Michael Meehan, is developing algorithms to determine the best strategy for vaccine roll-outs.

Our Health Economist and Data Scientist Dr Anton Pak evaluated the economic impact of the pandemic.

Every step of the way, the modelling research team informed its partners at Australia's Department of Foreign Affairs and Trade (DFAT), and the Australian Health Protection Principal Committee (AHPPC), which is the decision-making committee for health emergencies comprised of all state and territory Chief Health Officers and chaired by Australia's Chief Medical Officer.

The Australian Government used the research to take decisive action to close borders, a move which was instrumental in reducing the number of infections and deaths across the country.

The Institute's COVID-19 team also produced reports covering a range of subjects from early analysis of the Australian epidemic, to estimating case detection rates, why flattening the curve was not enough, economic consequences of the COVID-19 outbreak, evaluating the effectiveness of international travel bans, and a paper exploring superspreaders, asymptomatics and COVID-19 elimination.

They also reported on ways of achieving herd immunity while minimising loss of life, before moving to researching optimising vaccine delivery strategies.

The research is included in key reports, including 'The Implications of Unmitigated Epidemics', and 'The Road to Reopening', which were presented to decision-makers and policy-makers including the Communicable Diseases Network of Australia, and the Australian Health Protection Principal Committee.

As States and Territories achieved good control, Professor McBryde's team moved towards designing strategies for relaxing restrictions that would not lead to secondary waves.

Prime Minister Scott Morrison cited the Australian Institute of Tropical Health and Medicine's research into COVID-19, saying that in most jurisdictions Australia had the scientific knowledge, and was on track to control the pandemic.

The team has been invited to present to the international modelling consortium, at regional and global World Health Organization briefings, and have been invited to consultancies across regional countries including Malaysia and the Philippines, through The Global Fund.

Dr Tanya Russell is a medical entomologist whose research focusses on the underlying dynamics, control and surveillance of mosquito-borne diseases, to stop their transmission globally, with a focus on the Asia-Pacific.

Surveillance and Control of Aedes Mosquitoes in the Pacific

Dr Tanya Russell

Scientists at the Australian Institute of Tropical Health and Medicine have been working to combat mosquito-borne disease through projects which are changing policy and saving lives in the Pacific and around the world.

The Pacific Community and the World Health Organization (WHO) have recently launched the *'Manual for Surveillance and Control of Aedes Vectors in the Pacific'*, a document which is supporting governments to change the way they approach their mosquito programs.

AITHM's medical entomologist Dr Tanya Russell, the manual's lead author, said the document, translated in both English and French, provides an easy-to-follow manual and information guide for the surveillance and control of *Aedes* (mosquito)-transmitted arboviruses.

"We have developed this manual with the goal of strengthening vector surveillance and control capabilities in the region, and providing guidance for all Pacific Island countries to use in their efforts to prevent and control arboviral infections."

Dr Russell said in recent times, the Pacific had experienced unprecedented concurrent outbreaks of dengue, chikungunya and Zika virus infections spread by *Aedes* vectors.

"These have placed a heavy toll on many of the already fragile health systems and, if not contained, will have local economic and social repercussions aside from direct effects on morbidity and mortality, and pose a risk for further spread to other countries and territories," Dr Russell said.

The 98-page manual has been written to support managers and operational staff in Australia's neighbouring pacific island countries to plan, implement and monitor vector control programs.

The Pacific Community (SPC), an inter-governmental organisation providing sustainable Pacific Development through science, knowledge and innovation, is working together with the WHO, and the Pacific Public Health Surveillance Network to ensure the objectives of the manual are achieved.

The manual forms the foundation for entomological capacity building and is a key resource for the JCU-led Pacific Mosquito Surveillance Strengthening for Impact (PacMOSSI) program, a $5.1m project designed to combat mosquito-borne diseases in 12 Pacific Island nations, and strengthen biosecurity to Australia's mainland.

Discovering the Hole in the Malaria Safety Net

Dr Stephan Karl

Papua New Guinea has one of the world's highest malaria transmission rates outside Africa, and the insecticide-injected mosquito nets are the mainstay of the country's defence against malaria-carrying mosquitoes.

The treated nets are designed also to kill mosquitoes that come into direct contact with the insecticide-treated net surface, but researchers have discovered some nets are not doing their job.

The Australian Institute of Tropical Health and Medicine's Senior Research Fellow Dr Stephan Karl, who also heads up Entomology at the Papua New Guinea Institute of Medical Research, is leading the research and he said so far, the long-lasting insecticidal nets are the only vector control tool implemented nation-wide by the country's malaria control program.

The team that included medical researchers and entomologists from PNG, Australia and the UK looked into whether, despite the mandatory pre-delivery quality assessment of the around 1.5 million bed nets distributed annually to PNG residents since 2013, some nets might be falling short of the World Health Organization's (WHO) minimum 80 per cent mosquito kill rate.

The researchers discovered just 17 per cent of the donor-funded nets supplied to PNG between 2013 and 2019 met WHO standards for mosquito kill rates, compared to 100 per cent of the nets distributed from 2006 to 2012.

With the support of the PNG Department of Health and Rotarians Against Malaria, the team organised a search across 15 PNG provinces to locate nets distributed between 2007 and 2019 which were still unused and in their original packaging.

The results of the study revealed that all nets manufactured between 2007 and 2012 killed 100% of mosquitoes but most nets manufactured between 2013 and 2019 exhibited greatly diminished kill rates (average of 40 per cent).

"We couldn't believe it, we were actually doubting our own results to the degree that we repeated experiments," Dr Karl said.

Dr Lisa Reimer from the Liverpool School of Tropical Medicine, in the United Kingdom, as part of the research team, repeated some of the cone bioassays. A subset of samples was sent to Dr Reimer's lab, blinded, and their results supported the findings of Dr Karl's team.

They also exposed the net samples to high temperatures, to rule out the possibility the insecticide coating had been impaired by temperature variations while in transit from the manufacturer.

Dr Karl said the WHO and the two PNG net donors, both major funders of malaria prevention initiatives world-wide, were kept abreast of the investigations.

The net manufacturer, once alerted, requested samples of the nets from the researchers, and then conducted their own tests, which confirmed the findings of Dr Karl's team.

Dr Karl said under current guidelines, the total insecticide content of the nets is only determined by chemical analyses and not more advanced analysis like bioassays. As a result the substandard nets could remain undetected.

"Bioassays should be incorporated in the pre-delivery control process, and ideally, recipient countries should be enabled to undertake their own quality testing," he said.

Dr Karl said the research had alerted the WHO to address its routine monitoring and quality assurance assessment process for the mosquito nets. In response to the findings, The Global Fund to Fight Aids, Tuberculosis and Malaria has provided funding for an independent investigation of all currently WHO pre-qualified net products.

Further research is now also being funded by the National Health and Medical Research Council to expand the team's research in this area.

A dramatic resurgence of malaria in Papua New Guinea has prompted an international team of scientists to investigate the efficacy of long-lasting insecticide-treated bed nets (LLINs) on behalf of Papua New Guinea's National Malaria Control Program.

Asian tiger mosquito *Aedes albopictus*

Chasing the Tiger – Clipping the Wings of a New Invader

Tom Swan

While one mosquito species which transmits dengue has been thwarted in Far North Queensland, researchers are working hard to ensure another invasive species, waiting in the wings in the Torres Strait, does not reach Australia's mainland.

Aedes aegypti mosquito populations in North Queensland, have been successfully infected with *Wolbachia*, a type of bacteria which inhibits the ability for viruses to replicate inside the mosquito.

However, the Asian tiger mosquito *Aedes albopictus*, which also transmits dengue, has been found on Torres Strait islands – and has a proven track record for usurping *Aedes aegypti* territory, if given half the chance.

A team of researchers from the Australian Institute of Tropical Health and Medicine is looking at ways to curb the relatively new threat to the Australian mainland.

Higher Degree Research Student and Ecologist Tom Swan said the fear was the Asian tiger mosquito could move in and displace the *Wolbachia*-infected *Aedes aegypti* mosquitoes, quickly compromising the *Wolbachia* 'shield' on Australia's mainland.

"The Asian tiger mosquito is near the top of the 100 World's Worst Invasive Species List," Swan said.

"In much of south-east USA, including northern Florida, *Aedes aegypti* populations had been all but eliminated when the Asian tiger mosquito invaded in the late 1980s."

South-east Asian in origin, the mosquito, which also transmits Chikungunya virus, is believed to have reached the Torres Strait via illegal fishing boats.

Swan is conducting frontline research into the ecology of the species on Masig (Yorke) Island in the Torres Strait – the first identified Australian invasion point in 2005 – to compile knowledge that could provide a framework for future surveillance and control efforts.

Swan and colleagues have just published findings from a field trial on Masig Island involving a trap which holds promise as a useful tool to monitor the distribution and abundance of Asian tiger mosquitoes – a sound trap first developed by JCU researchers to catch male *Aedes aegypti* mosquitoes.

Funded by Verily Life Sciences, a US research organisation devoted to supporting the study of life sciences, the sound trap uses artificial playback of female wingbeat frequencies to lure in the males.

Swan's experiments on Masig Island confirmed that the trap, when modified to produce higher wingbeat frequencies, also attracts male Asian tiger mosquitoes. He also identified key locations for catching the mosquitoes.

"Unlike *Aedes aegypti*, which occur in and around houses, Asian tiger mosquitoes live in or on the edge of the bush," he said.

To date, spraying well-vegetated habitats has proven successful in greatly reducing abundance of the Asian tiger mosquito on Thursday and Horn islands in the Torres Strait, but few control measures have been conducted on outer islands, including Masig.

As part of his research, Swan collaborated with the Pest and Environmental Adaptation Research Group, Bio21, University of Melbourne to investigate the population genetics of the Asian tiger mosquito on different islands throughout the Torres Strait.

"We discovered recent movement of closely related Asian tiger mosquitoes between islands 31–203 km apart – likely a result of human-mediated dispersal on boats and planes," he said.

"Exploring potential pathways for Asian tiger mosquito movement between islands is the focus of ongoing research," he said.

Australian experts believe it may only be a matter of time before the Asian tiger mosquito gains a foothold on the mainland.

"One of the premises of my research that is improving surveillance options for Asian tiger mosquitoes may potentially have relevance in other areas where this mosquito occurs, or has not yet invaded" Swan said.

While COVID-19 was in the limelight, tuberculosis was on track to claim 1.8 million lives globally in 2020.

AITHM senior microbiologist Dr Andreas Kupz

Aussie Voice on World Stage for New TB Vaccine

Dr Andreas Kupz, Dr Ashley Waardenberg and Visai Muruganandah

In 2020, the Australian Institute of Tropical Health and Medicine's senior microbiologist and Tuberculosis (TB) Immunology group leader Dr Andreas Kupz, joined a select group of international scientists who are leading the research into finding a new more effective TB Vaccine.

Dr Kupz joined the Advisory Council of the Collaboration for TB Vaccine Discovery, which includes scientists from such prestigious research institutions as Harvard and Oxford universities, the Institut Pasteur in France, and the US-based National Institutes of Health – the world's largest biomedical research agency, and now James Cook University.

He said it was a significant achievement to represent Australian research on the council, which has only 14 members globally.

"The Council is one of the most influential groups in the world, in terms of guiding the course of TB vaccine research internationally," Dr Kupz said.

"It has a strong voice and provides expert advice on research priorities to many major global funding agencies."

"Multidrug-resistant TB remains a public health crisis, and that is why our work on new vaccines is so important," Dr Kupz said.

Dr Kupz also co-chairs the Live Attenuated Vaccines Research Community, one of seven specialised groups working on vaccines for TB.

This working group includes scientists who have vaccines currently undergoing clinical trials, microbiologists such as Dr Kupz, focussed on the design of new vaccine candidates, and researchers supervising vaccine trials in TB hotspots such as South Africa and India.

Dr Kupz said in addition to progressing his work on a promising new TB vaccine, the Australian Institute of Tropical Health and Medicine's TB Immunology group, and bio-informatician Dr Ashley Waardenberg, have developed a new modelling tool to help prioritise investment in new TB vaccines that merit further investigation.

The tool, called the Vaccine Empirical Integrated Model (VEIM), is designed to guide the crucial allocation of limited global resources to find a more effective alternative to the current TB vaccine, BCG (Bacille Calmette- Guérin) which has been in use to control TB for almost 100 years.

Phase 3 clinical trials can cost at least $500 million, so it is important to rank which clinical trial should move onto the next stage.

The Vaccine Empirical Integrated Model (VEIM) has featured in the prestigious international journal *Science Advances*, has attracted worldwide media attention, and has already excited the interest of the TB Vaccine Discovery Advisory Council.

Traditional pre-clinical evaluation of new TB vaccines is heavily skewed towards assessing immunogenicity (ability to stimulate a protective immune response) and/or efficacy, in terms of eliminating *Mycobacterium tuberculosis*, the bacteria which causes TB.

However, JCU medical student Visai Muruganandah, a first author of the study into the VEIM, said safety and efficacy are the dominant considerations when evaluating vaccines in human use.

"Despite this, there remains no gold standard approach to integrating data that covers all three criteria: immunogenicity, safety, and efficacy, to rank vaccines based on overall performance and simultaneous comparison across all three categories," he said.

Dr Waardenberg said the VEIM trial assessed 24 TB vaccine regimens to inform the development of a simple empirical model to systematically rank vaccination strategies by integrating multiple measurements of immunogenicity, safety, and efficacy.

"Developing simple models that are readily interpretable is important for understanding what makes an effective vaccination strategy and where we need to focus our efforts," Dr Waardenberg said.

Diseases of High Burden in the Tropics

Deadly Venom May Hold Key to New Life Saving Drugs

Professor Jamie Seymour and Emily O'Hara

Toxinologists from the Australian Institute of Tropical Health and Medicine at JCU, are leading the world in the search for revolutionary modern medicines made from venom.

Australia is famous for having the world's most deadly animals, but researchers such as Cairns-based toxinologist Professor Jamie Seymour, who heads James Cook University's Tropical Australian Stinger Research Unit (TASRU), know that within their venom lies a potential pharmacy that could save lives.

Professor Seymour and his team are successfully breeding, and studying the lifecycle of one of the smallest, yet most venomous jellyfish on the planet the *Carukia barnesi* jellyfish, one of 16 known species of Irukandji, found in the waters of North Queensland.

JCU Higher Degree Research Student Emily O'Hara has led a study which has allowed the TASRU team to successfully breed Irukandji in captivity, and she is now exploring insights for a better understanding of this fascinating marine animal's feeding ecology.

One of the objectives of the husbandry program is to get an up-close look into the way in which the jellyfish deploy their millions of microscopic stingers to inject deadly venom into their marine prey, or human skin.

Ms O'Hara aims to better inform our current knowledge about the stinging nematocysts of the Irukandji, to look more closely into how they sting their victims, which could lead to better treatment outcomes.

Partners in venom

TASRU is recognised as one of the world's premier research groups for its study into the ecology and biology of box jellyfish.

During 2020, TASRU's research into medical treatment of box jellyfish envenomings, was called on for expert advice in the development of a potentially life-saving mobile app.

The `Australian Bites and Stings app' was designed by Australian vaccine, anti-venom and pharmaceutical developer Seqirus to inform and educate Australians on venomous creatures.

The app's content is also accessible offline, and includes First Aid instructions on what to do if bitten or stung by a venomous creature, including a step-by-step guide to emergency resuscitation (DRSABCD), the Pressure Immobilisation Technique, and expert commentary on why it's important.

The Australian Institute of Tropical Health and Medicine has worked closely with Seqirus over a number of years, providing the company with a range of the highest quality venoms for use in manufacturing antivenom.

The cardiac effects of venom

Professor Seymour's work during 2020, also saw him delve further into the cardiac effects of the venom of the Irukandji (*Carukia barnes*i), and the large box jellyfish (*Chironex fleckeri*), a species which can cause cardiac arrest within minutes.

Professor Seymour found that while box jellyfish venom causes rapid cardiac dysfunction without a change in heart rate, the venom of the Irukandji revealed a different set of signs and symptoms, including slowing of blood circulation in the heart.

Another factor of these deadly marine creatures is in the unique venom profile of their tentacles, which research has found, differs from the venom profile found in the bell of the animal. This difference could be linked to the wide array of symptoms and pathologies experienced by victims.

Professor Seymour said a more complete understanding of the mechanisms of box jellyfish and Irukandji venom-induced pathology, may lead to novel treatments, including the discovery of novel cell pathways, novel drug scaffolds and novel drug targets for human disease.

Aquarist Sally Turner inside the TASRU research facilities

Drones an Early Warning Detection for Deadly Marine Stingers

Olivia Rowley

The Institute's Cairns-based researchers have demonstrated, for the first time, the potential for off-the-shelf drones to be used to detect deadly box jellyfish at popular tourist beaches.

The project, focussed on *Chironex fleckeri* commonly known as the sea wasp, is a species of box jellyfish capable of killing a human in under three minutes, and is considered the most venomous animal in the world.

Olivia Rowley measuring marine stingers on a North Queensland beach

Chironex fleckeri is found in waters off tropical Northern Australia between October and May, when its liking for shallow, calm, coastal waters can put it on a collision course with swimmers.

Higher Degree Research Student and project lead Olivia Rowley said drone surveillance could help make Australia's beaches safer, and reduce a reliance on time-consuming drag netting by Surf Life Savers.

Ms Rowley and colleagues from the Australian Institute of Tropical Health and Medicine have set out to establish the reliability of lower-cost domestic drones in detecting these large, near-transparent jellyfish.

The attraction of the high-tech but low cost devices is that they are more affordable, easily transported, and easier to use.

They don't require as much training and licensing as higher-end drone and a large number of surf lifesaving clubs, particularly in Australia, already have them in their kit for tidal rip identification, and crocodile and shark spotting.

Our researchers tested the drones' accuracy as jellyfish spotters in waters near Weipa on Cape York Peninsula. They deployed 70-metre nets, and then recorded drone footage before pulling in the nets and counting and measuring jellyfish.

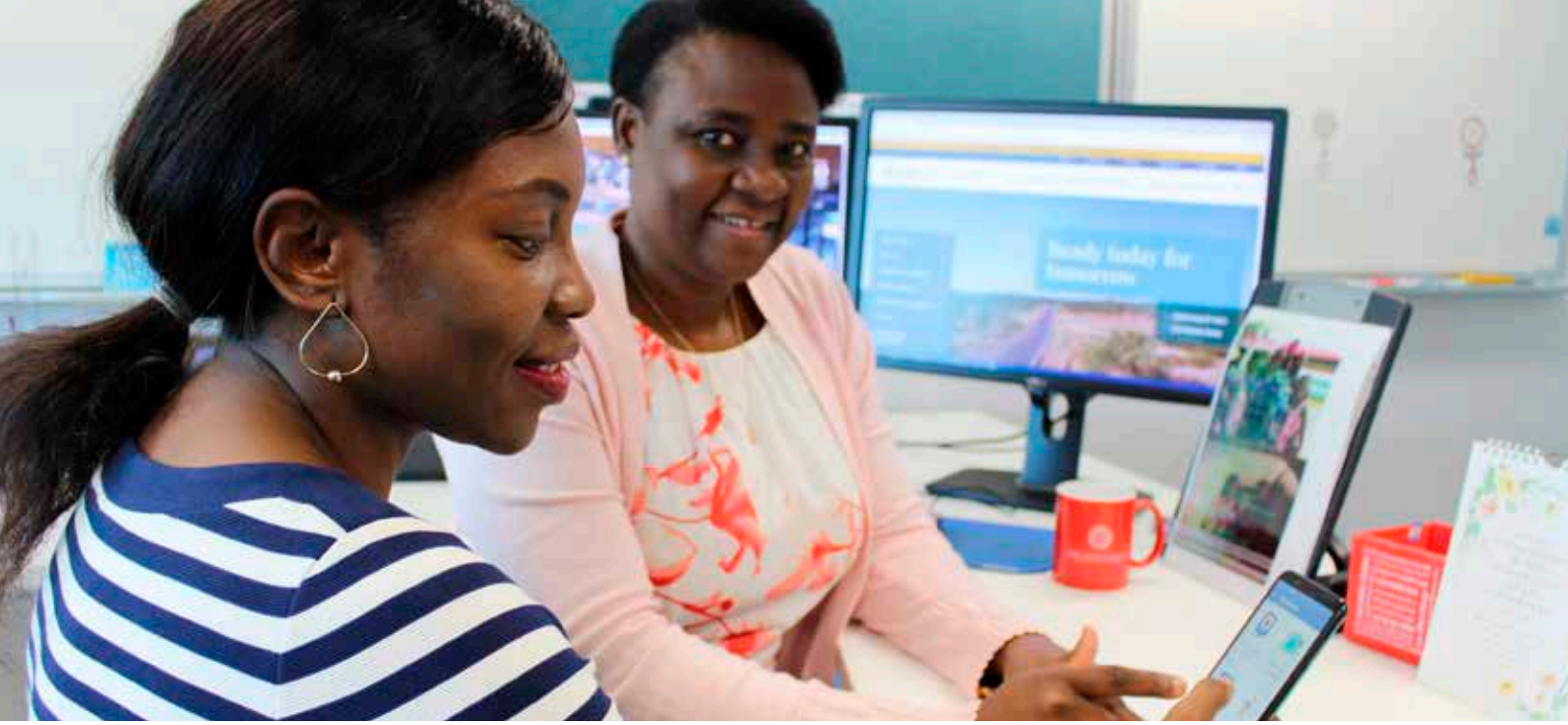
During the experiment the drone pilot kept records of jellyfish spotted during each flight. These records were later compared with the netted numbers, and with the accuracy achieved in a lab-based review of the footage.

The researchers confirmed that reviewing footage after the flights, led to significantly high detection rates. They also quantified the effects of weather conditions such as cloud cover and wind on the drones' success rate.

"This has huge implications. Most, if not all, beaches worldwide, from Japan to Europe and beyond, have issues with very harmful jellyfish and presently there is no way of telling if animals are there until someone gets stung," Ms Rowley said.

"This project really highlights the capacity for drones as early warning systems. Using drones is fast, effective and cheap and helps keep those on the front line out of the water and out of harm's way."

The next stage of the project will see this research trialled with Surf Life Saving hubs along the Queensland coast. The trials are funded by the Australian Lions Foundation and began in October 2020.



Finding app solutions: Mary Adu and Associate Professor Bunmi Malau-Aduli

Mobile Phone App to Help People Living With Diabetes

Associate Professor Bunmi Malau-Aduli and Mary Adu

Researchers at James Cook University have developed a new health app designed to be a hit with people living with diabetes in rural and remote areas.

Australian Institute of Tropical Health and Medicine member, and James Cook University Associate Professor Bunmi Malau-Aduli said while there were similar mobile health apps on the market, their research found many of these had low engagement rates.

Unlike some other apps, their research had involved people living with diabetes, clinicians, and diabetes educators, to find out what works best and what may be lacking, and resulted in the development of the 'My Care Hub' app.

Lead researcher, biochemist and Public Health Higher Degree Research student Mary Adu said mobile applications offered a convenient, viable and easily accessible resource for patients to access on-going self-management education and support.

However, they found that the lack of consistent user engagement was a significant and challenging limitation of self-management apps for adults living with Type I and Type 2 diabetes.

"We undertook international studies, and we found common gaps in skills and self-efficacy for diabetes self-management such as the impact of stress on diabetes, exercise planning to avoid hypoglycaemia, and interpretation of blood glucose patterns," Adu said.

"The most preferred diabetes app features were visual analytics, a food nutrient database, blood glucose trackers and personalised education."

The work spanned three phases of research including systematic review, cross sectional analytical studies, usability and pilot trialling as part of the total project, to gather enough relevant information in order to develop the user-friendly app.

The team, made up of medical educator Associate Professor Bunmi Malau-Aduli, endocrinologist Professor Usman Malabu, geneticist Associate Professor Aduli Malau-Aduli, and diabetes educator Mary Adu, is continuing to look at the health outcomes of users before and after trialling the 'My Care Hub' app, which was developed by tech experts of the JCU eResearch Centre.

The app allows for educational content, which considers the needs of the end-user and is based on empirical data, often lacking in many health apps.

The researchers worked with Diabetes Australia to help engage 217 Australians and international participants from Europe, North America, and Asia, who are living with diabetes.

Associate Professor Malau-Aduli said the results showed the app's potential as a behaviour change intervention tool, particularly because a high percentage of the participants said it had eased their self-care efforts, and improved their engagement with diabetes self-management activities such as blood glucose monitoring, physical exercise, and healthy eating.

Participants also suggested additional functionalities such as including more access to analytic data, automated data transmission from the blood glucose meter, and periodic update of meals and corresponding nutrients to further enhance engagement with the app.

Associate Professor Malau-Aduli said a source of further funding would be required, in order to progress to testing with a larger randomised controlled trial, before development for commercial purposes.

"Together, we want to do all that we can to not only protect knowledge of plants, but also add value to it, for the benefit of Traditional Owners and the wider community," – Professor Denise Doolan.

Unlocking Potential of Tropics' Medicinal Plants

Dr Phurpha Wangchuk

Researchers from the Australian Institute of Tropical Health and Medicine have joined forces with Traditional Owners from Far North Queensland, to discover if medicinal plants found in the Tropics could yield new drugs to treat inflammatory disease.

Natural products chemist Dr Phurpa Wangchuk is bringing together ancient knowledge with modern science to screen rainforest plants traditionally used by the Aboriginal and Torres Strait Islander People of the area.

Inflammatory Bowel Disease (IBD) is a primary target of this medicinal plant research project, in light of evidence that Aboriginal and Torres Strait Islander People possess far greater immunity to the condition.

The disease afflicts around 80,000 Australians and costs the country more than $2.18 billion a year in terms of treatment, and productivity lost.

Dr Wangchuk said records show Aboriginal and Torres Strait Islander People have eight times lower incidence of IBD than the non-Indigenous population.

While other factors cannot be ruled out, one hypothesis is that the use of bush foods and bush medicines rich in antioxidant properties, may be helping their gut microbiome making them less likely to develop the disease which is caused by reduced levels of 'friendly' gut bacteria.

"These plants have been in clinical use for countless generations," Dr Wangchuk said.

"We know from previous studies that if you focus on plants used by Aboriginal and Torres Strait Islander People, we are much more likely to find a new drug, than through random plant screening."

Dr Wangchuk is using cutting-edge techniques including metabolomics, separation science and bioassay models to analyse a collection of rainforest plants traditionally used by the people of the area.

He is working in a collaborative partnership with ethnobotanist Gerry Turpin, who manages the Tropical Indigenous Ethnobotany Centre, at JCU's Australian Tropical Herbarium in Cairns.

Mr Turpin said the Centre is the only one of its kind in Australia whose research activity is solely determined by an Indigenous working group.

"The centre is working to ensure cultural knowledge of plants is maintained and shared across generations, and that Traditional Owners in Northern Australia are equipped to develop businesses based on their botanical resources."

Herbarium Director, Professor Darren Crayn, said strategies were in place to protect the intellectual property rights of the Traditional Owners participating in the new research venture.

"We have ensured the plant samples are anonymous, calling them samples A, B, C etc, so only Gerry and his people know the identity of the specimens that they are submitting for testing," Professor Crayn said.

Plant extracts which show signs of therapeutic activity will then undergo more specialised assessment.

Australian Institute of Tropical Health and Medicine's Deputy Director Professor Denise Doolan said the project presents a unique opportunity for the discovery of new therapeutics to treat diseases which significantly impact public health.

"Many currently used medicines originate from plants, and the enormous diversity of flora and fauna in our region, suggests projects such as this could result in really innovative solutions to global public health problems."

"Together, we want to do all that we can to not only protect knowledge of plants, but also add value to it, for the benefit of Traditional Owners and the wider community," Professor Doolan said.

"This is a first- of-a-kind JCU-community collaborative biodiscovery project that follows Queensland Biodiscovery Act protocols. We are aiming to establish exemplary governance and pathways for drug discovery involving Aboriginal medicinal plants."

Ethnobotanist Gerry Turpin with Dr Phurpa Wangchuk

Lab technician preparing for work inside Townsville's PC2 research laboratory

Trials Begin for Vaccine Effective Against all Malaria

Distinguished Professor Louis Schofield

Australian Institute for Tropical Health and Medicine Director, Distinguished Professor Louis Schofield is a recognised authority in the immunology and pathogenesis of infectious diseases.

James Cook University is leading a project to develop a safe, effective and low-cost universal malaria vaccine that could protect and save hundreds of thousands of lives worldwide.

Distinguished Professor Louis Schofield, Director of the Australian Institute for Tropical Health and Medicine at JCU, is collaborating with the Defence Materials Technology Centre (DMTC), Townsville University Hospital, Glycosyn and Pfizer Hospira to produce the vaccine.

Professor Schofield said malaria kills about 400,000 people around the world each year and is a significant health threat to Australian Defence Force personnel deployed in tropical regions overseas.

"There is currently no vaccine that is protective against all strains, species and life-cycle stages of malaria that can prevent both infection and disease transmission.

"We are delighted to partner with DMTC in the manufacturing and clinical stage development of a universal malaria vaccine. If successful this project may solve a massive global problem which is also a key national security health risk," he said.

The project focusses on the development of GPIVax, a carbohydrate-based malaria vaccine candidate that shows strong pre-clinical effectiveness across all species, strains and life cycle stages of malaria tested to date.

JCU will be responsible for pre-clinical toxicology work and a Phase 1, clinical study from 2021 to 2022.

Australia has limited vaccine development capability. In addition to progressing what will be a medicine that has a significant global impact in combating malaria, the project's second aim is to establish a high-quality manufacturing capability for biotechnology products which meets stringent government standards.

Professor Schofield said the Australian Institute of Tropical Health and Medicine and JCU, are committed to developing and supporting the Australian biotech manufacturing industry.

"This project will help to further-develop Australia's capability to produce high value products such as vaccines, which otherwise would have to be sourced and imported from overseas. This project is particularly suited for commercial development through local biotech," Professor Schofield said.

The project will be managed under DMTC's national Medical Countermeasures Initiative, a whole of government effort to develop Australian vaccines, therapeutics and diagnostics to protect against bio-warfare threats, infectious diseases and pandemics.

Professor Schofield said the Institute had built a strong position over many years to carry out the program.

"Once the vaccine is proven safe in volunteers, the next stage will be to test its efficacy in preventing malaria.

The Institute has close ties to scientists and physicians in near neighbouring Pacific countries and Papua New Guinea where malaria remains a huge problem, who we plan will collaborate in testing the vaccine in those settings.

Artificial Intelligence Turning Tide on Autoimmune Disease

Dr Ira Cooke, Professor Norelle Daly and Legana Fingerhut

Antibacterial resistance is one of our most serious health threats, but elusive peptides found in animals and plants could hold the key to developing modern medicines to tackle this threat to human health.

However, locating the genes that encode these peptides is like finding a needle in a haystack. Researchers at the Australian Institute of Tropical Health and Medicine have developed a new high-tech tool in a bid to find solutions to antibacterial resistance.

Bioinformatician Dr Ira Cooke, and his team, have developed a tool which uses artificial intelligence, to analyse protein sequences and classify antimicrobial peptides. Dr Cooke said most forms of life on the planet produce antimicrobial peptides to combat pathogens, and to maintain a healthy microbiome.

Dr Cooke said there were more than 100 autoimmune diseases, and some such as diabetes, rheumatoid arthritis, muscular dystrophy, multiple sclerosis, and fibromyalgia were known to be associated with dysfunction in the microbiome.

The ability to regulate the human microbiome is essential for the body's development, immunity and nutrition. The scientific community has only recently come to appreciate that antimicrobial peptides can act as regulators of the microbiome and this has led to strong interest in them for pharmaceutical research.

"Despite the intense interest in antimicrobial peptides, the genes that encode them remain difficult to detect," Dr Cooke said.

"In a typical genome, there are tens of thousands of gene sequences and less than 1 per cent of those contain antimicrobial peptides."

Dr Cooke has guided the research of Higher Degree Research student Legana Fingerhut to develop a software package called *ampir*, which stands for `antimicrobial peptide prediction in R'. Legana said since the software was released in May 2020, it had been downloaded more than 9,000 times.

"We made a tool that is very fast, easy to use and very accurate," Legana said.

"In terms of computational speed, *ampir* takes less than two minutes to analyse up to 30,000 sequences or a whole genome using a desktop computer."

The tool is also able to distinguish mature peptides from other peptides that do not have antimicrobial activity.

The team has worked closely with the Institute's structural biologist Professor Norelle Daly, who is researching the potential of peptides as candidates for therapeutic application in inflammatory diseases. Professor Daly said the new tool with its machine learning approach is allowing researchers to have improved accuracy, and quicker results in picking good candidate sequences for further research.

Dr Ira Cooke and Legana Fingerhut

Torres Strait Dancers

Putting Skin in the Game to Close Health Gap

Dr Allison Hempenstall and Pelista Pilot

A pioneering study into treatment of skin infections in the Torres Strait is making inroads to closing the gap, for better Aboriginal and Torres Strait Islander People health outcomes.

Aboriginal and Torres Strait Islander Australians are three times more likely to be hospitalised for cellulitis treatment than non-Indigenous Australians.

But one of James Cook University's best and brightest GP training graduates and Fulbright Scholarship recipient Dr Allison Hempenstall is looking at changing the way these patients receive treatment.

Dr Hempenstall, a member of the Australian Institute of Tropical Health and Medicine, and a registrar at the Australian College of Rural and Remote Medicine, undertook a 12-month observational study of 298 cellulitis patients from 18 islands across the Torres Strait.

In the Torres Strait, patients with skin conditions such as cellulitis, are often admitted to the Thursday Island Hospital, involving a medical retrieval flight, followed by an extended absence from their home communities.

"In 2017, cellulitis was the number one cause of preventable hospitalisations on Thursday Island," Dr Hempenstall said.

"It's a huge burden on our local health service for a disease that elsewhere in Australia is predominantly managed in the home and in the community."

But thanks to Dr Hempenstall's research, patients in remote communities with cellulitis are now being safely treated at home, reducing both patient stress levels and costly hospital admissions.

Dr Hempenstall said the study included listening to the needs of her patients in order to manage the complex health needs of Torres Strait Islander communities, and giving them a voice.

Her important work was recognised through funding which allowed the Torres and Cape Hospital and Health Service to employ its first-ever Indigenous research officer, Ms Pelista Pilot, who played an integral role in the cellulitis study.

"There is a lot we can learn from First Nations communities, including Torres Strait Islanders," Dr Hempenstall said.

"We need to hear their voices and the value they place on culture, community and the health issues relevant to them, in the health research sphere."

Patients who enrolled in the study provided detailed baseline information on their health.

Under Ms Pilot's dedicated care and follow-up, the patients treated in the community experienced minimal side effects, with only one patient in 298, requiring hospitalisation.

"We hope that this study will demonstrate to clinicians on the ground that we don't need to admit patients to hospitals; that they can be safely treated in the community and that they actually prefer to be managed in the community," Dr Hempenstall said.

"Hopefully, by reducing hospital admissions, we are able to redirect those funds to much needed other areas of health care like diabetes, kidney disease and obesity."

Dr Hempenstall first visited Thursday Island as a junior doctor in 2016 and returned as a first-year registrar in January 2018.

She said she relished the challenge of managing the complex health needs of Torres Strait Islander communities, dividing her time between the hospital and the primary healthcare centres on outer islands.

Dr Hempenstall is now a JCU senior lecturer; sharing what she learned in the field, with fourth and sixth year medical students who have embarked on their rural and remote placements.

The Fellow of the Australian College of Rural and Remote Medicine has also started a Fulbright Scholarship-funded Masters of Public Health degree with Harvard University.

After completing her Masters, she said she plans to return to the Torres Strait region to continue to strengthen public health systems – in partnership with the Traditional Owners.

Researchers Seek Answers to TB Outbreak in PNG

Associate Professor Jeffrey Warner, Associate Professor Catherine Rush and JCU students Jess Scott and Angela Slatcher

In Papua New Guinea's (PNG) Western Province, Balimo, a community of nearly 50,000 residents, is generating 300-400 cases of tuberculosis (TB) each year – almost twice the country's national average.

The rate of drug-resistant cases is a staggering 10%, compared with 4% globally.

Members of the Australian Institute of Tropical Health and Medicine's, JCU microbiologist and veteran PNG health researcher Associate Professor Jeffrey Warner, and JCU immunologist Associate Professor Catherine Rush have been working on the frontline to identify what is disabling the small community of Balimo's immune defences against the deadly disease.

The researchers discovered a community experiencing personal loss, constant fear of illness, and a lack of health resources.

Associate Professor Warner has worked with the Balimo community on a number of infectious disease projects over the past 25 years and has an ongoing commitment to help the people beat the diseases that threaten them.

With the assistance of a $35,000 Hot North grant, Associate Professor Rush investigated the potential smoking gun in Balimo, where domestic fires lit beneath dwellings early each morning, send smoke seeping upwards through gapping floor boards and unglazed windows throughout the day.

Prolonged exposure to smoke from traditional wood-fuelled cooking fires is a recognised, insidious threat to lung health, already linked to Chronic Obstructive Pulmonary Disease, and which may be a risk factor for TB.

In January 2020, JCU third-year medical student Jess Scott, and Masters of Medical Science researcher Angela Slatcher, joined Rush and Warner, to take part in the ongoing epidemiological battle to save this community from the devastating TB epidemic.

Their visit to the small PNG township, gave the students valuable insight into the realities of frontline research, and brought their future career paths into sharper focus.

Ms Slatcher said she first decided to become part of the solution in her previous career as a scientist for Pathology Queensland, when she realised the burden of infectious diseases in Aboriginal and Torres Strait Islander communities, during several stints in rural and remote locations.

With the help of Associate Professors Jeffrey Warner and Catherine Rush, she designed a questionnaire to survey Balimo residents about their levels of exposure to smoke from cooking fires. By the end of her first week in the community, Ms Slatcher had surveyed 190 residents.

Meeting the people of Balimo

She planned to use the information to correlate with results from sputum and blood samples provided by study participants, to explore the impact of smoke on their lung function and immunity levels.

Ms Scott also helped to recruit community members, for her research investigating links to parasites, including gastrointestinal hookworms, roundworms and protozoa (single-celled organisms), with an increased vulnerability to TB.

During the visit, she processed samples from study participants, with a view to shedding light on the distribution of parasites and the epidemiology of co-infections (parasite and TB infections) in the region.

The practicalities of working in Balimo, which has no running water and only sporadic generator-supplied power, tested the mettle of both researchers.

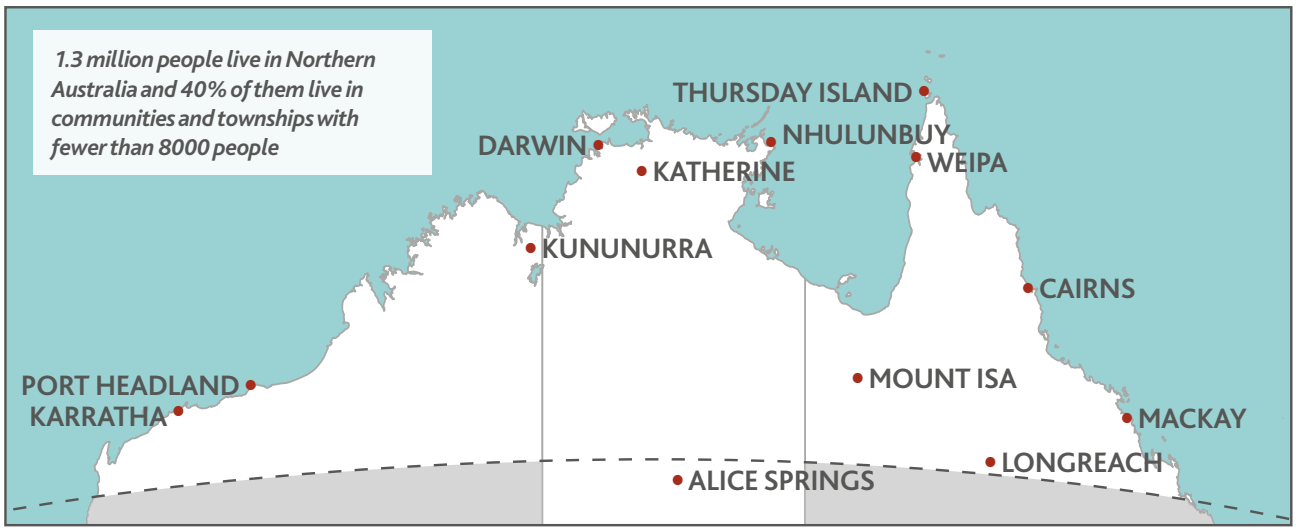
BYO work supplies, "from pens to pipettes" were the order of the day in the rudimentary lab, which, Ms Scott discovered, lacked both an autoclave steriliser, and a freezer to store samples.

They quickly realised their own difficulties paled in comparison with those of local health workers in both Balimo and remote Awaba, who endure chronic shortages in crucial clinical supplies, and in some cases are risking their own lives to tend to patients.

When they visited Awaba, a community only accessible by boat, they found health workers lacked even face masks, exposing themselves to TB, to care for people in their community.

Ms Slatcher said the people were heavily invested in the research, with a number of survey participants telling how they had witnessed family and friends struggle desperately with TB.

Tropical Health Systems



Health the Key in North's Roadmap to Economic Recovery

Professor Sarah Larkins, Alex Edelman, Professor Maxine Whittaker and Associate Professor Stephanie Topp

Disparities in the organisation and delivery of Northern Australia's health services could be a factor in preventing the region from becoming an economic powerhouse.

A new report, the `Northern Australia Health Service Delivery Situational Analysis', has highlighted trends, challenges and opportunities relating to key health system building blocks including governance, financing, workforce and service delivery across northern Queensland, the Northern Territory, and northern Western Australia.

JCU's Professor of Health Systems Strengthening, Professor Sarah Larkins, said health systems in the north were struggling to meet the needs of Northern Australia's 1.3 million residents, with poorly targeted resources and ill-suited funding models.

The $250,000 project, in partnership from the Cooperative Research Centre for Developing Northern Australia (CRCNA), was delivered in response to the Federal Government's Northern Australia White Paper, which identified health as a key strategic pillar in developing the north.

"The white paper defines Northern Australia as all of the Northern Territory, and those areas of Queensland and Western Australia above the Tropic of Capricorn," Professor Larkins said.

"We found many organisations providing healthcare and health workforce education and training which had largely isolated governance and resourcing structures."

"The health sector is fundamental to developing the North because a healthy and productive population supports industry growth across all sectors and is a platform for health-related knowledge and education services."

Professor Larkins said the research found scarce resources in some areas, but also waste and duplication resulting from poor co-ordination of services, and failure to address the social, cultural and environmental determinants of health.

"While we did see a few notable examples of cross-northern governance arrangements focussing on coordination and information-sharing relating to health services and workforce planning and delivery, these were few."

The report showed all three jurisdictions (Northern Territory, Queensland and Western Australia) had workforce shortages of health generalists and specialists, and allied health workforce in rural and remote areas. The turnover of the remote workforce was also a costly problem.

The Cooperative Research Centre for Developing Northern Australia (CRCNA) CEO Jed Matz said outcomes from the 'Health Service Delivery and Workforce in Northern Australia' report would assist in the development of the Roadmap to Economic Recovery for Northern Australia.

"Our recently published Northern Australia Health Service Delivery analysis has shown that across the north, health care and social assistance is the largest employing industry, representing 13 per cent of total employment, and with huge potential for growth," Mr Matz said.

"Strengthening health services, including the health workforce, in the north is fundamental to both the wellbeing of people living in the region and broader economic productivity and development. Therefore, the CRCNA continues to invest in research to help resolve some of the issues identified in this paper."

The CRCNA has said improving health outcomes for Northern Australia required political commitment, local leadership and targeted investment to improve health service delivery, workforce stability and evidence-based strengthening of community-led comprehensive primary health care.

Army Medic Cuts Healthy Research Legacy for North's Future Generations

Professor John McBride

"When I first came to Townsville, there were no infectious disease physicians or clinical microbiologists north of Brisbane." – Professor John McBride

Former Army medical officer and ground-breaking infectious disease researcher Professor John McBride, has made a significant mark on health and medical research in Australia's tropical north.

His tireless work in tropical health research over the past 50 years has taken him from rolling out anti-retroviral drugs in remote regions, to leading and inspiring future researchers, and finding new ways of detecting a future pandemic.

After 18 years at the helm of James Cook University's medical education and research program in Cairns, Professor McBride has retired but he said he hopes to continue his research and mentorship in his adjunct role.

The Adjunct Professor's passion for tropical health research stems back to the 70s when, as a medical student, he did an elective in the Solomon Islands.

After graduating in Medicine at Adelaide University, he moved to Townsville to work as an Army doctor and then undertook training in Tropical Medicine in Thailand before eventually returning to Townsville to undertake a Higher Degree in Research at James Cook University.

In the months before officially starting at James Cook University, Professor McBride travelled to Papua New Guinea to facilitate the roll out program for HIV anti-retroviral drugs.

"We were able to do the planning and start the public prescribing of anti-retroviral drugs, and this has grown to be an enormous program in New Guinea. I am immensely proud of that," Prof McBride said.

As a JCU Higher Degree Research Student himself, John studied a number of aspects relating to dengue fever and has continued his interest in this and many other tropical diseases affecting north Queensland. He secured funding for research into temperature screening of international travellers, in a bid to find ways of identifying and preventing the introduction of dengue fever into North Queensland.

He had seen temperature screening for SARS implemented successfully in Taiwan and wanted to test its effectiveness for dengue in Australia.

"We knew that every dengue outbreak started with someone coming in from Southeast Asia," he said.

"We used infra-red cameras at the Cairns International Airport, and we screened over half a million passengers, to look for people with fevers.

"We would then pull them aside and ask them to participate in research, which involved taking blood samples and trying to work out what they were suffering from."

Another exciting research endeavour he saw come out of JCU, is the *Wolbachia* mosquito project.

This project saw the release of mosquitos infected with the *Wolbachia* bacteria which reduced the ability of the *Aedes aegypti* mosquito to transmit the dengue virus.

"That project seems to have eradicated dengue from Far North Queensland, so that's been a fantastic achievement over the past 15 years or so."

"We haven't seen a case for years now. So it's been very successful, and very satisfying."

In more recent years Professor McBride has been evaluating genetic sequencing to improve detection methods of infectious diseases such as COVID-19.

"We know that when the next pandemic or unknown disease rolls around, we are not going to have a test for it," he said.

Predicting Waiting Time to Treatment for Emergency Department Patients

Dr Anton Pak

The Australian Institute of Tropical Health and Medicine is at the forefront, using machine learning algorithms to improve health system workflows and deliver better outcomes for patients waiting in public hospital Emergency Departments and medical testing stations.

The Institute's Health Economist and Data Scientist Dr Anton Pak said current systems of forecasting patient waiting times did not account for the dynamic and complex nature of hospital Emergency Departments.

His research has implemented machine learning algorithms to deliver greater modelling accuracy on waiting time forecasts.

The two-year observational study was conducted under the guidance of University of Queensland's economics Professor Brenda Gannon, in collaboration with Brisbane's Princess Alexandra Hospital's Deputy Director of emergency medicine Dr Andrew Staib.

Dr Pak scrutinised the movements of up to 120,000 Emergency Department (ED) patients using machine learning algorithms, to look at a large set of real-time patient information to determine their actual wait time.

The partnership with the Princess Alexandra Hospital facilitated the gathering of administrative data from the Hospital's ED including the patient journey from arrival to departure, over a two-year period between January 2016, and December 2017.

Once finalised, the system could be rolled out across Emergency Department networks in all hospitals, where patients could have access to view waiting times before deciding to go to a particular hospital.

Dr Pak said the research aims to help inform the development of a public interface, to give people access to ED waiting times, in close to real-time.

Such a system would help patients seeking emergency care who live in areas with access to multiple hospitals to choose the hospital with the shortest ED wait times, and could also be vital to assist planning during mass casualty events or pandemics where extended waiting times were expected.

"From a patient's perspective, the knowledge may reduce anxiety and uncertainty about waiting times and improve satisfaction."

It also has the potential to assist clinicians and nurses in how they estimate demand for care and calibrate workflow," Dr Pak said.

Dr Pak's research, published in the *International Journal of Medical Informatics*, has shown to be more accurate at predicting wait times than what is currently available.

"Current systems of reporting ED waiting times to patients are limited and have largely included rolling average estimates or median historical waiting times," Dr Pak said.

By implementing machine learning algorithms and using a large set of queueing and service flow variables, we were able to show evidence of the improvement in waiting time predictions for low acuity ED patients assigned to the waiting room.

Emergency department waiting times can affect patient satisfaction and quality of care, so we are looking for ways to improve the experience for patients across the country.

JCU Pharmacy student Breannan Busetti

Enlisting Pharmacists to Help Support Communities

Dr Deb Smith, Dr Erik Biros and Associate Professor Sophia Couzos

One of the largest research projects of its kind has explored integrating registered, and culturally-trained pharmacists into Aboriginal Community Controlled Health Services (ACCHS), to improve the quality of care received by Aboriginal and Torres Strait Islander people with chronic diseases.

James Cook University researchers undertook the evaluation of the Integrating Practice Pharmacists into Aboriginal Community Controlled Health Services (IPAC) project which was led by the Pharmaceutical Society of Australia (PSA) and designed and implemented in partnership with JCU and the National Aboriginal Community Controlled Health Organisation (NACCHO).

The pioneering project saw 26 culturally-trained non-dispensing pharmacists embedded within the primary health care teams of 18 ACCHS, across 22 sites in Queensland, Victoria and the Northern Territory, over 15 months.

More than 1700 Aboriginal and Torres Strait Islander patients enrol in the clinical trial, to work with culturally trained pharmacists and clinical ACCHS staff to improve their medication use.

A member of the Australian Institute of Tropical Health and Medicine, and JCU's Associate Professor for General Practice and Rural Medicine Sophia Couzos, said many Aboriginal and Torres Strait Islander people with chronic diseases did not have ready access to culturally trained pharmacist support.

Associate Professor Couzos worked with other AITHM members, including JCU biostatistician Dr Erik Biros who analysed and curated all the data, and JCU College of Medicine's Dr Deb Smith who managed the project.

Associate Professor Couzos said Aboriginal and Torres Strait Islander patients often struggled with medication regimes – including treatment for life-threatening conditions like diabetes and cardio-vascular disease.

"There is a higher burden of chronic disease in the Aboriginal community, and these patients are likely to be prescribed multiple medications, which also place them at greater risk of drug-related complications," she said.

"Yet they have limited access to a culturally trained pharmacist advice across Australia, particularly in remote areas.

"There's good evidence that pharmacists integration into general practices and other health services, improve patient health."

"We know that 'drugs don't work if patients don't take them', so finding ways to optimise this is a vital health system improvement."

The IPAC project saw culturally trained pharmacists, integrated within the primary healthcare teams of participating ACCHSs, to assist individual patients to overcome obstacles, and prescribers to optimise medication choices.

Dr Smith said the pharmacists were trained to collaborate with ACCHS staff and external stakeholders, such as community pharmacy and hospitals, to strengthen strategies for more effective medicine use.

"The pharmacists provided advice in a culturally safe and appropriate environment for the patient, where they felt at ease," Dr Smith said.

"Discrepancies in health outcomes for Aboriginal and Torres Strait Islander people give even greater weight to the importance of exploring ways in which pharmacists may improve medication management, such as embedding them within primary health care teams of culturally appropriate ACCHS, to try to achieve better health outcomes."

Dr Biros, who curated and analysed large amounts of data from the 18 participating ACCHS, said the project explored evidence for healthcare improvements in chronic disease sufferers, after they were supported by participating pharmacists throughout the IPAC project.

The Australian Government funded the IPAC Project under the Sixth Community Pharmacy Agreement's Pharmacy Trial Program to support the work of JCU's research team, the PSA and the NACCHO.

Aboriginal and Torres Strait Islander Health Workers in Vital Role

Associate Professor Stephanie Topp

JCU's Associate Professor Stephanie Topp is a member of the Board of Health Systems Global, and co-chair of the Health Systems Global thematic working group on social science research.

Aboriginal and Torres Strait Islander Health Workers play a vital role in the effective delivery of frontline primary health services striving to help Close the Gap.

But a JCU study has revealed these worker numbers are dwindling – and structural racism is partly to blame.

The study found these staff were struggling to support Aboriginal and Torres Strait Islander patients and build potentially life-saving bridges of communication and trust between their communities and non-Indigenous healthcare providers.

They themselves endured lack of professional recognition and support, as well as glaring inequities in pay conditions, compared to other health professionals employed by Queensland Health.

The study's primary investigator JCU health systems researcher, and member of the Australian Institute of Tropical Health and Medicine, and the Anton Breinl Centre for Health Systems Strengthening, Associate Professor Stephanie Topp, said the qualitative study had been prompted by a Queensland Health state-wide review.

It found the department was failing to achieve `full participation' of Aboriginal and Torres Strait Islander Health Workers.

The JCU study documented the experiences of 51 past and present Aboriginal and Torres Strait Islander Health workers in the Cape York and Torres Strait regions of the Torres and Cape Hospital and Health Service (TCHHS), as well as 19 of their non-Indigenous clinical colleagues.

In 2012, state-wide budget cuts to Queensland Health services led to the loss of almost 100 Aboriginal and Torres Strait Islander Health Worker positions within the TCHHS.

Associate Professor Topp said the study had yielded evidence that discrimination against these health workers was pervasive at all levels of the state's mainstream health system.

"I think when we get down to it, what we are seeing is structural racism," Associate Professor Topp said.

"It is systemic, at every turn, which means these study findings have implications for all Queensland Health's hospital and health services, not just the TCHHS."

Associate Professor Topp said this group reported they felt both beleaguered and disenfranchised, and discrimination started with the Queensland Public Health Sector Certified Agreement (No. 9) 2016.

Aboriginal and Torres Strait Islander Health Workers are the only Queensland Health employed health professionals who do not have their own career stream and award. They are relegated to the same category as cleaners.

Under their state Enterprise Agreement, these workers lack access to a wide range of benefits and conditions which are standard for other health professionals, including remote housing and professional development allowances.

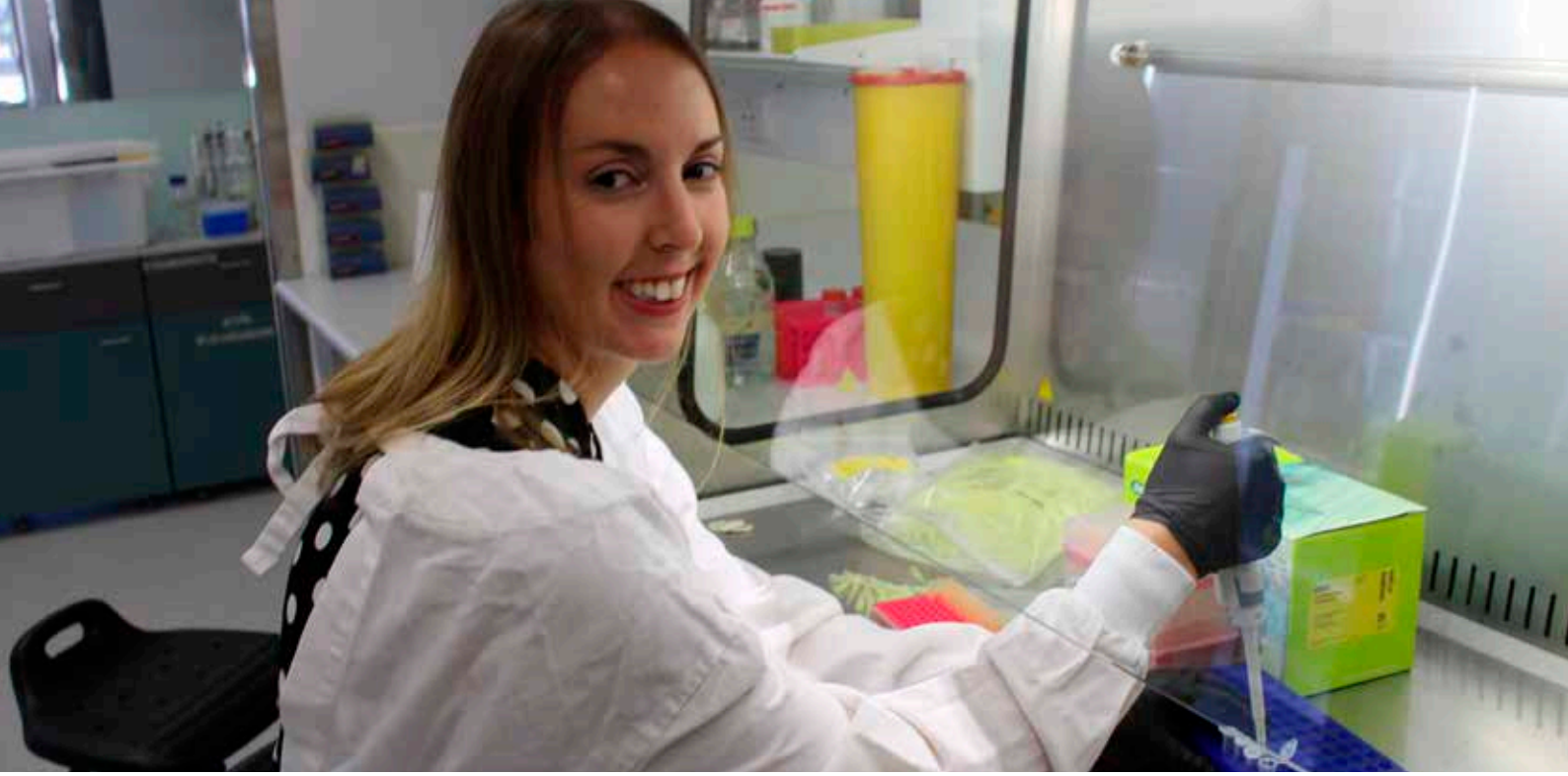
The unique cross-cultural nature of Aboriginal and Torres Strait Islander Health Workers' work is reflected in the fact that theirs is the only 'identified' health professional role in the mainstream Australian health system (i.e. this role can only be performed by Aboriginal and Torres Strait Islanders). Despite this, no targets exist for their recruitment and retention levels within the TCHHS.

The 2012 culling of these worker's positions within the TCHHS included several management roles, which has eroded Aboriginal and Torres Strait Islander Health Workers' corporate support, including critical programs to foster recruitment, professional development and succession planning.

Aboriginal and Torres Strait Islander Health workforce numbers are continuing to fall, partly due to ongoing dis-establishment of positions, where established Aboriginal and Torres Strait Islander Health Workers positions are not funded or are under-funded in operational budgets, preventing recruitment and leading to long-term vacancies and eventual abolition of those positions.

The study has made a number of recommendations, including establishment of a specific career stream, commitment to achieving benefits and conditions commensurate with standard expectations for other health professionals, and clear targets for recruitment and retention of these workers in all Queensland Hospital and Health services.

Associate Professor Topp said the Queensland study results should prompt further research into the status and workplace conditions of these health workers in other states, in light of the National Industry Insights Report forecast that their employment figures were expected to drop 18.75 per cent between 2019 and 2024; from about 1,600 workers to 1,300.



AITHM Infectious Disease expert Dr Hillary Vanderven

Flu Fighter Shifts Focus in Search for Universal Flu Vaccine

Dr Hillary Vanderven

A universal flu vaccine that provides broad protection has eluded experts for decades, but now researchers are honing their focus onto boosting antibodies as a technique to deliver broad-scale flu protection.

JCU Immunology and Infectious Disease expert Dr Hillary Vanderven is one of a team of researchers at the Australian Institute of Tropical Health and Medicine, looking at ways to combat the 'drift and shift' of flu viruses, in order to improve vaccine responsiveness.

Dr Vanderven said the effectiveness of current influenza vaccines is limited by the rate at which flu viruses mutate. Flu viruses can 'drift or shift' causing changes in viral proteins called antigens.

Over time, flu viruses 'drift' due to the random accumulation of mutations in their genes. This process of 'drifting' allows the flu virus to evade the immune system, leading to seasonal epidemics or outbreaks of flu. As a result of this drifting, researchers must change the composition of the flu vaccine annually in order to keep up.

Flu viruses can also 'shift' when two viruses infect the same cell, usually in an intermediate host like swine. The two different flu viruses can undergo 'genetic mixing', resulting in an entirely new influenza virus being produced.

The emergence of a new influenza virus, for which there is little or no immunity, can lead to a global pandemic.

Influenza viruses which have undergone this genetic mixing, or antigenic shift, include the 1918 Spanish Flu, the H3N2 Hong Kong Flu pandemic of 1968, the H1N1 Swine Flu scare of 2009, and the H7N9 avian influenza virus from China in 2013.

Dr Vanderven aims to better understand immune mechanisms responsible for preventing or controlling influenza virus infections in humans, in order to find ways to enhance influenza vaccine responsiveness, and find ways of treating severe influenza with novel antibody-based therapies.

Dr Vanderven said while current influenza vaccinations can induce neutralising antibodies capable of preventing infection, they are developed to protect against specific strains of the virus. As such they provide limited protection against new or mutating strains.

To overcome this issue, there has been a renewed interest in developing influenza vaccines that induce broadly-reactive antibodies which target those parts of the influenza virus that are highly similar or 'conserved' across different strains of the virus such as the hemagglutinin stem, which is a protein found on the surface of all influenza A viruses.

Dr Vanderven said responsiveness to flu vaccine also declines with age, with older adults more susceptible to influenza-related complications such as pneumonia, hospitalisation and death.

Older adults with low levels of influenza-specific antibodies, may be more susceptible to influenza virus infection. As such, a strong vaccine-induced antibody response may improve protective immunity in these at-risk individuals.

Research undertaken by Dr Vanderven and colleagues in 2020 highlighted the necessity for a more comprehensive assessment of the current influenza vaccination strategy, and the need to consider variability in the aged population.

Helping Teens Make Stress Their Strength

Riana Phillips

North Queensland teenagers are learning how to optimise stress and recognise small challenges, not as incapacitating hurdles, but opportunities for triumph, thanks to research being conducted at James Cook University.

Higher Degree Research Student Riana Phillips is completing a doctorate in Psychiatric Neuroscience supported by her supervisor JCU neuroscientist Professor Zoltan Sarnyai, to investigate ways to optimise stress responses during adolescence.

With stress affecting up to 72% of Australian adults, Riana is passionate about making a difference for future Australians.

"Adolescents are at a very vulnerable stage in life and are experiencing a lot of changes not just physically but mentally," she said.

Riana said adolescents were often juggling stresses related to home life, social life and school exam times, with recent reports showing one-in-seven children and adolescents experience mental health disorders.

"Some people may be more resilient than others and that's okay, but we need to address this."

"Stress causes a physiological response and over time this repetitive stress response will accumulate into negative effects on the body, leading to a greater risk of cardiovascular disease, autoimmune diseases, and neurodegenerative diseases."

Riana worked in a cross-cultural collaboration with the Centre for Studies on Human Stress in Montreal, Canada which gave her access to a series of short, YouTube videos the Centre had developed, to teach high school students how to turn stress to their advantage.

A group of North Queensland highschool students watched four five-minute neuroscience-informed `Stress Optimisation' videos over a period of two weeks and were asked to monitor their stress levels and mental wellbeing before and after the videos.

Riana worked with Professor Sonia Lupien, whose Montreal-based team developed the program to promote mental wellbeing not just locally, but also globally.

The research also evaluated whether there were differences between students in the two countries, and whether the intervention used in Canada would also work for Australian adolescents. The data is being collated.

Riana said she sees her PhD as the source of many opportunities to produce significant research, to develop as a professional, and to pro-actively tackle adolescent stress before it potentially becomes a chronic condition.

During COVID-19, the Australian Government has also recognised the importance of mental health, implementing additional Medicare subsidies for psychological therapy during these unprecedented times.

Laura Kaye
JCU Journalism Student

Cohort Doctoral Studies Program

"James Cook University's Cohort Doctoral Studies Program is one of the first of its kind in Australia."
–Associate Professor Melissa Crowe.

Cohort leader Associate Professor Melissa Crowe, Christine Teizel and mentor Associate Professor Meryl Churchill

Fostering Research

Under the guidance of Associate Professor Melissa Crowe, the Cohort Doctoral Studies Program, the research education arm of the Australian Institute of Tropical Health and Medicine, has become a thriving professional development program, supporting 138 Higher Degree Research candidates in 2020.

"Candidates come from diverse backgrounds and discipline areas including physiotherapy and hydrotherapy, nursing, mental health, pharmacy, pathology, infectious diseases, and gerontology.

Future researchers learn leadership in working successfully with advisory and stakeholder groups, in research design, research conduct and ethics, data management and goal setting."

Associate Professor Melissa Crowe
Head of Cohort Doctoral Studies Program

"People living in remote, and very remote areas are 1.2 times as likely to have diabetes as people in major cities, while Indigenous Australians are 2.9 times as likely to have diabetes as non-Indigenous Australians."

Australia's Health 2020: data insights report- Australian Institute of Health and Welfare.

An Emerging Burden Confronting Australia's Health System

Amanda Frier

Diabetes is one of the biggest challenges confronting the nation's health system, with 280 Australians developing diabetes every day.

Complications from the disease can cause blindness, amputations and heart disease, with an estimated annual cost impact of over $14.6 Billion.

JCU Higher Degree Research Student Amanda Frier's research seeks to incorporate the social determinants of health into the clinical management of type 2 diabetes.

Social determinants of health include; early childhood, education, employment, income, food security, housing, transport, economic status, social support and healthcare access. They are usually addressed at population and community levels, not individually or as part of clinical care.

The connection between Type 2 Diabetes and social determinants of health has been highlighted during Amanda's work across the vast landscape of North Queensland.

"People with the poorest social determinants of health are more likely to develop diabetes, and have more difficulties with self-management of the disease," she said.

With more than 17 years' experience in primary healthcare as a dietitian and diabetes educator, Amanda has worked in rural, remote and regional Queensland and has seen firsthand the challenges people can face because of their social determinants of health.

Amanda's research is being supported by JCU's Cohort Doctoral Studies Program, which she said had played a significant role in supporting and guiding her in all aspects of her PhD.

Through the Cohort Program she has received the support of experienced researchers, been exposed to other student's research, and she continues to increase her research knowledge.

"The Cohort Doctoral program has provided me with capacity building, theoretical and practical learning, and collegial support, all necessary to be successful when undertaking a PhD research project," she said.

Her research to date has found social determinants of health are an important consideration when helping people to self-manage diabetes.

Understanding the interplay between social determinants of health and Type 2 Diabetes management, may improve outcomes for people with diabetes.

Amanda said her research included looking into how better understanding an individual's social determinants of health, could assist in providing an individual's care.

By formally incorporating social determinants of health into Type 2 Diabetes management, more comprehensive care could be provided. This may then lead to improved self-management for people living with diabetes.

Amanda's research will continue to align with her professional desire to be able to help people self-manage their Type 2 Diabetes, to strive for health equality, and help people live well and enjoy life."

Greg Hamblin
JCU Journalism Student

Cold Case Detective in New Research to Help Solve Murder Mysteries

Senior Sergeant Jim Whitehead

Homicide cases can be difficult to solve even when ample evidence is available, but investigators face increasing challenges when the location of a body is unknown.

Such information is often crucial to find the perpetrator of a homicide but Police Officer and JCU Higher Degree Research Student Senior Sergeant Jim Whitehead is working towards creating a world-first system that could help find missing homicide victims.

The State Search and Rescue Coordinator and Training Officer is reconstructing data and patterns based on murderer's profiles, in an attempt to identify correlations around where murderers dispose of victims.

Supported by JCU's Cohort Doctoral Studies Program and his advisory team led by Associate Professor Richard Franklin, Senior Sergeant Whitehead analysed evidence from 779 Queensland homicide cases investigated since 2004.

Senior Sergeant Whitehead also interviewed police investigators on the cases, noting the information relevant to his research.

"The type of data I looked for includes where the homicide occurred, and where the body was found, the method of transport if it was moved, and method of homicide," he said.

"I also looked at information such as the offender's age, height and weight, the victim's height, weight and age, and the relationships and time between when they were found."

"It's world first, it's never been done that way, so we are breaking ground."

With the research, he planned to create a database similar to the Lost Person Behaviour database, which he uses in his role as Detective, to find missing people.

Senior Sergeant Whitehead said he had used his innovative system with seven new cases, and was successful "five-and-a-half times," he said.

"The `half time' was the right location but the perpetrator took the victim a little bit further than I would have expected."

Senior Sergeant Whitehead began his research at JCU four years ago, slowly working his way through the large amounts of data and text.

While conducting his research, Senior Sergeant Whitehead found there was no literature on his strategy for finding missing bodies, as typically police would find a murderer by investigating the body, not the other way around.

Senior Sergeant Whitehead said he would also like to use his approach to help successfully uncover cold cases.

Cameron McConnachie
JCU Journalism Student

The Royal Flying Doctor assisted 320,100 rural and remote patients in 2020.

The Royal Flying Doctor touches down in the Outback

New Health Researcher Breathing Life into Her Community

Sally West

Sally West is a remote clinical nurse at Weipa Hospital in Cape York who found herself leading research which would impact the health of the region's residents.

The specialist emergency department and paediatrics nurse said she began to notice the burden of bronchiolitis on the young families in her community.

"I saw a pattern of young parents and their children having to be flown to Cairns to receive a breathing apparatus to deliver nasal high-flow therapy," Ms West said.

"I began to explore whether other remote communities were experiencing the same problem and found that while nasal high flow therapy was being used by patients within remote communities, there was a great discrepancy in its use."

Ms West, a registered nurse of 17 years, said while she was clinically confident in a hospital and health care setting, but not so academically.

"My biggest weakness was my understanding and experience in undertaking research processes, but then I heard about James Cook University's Cohort Doctoral Studies Program," she said.

"I thought a higher research degree was out of the question for me as I didn't enjoy the process of writing and I didn't have confidence in this area.

"I was also hesitant to add to my workload as I already worked clinically, I had a small child, and I was pregnant with my second."

But Ms West said she couldn't ignore the needs of the remote community where she lives and works.

So, she met with James Cook University's Cohort's leader Associate Professor Melissa Crowe, and soon after, Ms West became one of 138 Higher Degree Research Students in health and medical research, at JCU in 2020.

"The Cohort program provided all of the knowledge, support and networking that I had been missing and I could not believe such support existed and was so easy to access," she said.

"The Cohort made me realise I could develop the resilience required to undertake a large research project and that my clinical skills could be well translated."

"They identified and placed value onto the work that I had been trying to achieve clinically and provided me with the academic rigour in order to do it right."

Ms West said with the support and knowledge, her research into ways to relieve the burden of bronchiolitis, progressed rapidly.

"I now have confidence when talking academia with my clinical peers and I feel my experience in the Cohort has also strengthened my clinical work."

"I have written a paper ready for publication, which I had never thought possible, commenced a method of quantitative data collation, conducted focus groups, set up training workshops and completed my confirmation of candidature," she said.

Ms West began working to develop new remote-specific guidelines for Queensland Health, to allow patients better access to the nasal high-flow therapy.

"I am using a panel of experts including local patients who are receiving treatment in tertiary facilities, as well as experts in retrieval, and nasal high-flow therapy, to adapt the tertiary guideline to focus on a remote use," she said.

"This guideline will then be implemented across three research sites including Thursday Island, Weipa and Cooktown, and the implementation will be evaluated using qualitative and quantitative methodology."

The project has drawn on a collaboration of local stakeholders to solve a local problem and will boost health staff's knowledge base, and access to resources for nasal high-flow therapy use.

It will also improve the capacity to keep people who require nasal high-flow therapy, in their home/country environment, at a time when they are most vulnerable.

It allows the remote person access to the same standard of treatment they would receive in a major centre.

Ms West is about to complete phase one of her project with the guideline being reviewed, and she will soon be working towards the second phase of evaluation.

Ms West received grants from the Emergency Medicine Foundation, Children's Hospital Foundation, and the Tropical Australian Academic Health Centre to undertake the research, which will lead to positive change for patients living in rural and remote areas.

Awards

Dr Karen Cheer – JCU Medal of Excellence for a Higher Degree by Research

Dr Malindu Fernando – Fullbright scholarship 2020

Dr Allison Hempenstall – Fullbright scholarship 2020

Emeritus Professor Rhondda Jones AM, Queen's Birthday Honours 2020

Dr Ann Kraeuter – JCU Medal of Excellence for a Higher Degree by Research

Dr Andreas Kupz – Young Tall Poppy Award 2020

Professor Emma McBryde, Dr Michael Meehan, Dr Anton Pak, Dr Oyelola Adegboye and Dr Diana Rojas Alvarez – James Cook University Research Excellence Award – Research on COVID19 for Epidemiology

Professor John Miles – Reviewer Award from the Journal of Immunology and Cell Biology

Professor Martin Nakata AM, Queen's Birthday Honours 2020, for significant service to tertiary education

Dr Amy Peden – JCU Dean's Awards for Excellence 2020

Kunal Pratap – JCU 3MT finalist and people's choice

Dr Stephanie Ryan – JCU Dean's Awards for Excellence 2020

Dr Roland Ruscher – American Association of Immunologists (AAI) travel award

Dr Tanya Russell – Far North Queensland Hospital Foundation Travel Award – Vector research

Rebecca Webb – JCU 3MT finalist

Positions

Professor Tom Burkot – Co-leader Pacific Mosquito Surveillance Strengthening for Impact (PacMOSSI) consortium, Global Malaria Programme – Malaria Policy Advisory Committee member and Malaria Elimination Oversight Committee member, Building Out Vector Borne Diseases in Sub-Sahara Africa Management Board Member, Indo-Pacific Initiative Advisory Group, Innovative Vector Control Consortium, and *Aedes albopictus* Torres Strait Programme Technical Advisory Group

Associate Professor Constantin Constantinoiu – JCU Academic Board for Learning and Teaching

Denise Craig OAM – Queen's Birthday Honours 2020, for service to people living with dementia

Andreas Kupz receives Young Tall Poppy Award 2020

Associate Professor Melissa Crowe – Head, Cohort Doctoral Studies Program, Supporting our Supervisors (SOS) James Cook University community of practice Co-lead. Research education for staff initiative Co-lead for Division of Tropical Health and Medicine, Research Education Sub-Committee Member, James Cook University

Dr Michele Dale – JCU Academic Board for Quality

Professor Norelle Daly – Co-chair International Society on Toxinology Regional Congress, Secretary of International Society on Toxinology – Asia Pacific

Professor Denise Doolan – Australian Institute of Tropical Health and Medicine Deputy Director, James Cook University Centre for Molecular Therapeutics Director, International Society of Vaccines President Elect

Dr Matt Field – Australian Bioinformatics Society Executive Member, Queensland Cyber Infrastructure Foundation (QCIF) Bioinfo Advisory Committee Chair, and QCIF's Services and Infrastructure Steering Committee member, Australian Health Research Alliance (AHRA) Data committee representative, Health Studies Australian National Data Asset (HeSanda) representative

Dr Stephan Karl – Papua New Guinea National Malaria Control Program Technical Working Group

Dr Andreas Kupz – Collaboration for TB Vaccine Discovery (CTVD) Advisory Council member, CTVD Live Attenuated Research Community Co-Chair, 2020 Flying Scientist Program, Australian Institute of Tropical Health and Medicine Early and Mid-Career Researchers (EMCR) Group Chair

Professor Sarah Larkins – Director, Research Development, Division of Tropical Health and Medicine, Convenor, Clinical Leadership Group, Tropical Australian Academic Health Centre, Co-Director, Anton Breinl Research Centre for Health Systems Strengthening, Scientific Advisory Committee, National Health Medical Research Council Partnership Centre in Health System Sustainability, Co-Convenor Spinifex Network (Rural Health Research Network), Member and Co-Chair – Primary and Chronic Care Panel – National COVID-19 Clinical Evidence Taskforce, National COVID-19 Clinical Evidence Taskforce, Research Australia Round Table, Innovative Research Universities Health and Medical subcommittee, NHMRC and MRFF grant reviewing

Professor Peter Leggat – JCU Academic Board Deputy Chair, Australasian College of Tropical Medicine President

Dr Diana Mendez – JCU Graduate Certificate and Diploma of Research Methods Committee Lead

Professor John Miles – International Journal of Molecular Sciences Board Member, Journal of Data Mining in Genomics and Proteomics Editorial Board Member

Professor Emma McBryde – Centre for Research Tuberculosis Executive Committee Member, Australian Respiratory Council Research Committee Member, Australian Clinical Tuberculosis Research Network (ACTnet) Member, The Australasian Tuberculosis Forum treasurer, Senior Tuberculosis clinician, Member of the Tuberculosis Expert Advisory Group member, and Health Issues Committee member for the Torres Cape Hospital and Health Service, and Drug Safety Monitoring Committee member

Dr Saparna Pai – NHMRC Grant Reviewer and Assessor 2020, Associate Editor Frontiers in Immunology Journal

Associate Professor Gunther Paul – MPDI Symmetry Topic Editor.

Professor Juergen Reichardt – Journal Human Genomics Associate Editor, Board of Pharmacogenetics and Pharmacogenomics as Associate Editor

Dr Roland Ruscher – Australian and New Zealand Society for Immunology (ASI) Special Interest Group (SIG) event Co-organiser, DC2020 International Conference Co-organiser and Social Media Communicator

Dr Tanya Russell – Malaria Elimination Advisory Group Committee Member for Ministry of Health Vanuatu, Guidelines Development Group for vector control – malaria Committee Member – World Health Organization, Indo-Pacific Initiative Advisory Group Committee Member- Innovative Vector Control Consortium, Pacific Mosquito Surveillance Strengthening for Impact (PacMOSSI) consortium Co-leader

Professor Zoltan Sarnyai – Journal Frontiers in Neuroscience Associate Editor

Emma McBryde, Adeshina Adekunle, Oyelola Adegboye and Anton Pak

AITHM Deputy Director Professor Denise Doolan

Distinguished Professor Louis Schofield – Queensland State Government Biomedical Research Group, James Cook University Research Committee, Tropical Academic Advisory Health Centre Board member, Life Sciences Queensland Board member, Mackay Institute for Research and Innovation Board member

Dr Mohammed Shorab – Vice-President of the e-Oral Health Scientific Group & Network of the International Association for Dental Research.

Dr Michael Smout – Frontiers in Medicine journal Review Editor, PLoS Neglected Tropical Diseases journal Associate editor, Agilent Technologies key opinion Leader, Conference organiser Australian Society of Parasitology conference 2020

Associate Professor Ruth Stewart – Australian National Rural Health Commissioner

Dr Katie Tungatt – Gender Equity Action and Research Team, member, James Cook University

Dr Lynn Woodward – Gene Technology Ethics and Community Consultative Committee, Human Research Ethics committee – James Cook University, Townsville Hospital and Health Service and Sunshine Coast University.

Emeritus Professor Ian Wronski AO – Tropical Academic Advisory Health Centre (TAAHC) Chair

"More than half of the world's population is expected to live in the Tropics by 2050."
– State of the Tropics Report 2020

Tropical North Queensland swimming hole in the Daintree

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