



scope

Contemporary Research Topics

health & wellbeing 6

November 2021

scope

Contemporary Research Topics

health & wellbeing 6

November 2021

Scope: Contemporary Research Topics, Otago Polytechnic Press.

Otago Polytechnic Ltd is a subsidiary of Te Pūkenga - New Zealand Institute of Skills and Technology

Scope: Contemporary Research Topics (Health & Wellbeing) – thereafter known as *Scope (Health & Wellbeing)* – is peer-reviewed and published annually in November by Otago Polytechnic | Te Kura Matatini ki Otago, Dunedin, New Zealand.

The journal *Scope (Health & Wellbeing)* aims to engage in multidisciplinary discussion on contemporary research in the landscape of health. It is concerned with views and critical debates surrounding issues of practice, theory, education, history and their relationships as manifested through the written and visual activities, such as original research, commentary, and critical debates concerning contemporary researchers, industry, society and educators in their environments of national and international practice. *Scope's* focus is on building a sense of community amongst researchers in New Zealand and the international community.

Scope is a non-profit publication with open access online. An online version of the journal is available free at www.thescope.org; ISSN (for hardcopy version): 2537-8872; ISSN (for online version): 2537-8880.

© 2021 the authors; © cover image and illustrations, including tables and graphs – the artists and other copyright owners.

Scope: Contemporary Research Topics (Health & Wellbeing) 7, 'Sustainability' (November 2022)

Call for papers for *Scope Health & Wellbeing 2022*, the seventh issue will provide the opportunity for authors to consider, discuss and debate how sustainability is understood in relation to health and wellbeing. Sustainability is generally considered as a destination, a complex, subjective, ambiguous or contested space. Sustainability in relation to health and wellbeing of individuals, indigenous populations and communities for example, health, ill health, shifts in health, access to health, local health, global health, climate change, COVID-19 or the United Nations 17 Sustainable Development Goals are considered for publication to raise awareness and dialogue. The seventh edition will publish in conjunction with nursing, occupational therapy, midwifery and sport, which attempt to (re)build and (re)foster dialogue.

Submissions for *Scope (Health & Wellbeing) 7, 'Sustainability'* are invited from researchers, educators, industry, writers, theorists and historians. Abstracts can be sent to Editor in chief jean.ross@op.ac.nz for discussion by 30 March 2022 otherwise submissions should be sent in electronic format by 30 June 2022 for review and potential inclusion in the annual issue to Associate Professor Jean Ross (Editor-in-chief) at Otago Polytechnic Ltd | Te Kura Matatini Ki Otago, Private Bag 1910, Dunedin, New Zealand at jean.ross@op.ac.nz. Please consult the information for contributors below or online versions for examples.

Peer review forms will be sent to all submitters in due course, with details concerning the possible reworking of documents where relevant. All submitters will be allowed up to two subsequent resubmissions of documents for peer approval. All final decisions concerning publication of submissions will reside with the Editor. Opinions published are those of the authors and not necessarily subscribed to by the Editors or Otago Polytechnic. Please refer to author guidelines for submissions at <https://www.thescope.org/contributors>. For further questions about submissions please contact the Editor-in-chief at jean.ross@op.ac.nz. The theme for Contemporary Research Topics, *Scope Health & Wellbeing 2022, 7 'Sustainability'*.

Please refer to author guidelines for submissions at <https://www.thescope.org/contributors>. For further questions about submissions please contact the Editor-in-chief at jean.ross@op.ac.nz.

Image note: CJ Moss (Kelisi), A map showing the Isle of Anglesey/Ynys Môn and nearby areas. This map's source is at <http://www.ifm-geomar.de/ifm-geomar/>, with the uploader's modifications, and the GMT homepage says that the tools are released under the GNU General Public License. GNU Free Documentation License, Version 1.2 licence.

Copy Editing: Ingrid Sage

Design & Typesetting: Suzanne Thornton

Printing: Uniprint, Dunedin

Cover: Kevin Miles, *Procession #2, Te Whanganui-a-Tara* (2021) unique gelatin silver photogram 46 x 106 cm.

Editorial Team:

- Associate Professor Jean Ross (Chief Editor)
- Associate Professor Karole Hogarth (Editor)
- Helen Jeffries (Editor)
- Richard Humphrey (Editor)
- Pam McKinlay (Editorial Liaison)
- Catherine May (Editorial Assistant)

For peer review and editorial advice and comment, the editors rely on a range of appropriate reviewers, but in the first instance on members of the **Editorial Board**.

Editorial Board:

- Professor Liz Ditzel, Te Kura Tapuhi | School of Nursing, Otago Polytechnic Ltd | Te Kura Matatini ki Otago, Dunedin, Aotearoa/New Zealand
- Emma Collins, Te Kura Tapuhi | School of Nursing, Otago Polytechnic Ltd | Te Kura Matatini ki Otago, Dunedin, Aotearoa/New Zealand
- Laurie Mahoney, Te Kura Tapuhi | School of Nursing, Otago Polytechnic Ltd | Te Kura Matatini ki Otago, Dunedin, Aotearoa/New Zealand
- Rachel Parmee, Te Kura Tapuhi | School of Nursing, Otago Polytechnic Ltd | Te Kura Matatini ki Otago, Dunedin, Aotearoa/New Zealand
- Professor Dominic Micklewright, University of Essex, United Kingdom
- Dr Campbell MacGregor, Toi Ohomai Institute of Technology, Dunedin, New Zealand
- Dr Daniel Ribeiro, School of Physiotherapy, University of Otago, Dunedin, New Zealand
- Dr Richard Young, High Performance Sport, Dunedin, New Zealand
- Mr Ian Crabtree, Te Ohu Ora | College of Health, Otago Polytechnic Ltd | Te Kura Matatini ki Otago, Dunedin, Aotearoa/New Zealand
- Mr Keith Whiddon, Community Chair, Bishops Castle, Shropshire, United Kingdom
- Dr Mark Siemon, Assistant Professor, Southern Utah University, Cedar City, Utah USA
- Professor Kathie Lasater, Professor Emerita, OHSU School of Nursing, Visiting Professor, Edinburgh Napier University
- Professor Midori Kamizato, Okinawa Prefectural College of Nursing, Okinawa, Japan

CONTENTS

7	Jean Ross	Islands an Approach to Understanding the World
9	Josie Crawley	Diagnosed an Islander
11	Interview by Keith Whiddon	Growing up and Nurturing a Rural Community: An Interview with Hope Robson, Bishop's Castle, UK
18	Marianne Cherrington, Ihaka Dunn and David Airehrour	Cracking the Covid-19 Code: Cutting-Edge Collaboration
26	Alun Roberts	Island life: A Reflection during the COVID-19 Pandemic
30	Mary Cooper, Pavitra Dhamja, Elizabeth Youard and Campbell Macgregor	Bugs in Gyms – New Zealand Attitudes to Infection Risk Management in a Gym Setting: A Pilot Study
47	Tavish Sehgal and Marianne Cherrington	Improving New Zealand Health Outcomes with Artificial Intelligence

- | | | |
|----|---|--|
| 57 | Natasha Moore | Reducing Seclusion Use for Tāngata Whai i te Ora through Integration of Māori Culture into Practice |
| 62 | Olivia Austen | Obesity Stigma: The Role of Healthcare Practitioners in Improving Patient Outcomes |
| 68 | Tessa Lee, Gemma Hooton, Olivia Hyslop, Hinemoa Julien, Maia Love-Williams, Amy McCarthy, Natasha Moore, Stella Murchie, and Laurie Mahoney | From One Island to Another – Migrant Workers from the Philippines Living and Working in Geraldine, New Zealand |

ISLANDS AN APPROACH TO UNDERSTANDING THE WORLD

Jean Ross

This edition of *Contemporary Research Topics Scope: Health & Wellbeing 6*, engages with the theme, islands. In this publication, an opportunity arises for authors to reflect, discuss and debate how islands may be considered and understood in relation to health and wellbeing. This sixth edition offers a space in which to recognise differing disciplines' perspectives, theoretical underpinnings, and engagement with islands in which to bring a deeper understanding of the varied relationships and connections we have with islands. Islands are considered as being surrounded by water; land carrying capacity; positioned within a certain time and space; connected/disconnected; isolated; habituated; having similarities/differences/challenges; a place to relax; to travel to/from or community. There are many ways to consider islands, photographer Kevin Miles's interpretation on the cover of this Journal has the potential to provoke interest in this camera-less photographic image in which reader's traditional concepts may be transformed by the photographer.

The overall exploration in this Journal is to open local, national and international debate to enhance dialogue related to health and wellbeing and the concept of islands. Figure 1 below, depicts what islands means to me, my identity and sense of place and belonging, and relates to the ocean, space, isolation, connected, functional, a habited island of a working lighthouse keeper and family; however over time this island has been transformed by technology and the lighthouse has become non-manned. However this island is still habited by visitors and wildlife. South Stack, situated on the Irish coast between Holyhead, North Wales, and Dublin, Ireland and is a place my family would visit and walk down and up the 365 steps to the lighthouse on Sunday afternoons (the family walk following Sunday lunch which was always a traditional roast).




Figure 1. *South Stack lighthouse* by "Deiz92", sourced from Flickr: Used under Creative Commons Attribution Non-Commercial No-Derivatives licence, CC BY NC ND 2.0.

The outline of the Journal engages, expands and integrates, the concepts of islands as physical, tangible and visible, imagined, meaningful and reflective which are considered widely by the contributors in this Journal. Josie Crawley's original poem, a reflective contribution titled 'Diagnosed an Islander', projects her connection with islands which is further depicted with her photographic image of Kapiti Coast driftwood situated in New Zealand. A further two personal reflective contributions include an interview by Keith Whiddon with Hope Robson, a young vibrant woman connected to the rural community of Bishop's Castle, Shropshire, UK, who is a social prescriber within this community and is also working towards establishing a community hub. A further reflective piece by Roberts considers islands and community life which further connects with this editorial as both our reflections are situated from the same coastal location our upbringing surrounded and dictated by this coast including the image of Holyhead harbour. Robert's reflection also considers the influence of the COVID-19 pandemic on island life. This reflection is nicely positioned to proceed Cherrington, Dunn and Airehrour's commentary which also focuses on the pandemic as they express cracking the COVID-19 code. Cooper, Dhamja, Youard and Macgregor's research interprets public gyms as 'islands' of community members, although their research was conducted prior to the COVID-19 pandemic, the findings are a significant reminder of the increased spread of respiratory disease that can transpire within the 'island' concept of gyms.

The remainder of the Journal presents four comparable papers comprising a wide range of new approaches that could improve health outcomes. All four papers enhance our awareness and considerations of health disparities, health inequities, with considerable emphasis of vulnerable population or cultural groups as islands of people who reside in Aotearoa. In this section, Sehgal and Cherrington's commentary stresses the importance of engaging with artificial intelligence to assist in reducing health inequities to improve health outcomes. In the following paper, Moore argues that seclusion, as a treatment to improve mental health outcomes for Māori is not affective, instead providing a cultural safe environment which embodies a therapeutic relationship is promoted. The third paper in this section supports Austin's literature review and discusses the stigma surrounding obesity and the role healthcare practitioners have in improving health outcomes of clients. The focus on improving health outcomes with vulnerable populations continues in the fourth paper, highlighting specific barriers experienced by Filipino migrants with the New Zealand healthcare system demonstrating the need for culturally safe integrated and enhanced migrant services that are specific to Filipino people.

I invite you to engage with the authors' contributions and progress in ongoing dialogue. I am open to letters to the Editor in future Journals.

Jean Ross  <https://orcid.org/0000-0003-2467-9233> is Associate Professor and has been working at Otago Polytechnic Ltd | Te Kura Matatini ki Otago since 2003. She is a Registered Nurse, holds a BN and a Master of Arts, and completed her Doctorate in 2017. She was made an Associate Professor in 2018. From 1994-2003, she was co-director of the National Centre for Rural Health and instrumental in the development of interdisciplinary postgraduate nursing education. In 2008, she received the Rural General Practice Network Peter Snow Memorial Award in recognition of her national contribution to rural health research.

Correspondence to: Jean Ross, Otago Polytechnic | Te Kura Matatini ki Otago.

Email: jean.ross@op.ac.nz

DIAGNOSED AN ISLANDER

Josie Crawley

*Am I cursed an Island dweller
or blessed a frequent flyer
castaway where quickness of thought
fatigues mis-fired neurons.
Such synaptic chaos
celebrates successful completion of each day,
careful allocation of energy and need, energy and want,
wanted, longed for energy.
Today no blueprint for tomorrow*

*Out there for those not marooned on islands
the world speedily spins
fragile plans with gossamer threads of health –
wealth, worth, career, status
eggshell futures for the sanguine.
Island life illuminates the moments that blur,
do mainlanders revel in an obedient bladder, navigating a step, the supportive joy of a pillow
behind the head;
small things that make a day
or does the nuanced challenge of being alive rush past.*



Figure 1. Kapiti Coast Drift. Source: Author

Josephine Crawley  <https://orcid.org/0000-0003-1011-3335>, RN, BA, MEd, GCTLT is a principal lecturer at the School of Nursing, Otago Polytechnic Ltd. She has been involved in nurse education in both the community and institutions for over 25 years. Her research platform explores the place of narratives within nursing education for reflection, to build compassionate care and to research the client and nurse experience. She has published in a variety of academic journals, case studies, presented internationally, co-edited a book and her poetry has been included in a collection of poems by Aotearoa New Zealand Nurses.

Correspondence to: Josie Crawley, Otago Polytechnic | Te Kura Matatini ki Otago. Email: josie.crawley@op.ac.nz

GROWING UP AND NURTURING A RURAL COMMUNITY: AN INTERVIEW WITH HOPE ROBSON, BISHOP'S CASTLE, UK

Interview by Keith Whiddon

"If I could apply my time to help people when I know that I can help them and that it could work – why wouldn't I?"

Hope Robson

Keith: Tell me a little about your background Hope.

Hope: I grew up in a small rural town in Shropshire, UK. It's very much a stronghold community here in the town where I live. It gave me the values and beliefs that I have now and that has allowed me to do all the work I do.

As well as growing up in a small rural community I also have another side to my background, which is a more nomadic way of life – travelling around to different festivals, with different types of cultures, creative arts and music – with lots of different things to offer.

So when I grew up, I was able to have a look at different areas of life; different lifestyles and different ways of people living. My background came with a lot of highs and amazing experiences – ones that I'll cherish for a lifetime. But also, I have a lot of understanding of the other parts of life that might not necessarily be so positive. My background really is about human connection and experiencing community in every sense. So I really enjoy having the background that I do. I think I understand culture quite well from it and I'm able to really understand and empathise with a lot of people, because I've experienced quite a few things – and quite a lot of these things I come across in my everyday life and in my career.

Keith: What was that like to grow up in Bishop's Castle?

Hope: I really enjoyed growing up in Bishop's Castle. Not many people would think that you'd enjoy being out in such a rural place, but that's what made it special. We always played out in the countryside. There was a big group of us all around the same age and we all got on. Everyone's family sort of felt like your family. You knew everyone's mums and sisters and brothers and aunties and uncles – you'd stay at different people's houses. There'd be a lot of festivals and things that we could get involved with.

I personally didn't have much difficulty with coming out of the rural headspace and rural scene because of the nature of the other side of my background, which has been a bit nomadic. I was well travelled, so being in a rural town never really fazed me as I got to experience all these other places around the UK and abroad. But I know that for a lot of the people I grew up with, travel was a big thing and not being able to utilise the resources that the UK can offer, because of their inability to be able to travel.

We don't really have much resource given to us here in Bishop's Castle. When I grew up it was very limited with the amount of opportunity that you could get as a youth. There weren't really any youth clubs. There weren't

any of the things you could get in big towns, where you get quite a lot of leisure activities tailored all around. We had a couple of things to keep us going – it was only a few things and as a community, we really had to fight for those things.

Growing up here was lovely because your friends mattered. The connection you made with your friends really mattered, because they were all you had. You couldn't just go and make a new group of friends – there wasn't a new group of friends to make. So you always had to use conflict resolution. You always had to understand yourself a lot more – you always had reflections around you. Also, everyone knows everybody here, so you had to be good growing up here in respect of the reputation of your family, because everyone knows everybody here. You want to do well – you want to do well for your family – you want to be seen as a good person here. Reputation means a lot in the small town that we live in because you're here for so long.

Keith: What did you study after school? Why was that your chosen course?

Hope: So, when I was in school, I didn't do very well. I have dyslexia, which meant that it was really difficult for me to be able to apply myself correctly through my GCSE studies, which is what we did in secondary school. After I left school, I didn't have enough GCSEs to do the original things that I'd like to do. I would have liked to have done more arts and psychology and try to do art therapy, because at the time, I was very much into that. But I didn't have enough qualifications at that point to be able to. So luckily, my path actually was led down to Health and Social Care, as a vocational study, BTEC level 3 extended diploma – and I really enjoyed doing that. It was definitely something that was made for me in the way of being a good experience and getting me to where I needed to be in life.

So the BTEC level 3 Health and Social Care gave me 450 hours of volunteered vocational study, which meant I did placements in a lot of different sectors that focused on different areas of health and social care: from homelessness; to youth referral within homelessness; working with nursery children and also in a care home with people with learning difficulties. I also did an extensive amount of course work. I really enjoyed doing Health and Social Care – I learned so much more about culture, about diversity, about a safeguarding people, how to do the right thing, understanding a lot more about connection, dignity and care.

I also did a Complimentary Therapy course VCTC level 3, because I believe in looking at people holistically. When I was in college, I realised that there was a lot to health and social care, not just medical care and not just basic care standards. I realised that there's a holistic way of looking at people. My complementary therapy focuses a lot on that aspect. So I do massage, aroma therapy, reflexology, with the hope to progress with other therapies that can help within the holistic model of health.

I then went on to university. I studied a Foundation Degree in Health and Social Care. Because of my dyslexia, I didn't feel like I was able enough to go off to a bigger university lecture hall, so I did a foundation degree, which was also another vocational study, where I was able to do two days of placement in a nurture school for emotionally challenged children and some who were on the autistic spectrum. That was really good. I really got to see what it was like to use holistic teaching and realistic education for children that were emotionally challenged and the difference that it made these children to have this therapeutic care and nurture given to them and how much that allowed for them to make positive future pathways for themselves.

Keith: You've made your home in Bishop's Castle when many young people your age have moved away. What made you want to stay here?

Hope: So with my background and growing up in Bishop's Castle and also knowing lots more about cultures in different ways and lifestyles, I immersed myself quite deeply into the connections I have with people – into spaces and into environments. I've never really wanted to go to a bigger place because I've already been to quite a few big places. I've already been to festivals. I've already been to mass gatherings. I don't need to go into a place that has a lot of resources like a city or a big town. I like living small and local in a stronghold community. I enjoy having a safe

space on this earth where I can come and I know the people, they know me – where they've known me since I was little. I'm safe here. I don't enjoy animosity. I don't enjoy the loneliness of a city. I think that that there's a lack of connection there. I'm quite a tribal person in that sense. I really like the fact that Bishop's Castle has massive sense of tribe. Also, I personally couldn't leave this place because I believe that there's a lot of work to be done here for the next generations that come after me.

I believe in this town and I believe in what it can offer people. It's so creative, it's so flamboyant! It has so many positive things to it. So when I look at staying in Bishop's Castle, I want to create a positive construct for the people in this town, so that they can live a good quality of life – something that I'd find very hard to do in a bigger place. I don't think in a bigger place, my ideas will be listened to, or I would be respected as much as I am here, or that they would get as much motion as what they do here. Because I'm in a small town, I'm able to really apply myself here and things are able to be seen and heard – and I feel very supported. I realised that most of my friends that go away come back later and I don't want to be one of those people to leave this place and come back few years later to watch it just get more derelict, more buildings not being used, less young people, more older people, less carers. I don't want to come back to my town and see it being deteriorated because nobody's put in the effort to keep it strong. So I don't leave and I haven't decided to leave because I want to make this town strong.

Keith: You are now a Social Prescribing Advisor – can you explain what Social Prescribing? What does your job entail?

Hope: So after doing uni I understood a lot more about the environment and determinants of health, and how much determinants of health impact us. This might be psychological, sociological or biological. I realised that in our society, there are lots of people that are going through lots of different things and each one has a determinant of health that they're going through – and it could really change their life in ways that they wouldn't or might be expecting.

I was able to acquire a job as a Social Prescribing Advisor in Shropshire. What we do is we give people time to talk. We offer them action plan, a type of non-clinical prescription that gets them out and about into their community, as well as into different services. I can signpost people to different services, or I can refer them into quality-assured, signed-up interventions. So this might be cookery courses, music clubs, exercise on referral – there are lots of different avenues that I can refer people to.



Figure 1. Hope Robson, Social Prescribing Advisor.
Source: Hope Robson

So, to give you an example, a young adult who has asthma has an inhaler and is coming to the pharmacy too often to get a prescription. They have been having panic attacks and anxiety attacks and are using the inhaler. They didn't realise that asthma attacks and anxiety attacks are two different things. Social prescribing can support them through this understanding of that determinant of health, which was that they have this biological condition of asthma and they have prescription medication to be able to help with that, but they are abusing their prescription medication and using it for another type of concern; the other concern, anxiety, can be worked on and aided. A doctor can refer them to social prescribing so that they can get support. We could speak about anxiety and

different services and different pathways that they could be referred to, that would maybe help them understand their anxiety better.

After setting up a pathway, a few months of talking, and a few interventions with the counsellor, a few workshop style things in the community or on the internet, a meditation app, etc., this young adult may start to understand their anxiety a lot more and feel supported through this transition.

In a good case they won't need their inhaler as they now understand the difference between a panic attack and asthma attack and they understand themselves better. We could then work on how we get them from being anxious and not being able to do things day to day, to how to progress into doing something that they are interested in. We'd hope to build their confidence back by understanding their conditions more and be able to make their future pathways. It is about self-empowerment and positive choices.

So that's what Social Prescribing is really about. It's being able to pick up people that have determinants of health and trying to address what their needs might be to make sure that they don't have future health concerns, when we could have done some early intervention, to be able to help them through these determinants of health.

Keith: You have been working with New Zealand year 3 nursing students for the past 2 years using the 'CHASE model'. How was this experience?

Hope: I've been working with New Zealand student nurses for a few years now and it's been a really good experience. Being a Health and Social Care practitioner, I really enjoy what the nurses have to offer. Also being part of the holistic health ethos and understanding that there's a lot more to health than just the medicine and just looking at people biologically, the nurse's project gives me a sense of inspiration. I really enjoy what they look at, how they look at it and why they look at it; why health comes about and how they can help with people's health. I really enjoy the fact that they look at the geographical area and look at lots of people within that – not just one or two people, because I feel that health is also a societal thing. Within that holistic ethos it's everybody's business to have a healthy society and everybody has a role to play in having a healthy society. There are a lot of factors that make a healthy society and lots of factors that makes a healthy person.

So with the nurses and what they do, I can see how they're trying to empower people, to show them that they have a role in health and that they can make their health better as well as their communities. It also helps someone like me that lives in a rural place where we don't have much resource and we don't have many people looking in on us, to have the nurses look at our town and give us statistics and evidence to back our ideas up. We're able to have credited information which we can apply and help us with our future development projects. So being part of this project has meant so much to me. I've been able to get myself heard and listened to. It's just been such a pleasure working alongside a group of younger adults on the other side of the world.

Keith: You're applying your expertise to help build a Community Hub for Bishop's Castle. What gave you the idea for this?

Hope: So, I have started to try to build a Community Hub in Bishop's Castle – and when I say Community Hub and Bishop's castle, I'm not just talking about a place where you go and it's a nice area – you know, like a typical Community Hub. I'm talking about something that's quite diverse in the way that it approaches people. I want everybody to feel accepted, welcomed and respected when they come into the Hub.

So I decided to come up with the Hub idea because I have worked in so many different sectors, so many different job roles and so many different areas each with a different ethos: the nurture school and how they work to educate; the homeless shelter and how they help with psychological and physiological needs; the youth referral and how they work to try and get these kids back into understanding how to live independently to the nursery, and understanding how nursery kids are taught in forest schools and things like that.

All of my experiences from the age of 16 to my age now, which is 23, I've looked at different services and realised that there's no joined-up situations and I think that's really the very basic mono level. I want to try and make a service that's going to harness the community's talents and potential, in all sense – not just one type of way of being or one type of ethos. I would like to be able to create a hub that's going to expand the community's talents, entrepreneurial skill and skill-set, as well as connect them, as well as highlight all the different projects, and different head-spaces and ideas that the community do have, as well as give traffic to the ones that already exist. All the different projects already exist – I want to be able to make them stronger. I think creating the Community Hub will do that.



Figure 2. Community Hub Project. Source: Hope Robson

Keith: Can you describe what the Hub might look like?

Hope: The Hub we want is a facility where you'd 'walk in, talk to us and we connect you into your community'. We'd like it to be quite central hub, then you come in and we have lots of different things to offer; we call them micro-hubs in the community – already established parts of the community that are happening, that people can get involved with. And if there aren't already established parts, micro-hubs that they enjoy then creating micro-hubs that people enjoy, so that we can keep people's talents alive. So that we can keep people merging, connecting, learning and passing down skills. So these micro-hubs will range from all different things, from construction to art and design, to events management, and helping with events management.

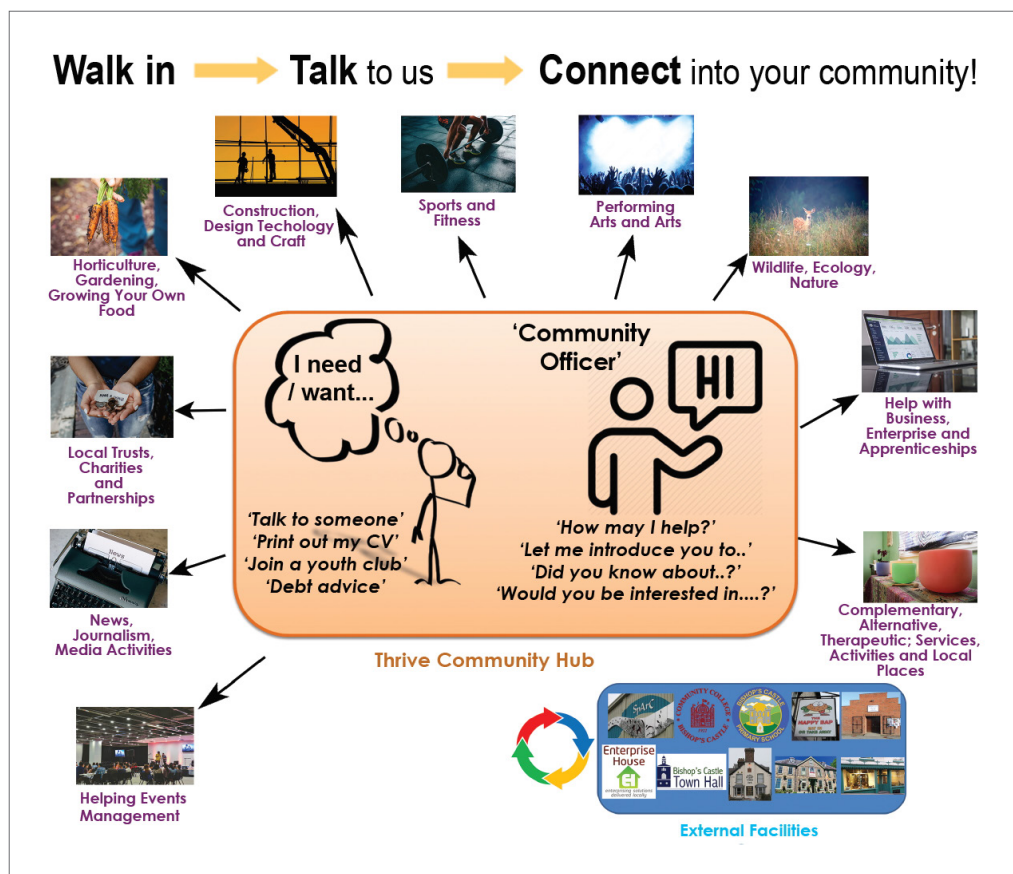


Figure 3. Hub Diagram. Source: Hope Robson

Keith: What drives you to want to help others like you do?

Hope: What drives me is the sense of achievement that I get when I watch, see, feel, or hear that the intervention that I've been able to give through my understanding has made a positive impact on one person, or two people or a family or community. I think the real sense of why I want to help is because I want to make people feel like life's worth living – that they can have a good quality of life – that there are little tips and secrets in life that can get you through. I've experienced a lot in my life, and I can understand and empathise with a lot of things. This makes me want to be able to help people. If I can help them, why wouldn't I? *If I could apply my time to help people when I know that I can help them and that it could work – why wouldn't I?* That's the question. I always ask, 'why wouldn't you just do that'?

I think I'm quite a selfless person when it comes to something like that. If it was up to me, I would just be doing all of this behind the scenes, without anybody really knowing that is me doing it – because it's not about me – it's about the people that I'm helping. But luckily for me, I actually have people around me that respect me and want

to hear about my ideas and that want to interview me and listen to what I have to say. So that most of the stuff that I do isn't just behind the scenes, or no one knows that it's me. But yeah, is a quite a daunting experience and I know that I'm quite a big role model for a lot of people in my area. I just want to be able to give them the best quality of life that I can and I hope that the Hub idea can achieve that.

Bishop's Castle breeds people with big hearts and it breeds people with big minds. It breeds people that have amazing creative abilities – and I'd never want that to die.

Hope Robson is a Social Prescribing Advisor with Shropshire Council. She grew up and still lives in Bishop's Castle, a small and remote town in the Shropshire Hills, UK. Hope studied as a Health and Social Care practitioner and has a strong desire to improve the health and wellbeing of her community.

Correspondence to: Hope Robson. Email: Hope.Community101@outlook.com

Coronavirus instigated a global pandemic. Unprecedented public health measures mitigated its deadly trajectory, but how did collaboration within the research community lend support?

CRACKING THE COVID-19 CODE: CUTTING-EDGE COLLABORATION

Marianne Cherrington, Ihaka Dunn and David Airehrour

PREAMBLE

This paper was completed Easter Weekend, 2020 in Lockdown level 4. Looking back at that surreal 'moment in time', lockdown islands, burst bubbles and feelings of isolation have followed. Shifts in mindset are needed, and collaboration has been a means of survival, sustenance, support and sustainability. It is astounding how diverse the Covid-19 response has been in different countries and how the 'facts' have been interpreted. Research, data and facts should be a basis for making informed decisions; a vibrant research community is key. As we open and close our island nation with travel bubbles, it is worth thinking about healthy collaboration, but also reflecting on our well-being and the connectedness that makes us human. The answer is Connection.

No man is an island entire of itself; every man
is a piece of the continent, a part of the main.

MEDITATION XVII, Devotions upon Emergent Occasions. John Donne

INTRODUCTION

The pandemic created by Coronavirus (SARS-CoV-2) sent shockwaves worldwide, first for humanity and then for the economy. By mid-April, 2020, it was possible to pause and reflect on new realities, and imagine what might lay ahead. Cutting-edge data techniques were employed to identify, track and control COVID-19 and collaborative methods in research helped accelerate positive outcomes in many environments. This paper considers typical contributions from published research collaborations in pandemic problem-solving contexts. It hints at some of the problems of data analysis and the diversity of decisions and perspectives that followed.

The emergence of the COVID-19 pandemic caused by a novel Coronavirus (SARS-CoV-2) created research collaborations that may have gone largely unnoticed, but that are remarkable. The war on this 'invisible enemy' brought out the good, and not so good, in people worldwide. This paper takes a look at some of the many published research collaborations that took place up until mid-April, 2020. Most of these research contributions used real clinical data, of many types, to save lives and to make valuable and material contributions that spanned many fields of endeavour.

A COLLABORATIVE CALL TO ARMS

On December 31, 2019, the Chinese government confirmed dozens of cases of a new virus they were monitoring. By 21 January, confirmed cases were reported in Japan, Thailand, South Korea and the United States (Taylor, 2020). The World Health Organisation declared a global health emergency on 30 January, 2020. By that time, the incidence of the virus was continuing to rise and it soon became evident that a global outbreak was imminent (Sohrabi et al, 2020).

For active researchers, the impetus to explore a global pandemic in greater detail is compelling. It is relatively easy to go beyond headlines to hunt for data and facts. Because of the Sars-CoV outbreak in 2002, some peer reviewed papers were revised and immediately published to update the third Coronavirus outbreak to cross species into the human population within two decades (Daga et al., 2019). Even more research and numerous works-in-progress were published and made freely available, often without peer review, in the first few months of this year. Despite impediments in the accessing of accurate data, a flurry of publication was released to assist researchers worldwide, in a supportive response to the growing COVID-19 pandemic.

TRACKING A KILLER

Data issues immediately manifested. Misdiagnosis, data gaps or sparsity and even infodemics hampered analysis. Downplaying the severity of the virus also helped the virus spread from 1 December, 2019, when the first case was reported in the news. Chinese New Year preparations were curtailed to prevent further spread, as worries about asymptomatic COVID-19 carriers intensified (Guan et al., 2020). Strict regulation on population movements ensued.

The use of big data and digital technologies, began to hasten the fight against the virus (Hua & Shaw, 2020). But machine learning is hindered in both parametric and pattern identification due to mitigating factors found in almost every epidemic, such as super-spreader phenomena and tracking complexities (Ndiaye, et al., 2020). This led to the use of intrusive digital tracking technology to gather data then severely restrict movement in the early weeks of 2020 in an attempt to track and corral those infected. Social media sites could be monitored even more closely than normal. Digital footprints were used to monitor and control individuals. Eventually data from Google granular location data maps, routinely used for ad-targeting and commercial strategies, were released and utilised as the pandemic progressed (Koksai, 2020). These efforts help track the virus with greater accuracy, but also expose the access that technology giants have to our digital data and to further raise ongoing privacy concerns.

These days, the spread of epidemics and infection paths are commonly forecasted using bio-inspired metaheuristic simulations. Such swarm intelligence approaches are self-organising and spontaneous. They can also be modified to include the element of mutation in models. These methods can gauge interactions with specificity using a population-based approach to maximise performance while discarding irrelevant data with iterative updates (Cherrington et al., 2019c). In such a way, it is possible to simulate the spread of Coronavirus from patient zero and also model probability of re-infection. Assumptions are both essential and significant in such analyses, but they can modify quickly to new inputs and conditions. They are most accurate as input parameters, including disease statistics, evolve and resolve; this negates the need for subjective initial inputs. After a few iterations, such Coronavirus models can be used effectively in more complex deep learning models with reasonable accuracy. (Martínez-Álvarez, et al., 2020).

Of course, the pandemic expressed itself differently in numerous countries. Many researchers relied on the initial scholarship and information from China, to improve on Coronavirus intelligence. With Italy and Spain in the midst of unbelievable tragedy, researchers in those countries also scrambled to use swarm intelligence models to fine-tune parameters, given the idiosyncrasies of externalities and demographics in their regions. Fortunately, the language of mathematics is universal and often systems are transferable (Simón, 2020). This is just one of the reasons that in the research community, international collaboration is necessary, encouraged and rewarded.

IDENTIFYING THE CLUES

Other collaborative methods were impactful. Machine learning techniques were integrated into online platforms, freely available to clinical facilities. Supporting research was made directly available in pre-print format. Research portals were deployed and used in over 50 hospitals in Wuhan. As specialist skills were in high-demand, the accuracy of imaging classification techniques using improved visualisation methods became vital tools for COVID-19 screening and evaluation processes (Shi et al., 2020).

The sheer size and speed of the Coronavirus disease overseas prompted the development of deep learning models that were fully automated and that could support beleaguered hospitals. Multi-centred case studies were undertaken using diagnostic tomography and radiography images to automate classification of patient results. Visual scanning techniques have improved vastly in recent years; with high accuracy levels, such techniques are more precise than exhausted healthcare professionals could achieve realistically. It is worth noting too, that when full personal protective equipment is available and utilised, it is restrictive, cumbersome and fatiguing; teams of nurses must work together to ensure critical care patients in ICU receive intensive treatment. When automated techniques are used, they free highly trained medical staff for more specialised care (Xu, et al., 2020). Robotics were used in less intensive settings, for tasks such as disinfecting surfaces and to support medical staff (Peng, J., et al., 2020).

Patient data is especially valuable when assessing behaviour of the virus, treatment efficacy and probable progress of those infected. To support these assessments, patient data was coded and was often made accessible for researchers worldwide. For example, clinical features of patients were analysed and the results were published in the Lancet in January, along with de-identified data, which were made freely available (Huang, et al., 2020).

NEXT MOVE, FAST MOVE

Whether predicting the behaviour of the virus or encouraging informed behaviour in the population, machine learning automation methods are popular. Focusing attention on the vital few features of importance is a selection issue in data analysis that eliminates irrelevant and redundant attributes to simplify learning and improve accuracy (Cherrington et al., 2019f). By the time patients were being screened using electronic records in Tongji Hospital from January 10th to February 18th, 2020, XGBoost machine learning algorithms were forecasting risk of death from only three features using a flowchart of patient enrolment. The accuracy of the model helped hospital doctors with early identification and intervention, to reduce the probability of mortality (Yan et al., 2020). They also helped detect the early progression of symptoms to more ominous warning signs such as pneumonia which required more intensive care and specialised resources (Gong et al., 2020). These methods were able to similarly close the gaps between process times from testing, to confirmation and treatment, which improved recovery prospects.

Classification of the genome sequences can be used to design new primers for detection of the virus using deep learning and viromics. High throughput techniques were used to understand the mechanisms of the virus at a molecular level, and notably, they were soon used to hasten testing regimes and confirmation of those infected with the virus. As the virus took hold, these techniques were quickly deployed to support the fight against the Coronavirus. The collaboration used to ensure automated techniques were trained deftly, is truly inspiring; for example, forty authors contributed to 'Artificial intelligence application in COVID-19 diagnosis and prediction' in the Lancet, to employ AI classification using clinical characteristics and laboratory results to rank attributes for diagnosis and triage so as to reduce clinical workloads (Peng, et al., 2020).

It soon became clear to the world, that many countries were overwhelmed by Coronavirus. Heuristic modelling methods that worked well in Hangzhou did not work well in Wuhan. A novel solution to schedule drivers for quarantine vehicles was created with sufficient accuracy for Hangzhou, but was developed using the assumption

that such vehicles and their drivers, were freely available. This was not so in areas deluged by the virus. During the peak period of COVID-19, volunteer drivers were sought and worked tirelessly in Wuhan to transport medical staff through road blocks to hospitals, with high-risk individuals. This put efforts to contain the virus in jeopardy, the exact opposite of the purpose behind the development of the vehicle scheduling model (Zhang et al., 2020).

SIGNIFICANT FEATURES

In Wuhan city and Guangzhou, patients were stratified by risk and severity, using demographic, clinical, and laboratory data. Like SARS-CoV, it became apparent that the elderly and those with underlying health conditions were most at risk. This confirmation was beneficial, but could also lead to nonchalance in young, healthy populations. These techniques developed a better understanding of the basis of the novel virus. It highlighted anomalies in the behaviour of the virus, and verified contributing factors such as hypertension, diabetes, coronary heart disease, chronic respiratory disease, tuberculosis disease. The models could predict with high diagnostic accuracy those patients most likely to progress to severe COVID-19, which yielded superior clinical net benefits (Gong et al., 2020).

Understanding aspects of the huge amounts of data that are generated around COVID-19 can be accomplished with neural networks and deep learning models. They provide scalability for high dimensional data, so that good representations of significant features can be drawn out of high dimensional data and raw inputs. These automatic learning techniques are abstractions that can support inquiry by learning complex functions mapping of systems (Cherrington et al, 2019d). Subsequently, black box systems can divulge hidden insights, detecting unusual occurrences or be used for prediction.

TECHNOLOGY TECHNIQUES

With travel restrictions, friends and families depend on mobile apps and zoom, especially in lockdown or quarantine conditions. As schools close, learning continues online. Society relies on technology to enable our connectedness, social cohesion. It also helps authorities focus on how people are linked (Cherrington et al, 2019a). Using high dimensional data, digital trends and challenges are captured and revealed. Valuable and untapped resources can be discovered. Opportunities and collaborations can be leveraged and be used to deliver new evidence-based information that might otherwise go unnoticed or be unseen, to solve unique or complex problems (Cherrington et al, 2019e). Data technologies are invaluable in pandemics; they are more reliable than memory when back solving social contacts of fatigued hospitalised Coronavirus patients.

Mobile phones can be employed as one of the most commonly available, accessible and cheap tools for patient monitoring, health surveying, epidemiological surveillance and public health awareness (Madanian et al. 2019). For countries expecting travellers to self-isolate or quarantine, amplifying the probability of adhering to protocols is crucial. Identifying factors associated with adherence is important and mobile phones can be used as tools to encourage positive behaviours (Webster et al., 2020). Mobile phones can be tools that support whole communities to fight a pandemic and also be employed for emergency response services and alerts. This form of cooperative, collaborative approach is beneficial.

Moving ahead of Coronavirus disease is essential. Using Google search data in the private subscription Google Health Trends API, daily query frequencies were used to monitor the prevalence of the disease with good results. This method was sought, because data accuracy was an issue with the emerging COVID-19 pandemic; training using unsupervised, or semi-supervised machine learning and data smoothing techniques were used and regular updates were made available (Lampos, et al., 2020). Social media and communications applications can classify or cluster information that is rapidly changing, made especially difficult with mixed media content and semantic nuance (Cherrington et al, 2019b). Critical investigation of social media sites such as Weibo were used to disseminate

information using natural language analysis to classify situational information (Li et al., 2020). Tweets were analysed to support the implementation of disease control measures, to gauge attitudes towards preventative measures and guide ongoing public communications (Alhajji, et al., 2020).

COMPETITIVE RIVALRY

Of course, not all COVID-19 related progress will arise out of collaboration. Finding a vaccine will prove a lucrative proposition for those with a first mover advantage. Antiviral treatments are already being used in hospitals, even without rigorous testing regimes. Partnerships with big pharma and tech giants are leveraging quick solutions to market. (Turner, 2020). This is another economic reality of the pandemic; access to treatment is not universal. This has flow on effects: with the Coronavirus re-focus, research and clinical trials for other diseases are on hold.

Competition can be just as productive as collaboration; they are both necessary to drive innovation forward.

FUTURE IMPLICATIONS – HE WAKA EKE NOA

'He waka eke noa' is a whakataukī (Māori proverb) that reminds us we are all in this together, that we rise or fall as one. Decisions made in the effort to save lives, are now tipping in favour of decisions concerning economic recovery. Economic decisions based on data and facts will always be better than mere guesses, especially in times of unparalleled turbulence and upheaval. The techniques used to crack the COVID-19 code can be used to navigate shifts in economic data as well. Data sharing, privacy and ethical concerns are issues that we will continue to grapple with as machine learning and AI become more pervasive.

There has been an outpouring of collaborative research to improve our understanding of the structure and expression of this novel Coronavirus. Data analysis and machine learning have been used to find the features most likely to predict diagnosis and prognosis as well as to underpin artificial intelligence and deep learning models that automate and hasten decisions and delivery of countless needed supplies and resources. Novel methods of tracking COVID-19 supported tough life-and-death decisions. From patient data to mining social media, quantitative and qualitative research in many fields is a basis for turning data into information and into knowledge for better decision-making (Cherrington et al, 2020). The sharing of information and collaboration through networks of individuals, agencies, organisations and leaders proved critical to outcomes in this pandemic and will continue to be critical in our recovery phase.

A collaborative research community will continue to play a vital role in providing data that is informative, predictive and that can be used to leverage and improve outcomes. But there is still a huge amount of private wealth and talent that lies waiting to be tapped into, to improve economic and social realities, post-COVID-19. (O'Sullivan, 2020, p. 2). The tourism industry is currently decimated as well as those small businesses that depend on it; there is no timeframe for when the lucrative international tourism markets will reopen. Some service businesses will never reopen their doors. There will be new challenges and opportunities that result in new ways of working.

New Zealand, as an example, managed the 'human cost' of the pandemic well, but cannot go to level one lockdown status by the end of April in order to ramp up the economy; unlike other countries, New Zealanders have virtually zero immunity to COVID-19. Former Prime Minister, Bill English said "New Zealand now has zero net migration, zero tourists, zero foreign students and zero inflow of temporary workers. These flows, which have been drivers of the labour market and the housing market, won't just turn on again" (Rutherford, 2020, p. C1). Tourism, and the myriad of small businesses which depend on tourists, will be difficult to resurrect immediately. But the lucrative international student market could be attracted to New Zealand as a safe haven from the virus, even if quarantine restrictions are not immediately lifted, with the longer-term goal of attaining residency. With the newly instigated New Zealand Institute of Skills and Technology, the government has a vested interest in the polytechnic sector. Fast-tracking international student applications is easy to action.


Everyone is speculating about the likely environment as restrictions lift and the true extent of the economic fallout is evaluated. With an election looming in New Zealand, people will forget about ICU wards and need jobs to pay their mortgage and put food on the table. Voters will “not care about financial markets – it is the real economy that matters” (Rutherford, 2020, p. C1).


Businesses will have to act more sustainably and deliver greater value to be financially self-sustaining in the future. We have been reminded that all resources are precious; they must be employed wisely. What we do at a local and national level truly does have global consequences. Life will inexorably alter. We have seen the magnitude of human inter-connectedness in all its glory and in all of its frailty.


CONCLUSIONS

There is still so much to be done collectively; it is the perfect time to reflect on our values, beliefs and actions. There is still room to leverage outcomes through collaboration in our communities, our nations and worldwide, using our networks and our abilities to grow our spheres of influence. Thankfully, work in the research community is based on sharing, collaboration and contribution; the way forward must continue to be based on wise, informed decisions. Pragmatic decisions should always be based on improving outcomes for society, including economic recovery.

Today is Easter 2020, as apt a day as any to reflect on a pandemic, as well as our lives and contributions on this planet. Collaboration is the act of working together to produce; research is wasted without the intention of improving the health and wellbeing of our world in some way. Research is not just meant for publication; research is meant to build knowledge, to foster understanding and to make a tangible difference in the lives of others. We need more pragmatic, collaborative research. COVID-19 has been a clarion call.

Marianne Cherrington  <https://orcid.org/0000-0002-1240-2010> is a senior lecturer at Otago Polytechnic Ltd, Auckland International Campus in disruptive and technological innovation using sustainability perspectives and Māori worldviews. PhD research into feature selection and machine learning algorithms has application in many fields and produces interesting collaborations and research projects within New Zealand and overseas.

Ihaka Dunn  <https://orcid.org/0000-0002-7820-5474> majored in physiotherapy and is completing a bachelor in medicine and surgery. He was key researcher for the paper community-based physical activity programmes for culturally linguistically diverse older adults: a systematic review, in the Australasian Journal of Ageing. Research interests include indigenous health and inequities, and Māori health.

Dr David Airehrour  <https://orcid.org/0000-0002-4701-1351> is a UNITEC lecturer and PBRF-ranked researcher in computer and information sciences. Active in many professional bodies, he has industry certifications in information systems, information technologies and information security. His research interests include big data analytics, green informatics, health informatics, IoT, trust and reputation management systems.

Correspondence to: Marianne Cherrington, Otago Polytechnic | Te Kura Matatini ki Otago, Forth Street, Private Bag 1910, Dunedin 9054, New Zealand. Email: Marianne.cherrington@op.ac.nz

REFERENCES

- Alhajji, M., Al Khalifah, A., Aljubran, M., & Alkhalifah, M. (2020). Sentiment Analysis of Tweets in Saudi Arabia Regarding Governmental Preventive Measures to Contain COVID-19.
- Al-qaness, M. A., Ewees, A. A., Fan, H., & Abd El Aziz, M. (2020). Optimization method for forecasting confirmed cases of COVID-19 in China. *Journal of Clinical Medicine*, 9(3), 674.
- Cherrington, M., Airehrour, D., Lu, J., Xu, Q., Wade, S. and Madanian, S. (2019a) "Feature Selection Methods for Linked Data Limitations, Capabilities and Potentials," in proc. 2019 IEEE/ACM 6th Int. Conf. on Big Data Computing App and Tech.
- Cherrington, M., Lu, J., Airehrour, D., Thabtah, F., Xu, Q., and Madanian, S. (2019b) "Feature Selection: Multi-source and Multi-view Data Limitations, Capabilities and Potentials," in proc. 29th Int. Telecom Networks and Applications Conference.
- Cherrington, M., Lu, J., Airehrour, D., Thabtah, F., Xu, Q., and Madanian, S., (2019c) "Particle Swarm Optimization for Feature Selection: A Review of Filter-based Classification to Identify Challenges and Opportunities," in proc. of IEEE IEMCON.
- Cherrington, M., Lu, Z., Xu, Q., Airehrour, D., Madanian, S., Dyrkacz, A., (2019d) "Deep Learning Decision Support for Sustainable Asset Management," In *32nd Int. Conf. on Condition Monitoring and Diagnostic Engineering Management*.
- Cherrington, M., Lu, Z., Xu, Q., Thabtah, F., Airehrour, D., & Madanian, S. (2019e) Digital asset management: new opportunities from high dimensional data—a New Zealand perspective. In *32nd International Conference on Condition Monitoring and Diagnostic Engineering Management (COMADEM 2019)*.
- Cherrington, M., Thabtah, F., Lu, J., & Xu, Q. (2019f). Feature Selection: Filter Methods Performance Challenges. In *2019 International Conference on Computer and Information Sciences (ICIS)* (pp. 1–4). IEEE.
- Cherrington, M., Airehrour, D., Lu, J., Cherrington, M. P., Cameron-Brown, D., Stokes, A., (2020) (in press). Features of future organisations and successful learning models in a climate of change. 2020 ITP Research symposium.
- Daga, M. K., Kumar, N., Aarthi, J., Mawari, G., Garg, S., & Rohatgi, I. (2019). From SARS-CoV to Coronavirus Disease 2019 (COVID-19)—A Brief Review. *Journal of Advanced Research in Medicine (E-ISSN: 2349-7181 & P-ISSN: 2394-7047)*, 6(4).
- Gong, J., Ou, J., Qiu, X., Jie, Y., Chen, Y., Yuan, L., ... & Shi, Y. (2020). A Tool to Early Predict Severe 2019-Novel Coronavirus Pneumonia (COVID-19): A Multicenter Study using the Risk Nomogram in Wuhan and Guangdong, China. medRxiv.
- Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Du, B. (2020). Clinical characteristics of Coronavirus disease 2019 in China. *New England Journal of Medicine*, 382(18), pp.1708–1720.
- Hua, J., & Shaw, R. (2020). Corona Virus (COVID-19) "Infodemic" and Emerging Issues through a Data Lens: The Case of China. *International Journal of Environmental Research and Public Health*, 17(7), 2309.
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., ... & Cheng, Z. (2020). Clinical features of patients infected with 2019 novel Coronavirus in Wuhan, China. *The Lancet*, 395(10223), 497–506.
- Koksal, I. (2020, April 7). Google Starts to Publish Coronavirus Mobility Reports. *Forbes magazine*. Retrieved from: www.forbes.com/sites/ilkerkoksal/2020/04/07/google-starts-to-publish-coronavirus-mobility-reports/?sh=6406cafl15a3
- Lamos, V., Moura, S., Yom-Tov, E., Cox, I. J., McKendry, R., & Edelstein, M. (2020). Tracking COVID-19 using online search. *arXiv preprint arXiv:2003.08086*.
- Li, L., Zhang, Q., Wang, X., Zhang, J., Wang, T., Gao, T. L., ... & Wang, F. Y. (2020). Characterizing the Propagation of Situational Information in Social Media During COVID-19 Epidemic: A Case Study on Weibo. *IEEE Trans. on Comp. Social Systems*.
- Madanian, S., Parry, D. T., Airehrour, D., & Cherrington, M. (2019). mHealth and big-data integration: promises for healthcare system in India. *BMJ health & care informatics*, 26(1).
- Martínez-Álvarez, F., Asencio-Cortés, G., Torres, J. F., Gutiérrez-Avilés, D., Melgar-García, L., Pérez-Chacón, R., ... & Troncoso, A. (2020). Coronavirus Optimization Algorithm: A bioinspired metaheuristic based on the COVID-19 propagation model. *arXiv preprint arXiv:2003.13633*.
- Ndiaye, B. M., Tendeng, L., & Seck, D. (2020). Analysis of the COVID-19 pandemic by SIR model and machine learning technics for forecasting. *arXiv preprint arXiv:2004.01574*.
- O'Sullivan, F. (2020, April 11). Rich Listers: Your country needs you – now. *The New Zealand Herald*, p. C2.
- Peng, J., Ren, N., Wang, M., & Zhang, G. (2020). Practical experiences and suggestions for the 'eagle-eyed observer': a novel promising role for controlling nosocomial infection in the COVID-19 outbreak. *Journal of Hospital Infection*. 05(1), 106–107.
- Peng, M., Yang, J., Shi, Q., Ying, L., Zhu, H., Zhu, G., ... & Yan, H. (2020). Artificial Intelligence Application in COVID-19 Diagnosis and Prediction. Preprints with The Lancet. Available at SSRN: <https://dx.doi.org/10.2139/ssrn.3541119>
- Rutherford, H. (2020, April 11). This will be a long haul. *The New Zealand Herald*, p. C1.
- Shi, F., Xia, L., Shan, F., Wu, D., Wei, Y., Yuan, H., ... & Shen, D. (2020). Large-Scale Screening of COVID-19 from Community Acquired Pneumonia using Infection Size-Aware Classification. *arXiv preprint arXiv:2003.09860*.

- Simón, C. B., Cortés, J. C., Navarro, E. L., Martínez-Rodríguez, D., Martínez-Rodríguez, P., Julián, R. S., & Villanueva, R. J. Modelo para el estudio de la dinámica de transmisión del SARS-COV-2 y la enfermedad del COVID19. Descripción técnica.
- Sohrabi, C., Alsafi, Z., O'Neill, N., Khan, M., Kerwan, A., Al-Jabir, A., ... & Agha, R. (2020). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *International journal of surgery*, 76, 71–76.
- Taylor, D. B. (2020, April 7). A Timeline of the Coronavirus Pandemic. The Coronavirus Outbreak. *The New York Times*. <https://www.nytimes.com/article/Coronavirus-timeline.html>
- Turner, M. (2020, April 12). *The race to find a Coronavirus vaccine, startups to watch, and a real estate meltdown*. Business Insider: Australia. <https://www.businessinsider.com.au/top-business-stories-this-week-Coronavirus-vaccine-startups-real-estate-2020-4?r=US&IR=T>
- Webster, R. K., Brooks, S. K., Smith, L. E., Woodland, L., Wessely, S., & Rubin, G. J. (2020). How to improve adherence with quarantine: Rapid review of the evidence. *Public Health*, 182, 163–169.
- Xu, X., Jiang, X., Ma, C., Du, P., Li, X., Lv, S., ... & Li, Y. (2020). Deep learning system to screen Coronavirus disease 2019 pneumonia. *arXiv preprint arXiv:2002.09334*.
- Yan, L., Zhang, H. T., Xiao, Y., Wang, M., Sun, C., Liang, J., ... & Tang, X. (2020). Prediction of criticality in patients with severe Covid-19 infection using three clinical features: a machine learning-based prognostic model with clinical data in Wuhan. *medRxiv*.
- Zhang, M. X., Yan, H. F., Wu, J. Y., & Zheng, Y. J. (2020). Quarantine Vehicle Scheduling for Transferring High-Risk Individuals in Epidemic Areas. *International Journal of Environmental Research and Public Health*, 17(7), 2275.

ISLAND LIFE: A REFLECTION DURING THE COVID-19 PANDEMIC

Alun Roberts

Islands. There's something about them. The fact that you're surrounded by water has a subconscious effect on you. You feel part of a close-knit community, all living in a limited space where the sea can play a major role in what you do and how you think.

Imagine that you live on an island, off an island. Well, that's Ynys Cybi for you (Cybi's Island or 'Holy Island' as it's better known in English). It is a small island, 15 square miles in size, which lies off the coast of the Isle of Anglesey in North Wales, UK. Anglesey lies off the coast of the UK mainland and is joined by two bridges – the Menai Suspension Bridge and the Britannia Bridge. Holy Island is a stone's throw to Anglesey and a short bridge, and two causeways make that important connection to the big world.

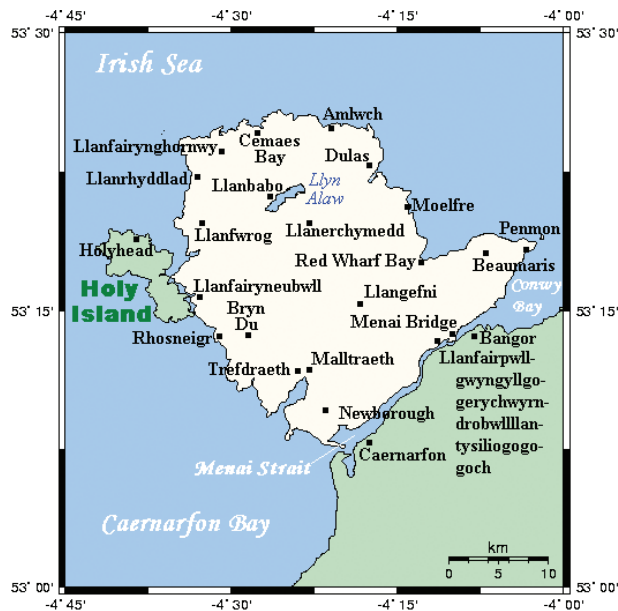


Figure 1. CJ Moss (Kelisi), A map showing the Isle of Anglesey/Ynys Môn and nearby areas.

This map's source is at <http://www.ifm-geomar.de/ifm-geomar/>, with the uploader's modifications, and the GMT homepage says that the tools are released under the GNU General Public License.

GNU Free Documentation License, Version 1.2 licence.

Living on an island does bring that something extra into the way you think and act. There's no doubt that people feel connected to each other. That community spirit which we all crave for is to be found by the bucket load – especially in the port town of Holyhead – which dominates Holy Island. For a town of population of 10,000 it feels more like a village – where everyone knows each other by sight, familial ties or kith or kin, but may not necessarily know each other's names.

That community spirit – felt subconsciously but not always seen – is something which comes to the fore when the chips are down. Disasters which befall individuals in the town are met by an outpouring of people wanting to help. Crowdfunding for funerals, volunteering for a range of organisations, raising money to send young people on summer camps – these are just a few examples of what a real community does for itself.

Whilst there are challenges for all communities dealing with the effects of COVID-19, it is people looking out for each other which enables a pandemic to be tackled head-on and brighter futures experienced as the collective will to survive prevails.

The challenges which COVID-19 has brought to Holy Island have been difficult to face – with the island's tourist trade badly hit as visitors are unable to travel to enjoy the island's beaches and spectacular scenery – that peace and tranquillity which normally provides a retreat from the fast pace of modern life.

This effect of fewer visitors on the economy has been felt alongside the impact on the ability of health professionals to deliver a service during unprecedented times.

The island has three general doctor practices and they have soldiered on in trying times to provide that level of support for patients who are trying to cope with a totally new phenomenon which the COVID-19 pandemic has thrust upon us. The programme of immunisation which started in 2020 has been in full flow for some time and it is remarkable to see such a behemoth of a machine – the UK'S National Health Service – kick-in to full 'military planning mode'. Seeing the regimented line of adults patiently waiting at the local cottage Hospital in Holyhead for their Pfizer jab – sometimes outside in the pouring rain, is a site to behold.

Whilst the town has seen about eight residents succumb to the dreaded virus, we have all come together to look after our friends, neighbours, and often complete strangers. The willingness of people to give their time freely to support food banks, collect and deliver medicines for the isolated and vulnerable and a desire generally to make the best of a bad situation, gives one a warm glow feeling inside.

With restrictions imposed by our Government likely to ease from now on, the sight of cruise ships starting to arrive back in Holyhead port is an indication of some semblance of normality returning. Whilst the cruise ship passengers disembarking and joining buses to tour the local area need to wear their masks, the fact they're here at all is a blessing, an economic blessing. Islands rely heavily on the spending power of tourists and their return is something we all welcome.



Figure 2. Cruise ship travelling through Holyhead harbour. Source: Author

With the school Summer holidays upon us there is that belief that we can see the light at the end of this pandemic tunnel and life will return to normality soon. There is a great deal of hope that children of school age will be able to resume their education in September 2021 without the restrictive controls of mask wearing and self-isolation which has been a curse for both teachers and pupils in the last few months.

Patients who have had surgeries and treatments postponed because of the focus on the pandemic are nervously waiting for news on when they will be seen or treated. The Health Service which has ensured we have been vaccinated is also buckling under the huge increase in hospital waiting lists and this situation will take unprecedented action to rectify. It is in difficult times that you realise the value we place on our health professionals and the demands placed upon their dedication and passion to make a difference in people's lives.

Public houses, restaurants, and hotels are nervously waiting to see if they can cope with the new demands placed upon them and their staff as the tourist season swings into action. Staff are hard to find for the hospitality industry in the United Kingdom now and Holy Island is not immune to this situation. Lockdown has made people think about their lives and for many they have decided to change careers. Many have opted not to work in demanding occupations such as bar and in the hospitality industry. Employers are struggling to recruit staff and have had to increase wages they pay staff to ensure they turn up for work. Interesting times indeed.

Island life goes on apace and people will come to appreciate how resilient they've been in facing these challenging times head-on. We'll all look back at this journey and be thankful that we survived this onslaught on our personal and communal lives.

Alun Roberts, BA Business Administration was brought up in a small seaside village on the west coast of the Isle of Anglesey. He attended the local high school and progressed to higher education at the local university in Bangor. He did a BA degree through the medium of Welsh (which is his first language). His first proper job after university was as the Tourist Information Officer for the local authority in Anglesey. This gave him an excellent grounding and understanding of his home county. After a couple of years, he went into private business running an agency which offered self-catering accommodation within 800 properties on the Isle of Anglesey. Later he moved to work for a company in the construction industry as a commercial sales director before entering the world of supporting people who were struggling to find work. Over the previous 25 years he has been employed by a number of organisations such as Bangor University to utilise his local knowledge to support people into work or to establish new business ventures. He Chairs the only business forum in the county (Holyhead) and is a regular consultee in respect of community and business development in the county.

Correspondence to Alun Roberts. Email: alun@moncf.co.uk

BUGS IN GYMS – NEW ZEALAND ATTITUDES TO INFECTION RISK MANAGEMENT IN A GYM SETTING: A PILOT STUDY

Mary Cooper, Pavitra Dhamja, Elizabeth Youard
and Campbell Macgregor

INTRODUCTION

The spread of infectious microorganisms has been a perennial challenge globally, with an unabated effort continuing to prevent and control infection, reduce additional pressure on health systems and improve health outcomes for communities. Poor hygiene practices, lack of awareness of infection risks, and greater population density, have contributed to the challenge of addressing the spread of infectious diseases, which people's ability to travel long distances in a short amount of time continue to spread. Shared community spaces, including gyms, have been identified as areas which potentially harbour infectious diseases (Núñez-Corrales & Jakobsson, 2020). Traditionally, cleanliness in gym facilities has been maintained to a high standard through education of patrons and staff.

Gyms can be considered 'islands' within the community, with individuals who possess a paid membership attending a physical location during set times. Worldwide, research has reinforced that various gym surfaces harbour microorganisms, including bacteria with the potential to cause disease, such as *Staphylococcus* (Bilung et al., 2018; Mukherjee et al., 2014). Gym users' awareness of infection risk and implementation of strategies to reduce the chance of infection, play an important role in maintaining a healthy gym environment (Meade, 2015). Strategies such as hand hygiene and disinfecting equipment have been recommended to reduce the risk of common skin infections among athletes and sports players (Zinder et al., 2010). With an 'explosion' in gym membership across New Zealand, and overall growth in the \$260 billion health and fitness industry (New Zealand Institute of Health and Fitness, 2021), there is clearly a need for greater awareness of the risk of infection in gyms (Australasian Leisure Management, 2021). Despite being an industry focused on health and wellbeing, gyms may inadvertently be putting users at risk of infection. This pilot study was undertaken in Rotorua, New Zealand, to investigate gym users' awareness of infection risk, and risk prevention behaviours.

This pilot study was conducted prior to the COVID-19 pandemic

BACKGROUND

Health and fitness centres, commonly known as gyms, form a community of people who have each purchased a membership and follow the routines and rules of the gym, defined by the paid membership. Gyms form 'islands' hosting an extended community, with members attending the set location at a set time, looking to become fitter, healthier, and stronger.

The risk of airborne infections like influenza and tuberculosis can be greater in a gym due to a high concentration of users who are exerting greater respiratory effort during intense exercise, in an indoor environment (Andrade

et al., 2018). Andrade et al. point out that this potential risk from airborne diseases can be exacerbated by poorer quality building materials and ventilation systems in gyms.

However, the risk presented by gym equipment has become an area of attention due to its capacity to transmit pathogens. A study examining the microbial profile of a range of gym equipment identified various *Staphylococcus* spp. (species pluralis, aureus or multiple species) as the most common contaminants on all surfaces tested (Mukherjee et al., 2014). In a gym environment, surfaces and equipment exposed to direct skin contact have higher and more diverse bacterial colonies than floors and mats in the same area (Wood et al., 2015). *Staphylococcus aureus* (*S. aureus*), a common, normally occurring skin flora frequently responsible for skin infections, has been found to remain viable and highly transmissible for up to several months on non-porous surfaces (Desai et al., 2011); this would include the surfaces found on gym equipment. Common *S. aureus* skin infections are a concern as they may progress to involve soft tissue to produce cellulitis or life threatening septicemias; they are also implicated in multiple system infections (Lee & Bishop, 2016). In addition, increasing *S. aureus* resistance to common antimicrobial drug therapies presents a challenge in treating infections effectively, increasing risk.

While Methicillin-resistant *Staphylococcus aureus* (MRSA) is commonly associated with hospital settings, of increasing concern is the emergence and rise in the incidence of a variant of this pathogen, community-associated Methicillin resistant *Staphylococcus aureus* (CA-MRSA) which produces infection in healthy people, and which is now said to be reaching epidemic proportions (Cohen, 2008). This notorious superbug is most commonly associated with deprivation and overcrowding (Loewen et al., 2017), but is increasingly emerging in novel areas and now appears more frequently among younger people (Junnala et al., 2020), athletes (Moriya et al., 2020), and those participating in contact sports (Braun & Kahanov, 2018). Studies of the prevalence of CA-MRSA point to a wide variation in its occurrence of between 0.3% and 23.5% among the general population of the Asia-Pacific region (Wong et al., 2018), with the rate in New Zealand increasing from 5.7 to 9.3 cases per 100,000 people over the five-year period from 2007 to 2011 (Williamson et al., 2013).

CA-MRSA is a pathogen of concern, as it has been shown to have higher levels of virulence and 'fitness', i.e. the microorganism has the capacity to flourish, and persist within a human host (Otto, 2013)^P, increasing the risk of infection among those generally involved in health promoting activities.

In a further study, Bilung et al. (2018) found *S. aureus* bacteria isolates on various fitness equipment including back machines, exercise mats, dumbbells and treadmills, with 31 of 42 swabs from fitness equipment testing positive for *S. aureus*. However, there is conflicting evidence concerning the presence of MRSA and Methicillin-sensitive *S. aureus* (MSSA) isolates in the gym environment. One study of community gyms found no evidence of MRSA and MRSS colonisation in 240 cultures of swabs taken from various gym equipment and locations before and after cleaning (Ryan et al., 2011). The authors emphasised that skin-to-skin contact is the most likely source of community transmission of these contaminants, so effective cleaning mechanisms in exercise facilities and users adhering to cleaning protocols, may have contributed towards reducing contamination in these shared environments (Ryan et al., 2011).

To limit contact with bodily fluids including sweat, saliva and contaminants on hands, gym users are actively encouraged to clean equipment after use. Guidance includes using a towel as a barrier between surfaces and the body, not sharing towels or drink bottles, and washing hands before and after a gym session; these protocols are part of the standard guidelines for personal protection in gyms (Health Protection Agency, 2010). While Ryan et al. (2011) point to the potential effectiveness of these measures, there have been no studies to investigate these or other measures to limit infectious disease spread in the gym environment. In their research investigating the healthcare setting, White et al. (2015) found individual strategies to improve standard infection control measures, e.g., hand hygiene, should be used to specifically address healthcare workers' failure to implement protocols due to being distracted by role demands; for gym users this distraction could be their exercise routine. Ryan et al. (2011) suggest that attitude and behaviour may play a role in reducing the risk of contamination in a shared gym setting.

This perspective is shared by White and colleagues (2015) who discuss how intention, as described in the theory of planned behavior (TPB), is the best predictor of an individual's attitude and actions (Ajzen, 1985). This theory can be related to infection control practices. Personal awareness of risk provides an important line of defence against infection and presents an opportunity to adopt preventative and protective measures. However, according to the TPB, as described below, engaging in practices that align with infection risk mitigation in gyms may involve a complex interplay of factors, that could be beyond the control of the individual gym user.

THE THEORY OF PLANNED BEHAVIOUR

The Theory of Planned Behaviour (TPB) first proposed by Ajzen (1985), has been shown to be useful in explaining the uptake of infection prevention and control measures. The theory suggests that an individual's intention to accomplish a behaviour is contingent upon a range of factors associated with their beliefs, ability to have control over an endeavour, and their consideration of the perceptions of others in terms of the importance of carrying out a behaviour (Ajzen, 1985). O'Connor's (2018) representation of this theory indicates that behavioural control plays an important direct role in an individual's behaviour and influences the intention to act, or perform a behavior.

The interplay between individuals' attitudes, the perceptions of others and the level of an individual's perceived control as indicated in the TPB, may help influence users' adoption of infection prevention techniques, and their compliance with infection prevention guidelines, when applied in the gym setting. The mode of transmission of CA-MRSA in a gym occurs via infected users who contaminate surfaces and equipment (CDC 2008). Therefore, promoting primary measures of prevention including educating gym users about infection spread, increasing personal hygiene measures including hand hygiene, and a robust cleaning schedule of building and equipment surfaces, can lessen or eliminate harmful pathogens (Redziniak et al., 2009). Studies have shown that it is possible to remove pathogens in gyms and sporting facilities through processes that support cleaner environments (Montgomery et al., 2010; Ryan et al., 2011). Elba and Ivy (2018) found that signage, and easy access to cleaning equipment, led to an increase in post-use cleaning of gym equipment by users, most noticeably near signs prompting this behaviour. This study highlights that the prevention or reduction of contamination and infection risk in the shared 'island' spaces of gyms is possible when the TPB (Ajzen, 1985) is applied.

THE RESEARCH STUDY: WHAT WERE THE RESEARCH QUESTIONS?

This pilot study was undertaken to explore gym user behaviours relating to infection risk management. The study focused on answering two questions:

1. How aware are local gym users about infection risks in fitness centre settings?
2. What strategies do local gym users implement to reduce the chance of infection in fitness centre settings?

A number of areas were explored in this study; this article will report on the findings of two: gym users' awareness of infection risk and two strategies of the examined, user hand hygiene practices during gym visits and their post-use cleaning of equipment. In this study, gym users' hygiene practices were also considered to relate to the use of a personal towel, and hydration during a gym session.

METHODS

An online cross-sectional opt-in survey of gym users was conducted to gather quantitative data regarding users' beliefs and behaviours concerning infection risk management in the fitness centre setting. The survey questioned respondents to determine their awareness of infection risks, and to find out what strategies users believed would reduce the chance of infection.

The wording of the pilot study questions was developed with the assistance of the Toi-Ohomai Research office staff, who peer reviewed the survey items, providing feedback on the content and complexity of the questionnaire. Ethical approval was provided by the Toi Ohomai Research committee (TRC 2018.060).

The survey was advertised online via social media, and to increase the number of participants in the study, 12 local gyms were asked if they could host recruitment advertisements including posters and flyers to be displayed at their facilities. Eight of the 12 local gyms (67%) agreed to this. Therefore, participants of the study were gym users based in Rotorua and surrounding areas. Non-probability sampling (convenience sampling) was used to recruit participants. The study surveyed participants who were at least 18 years old and held a paid gym membership.

Google Forms, a free online survey website, was used to administer the survey. The front page of the survey contained an information sheet and statements about informed consent. Therefore, participants were required to complete the consent page before progressing to the actual survey questions.

The first section of the survey collected participant demographics and then asked three questions probing gym use, routines and regularity of attendance. The second part of the survey consisted of an eight-item questionnaire; items were based on a four-point Likert-type scale with accompanying subscales of between two and four items probing general knowledge of infection risk and understanding of infection control strategies. All questions were analysed using *Microsoft Excel*.

RESULTS

Convenience sampling recruited 55 participants aged 18 years or older from Rotorua and the surrounding areas, online and via the advertising on display in eight gyms. The majority of participants (80%) were aged between 18 and 44 years (Table 1), with more females than males responding to the survey (Table 2).

Table 1. Survey Participants by Age Group

Age Range	<i>n</i>	Percentage
18-24	9	16%
25-34	24	44%
35-44	11	20%
45-54	6	11%
55-64	4	7%
65+	1	2%
TOTAL	55	100%

Table 2. Survey Participants by Gender

Gender	<i>n</i>	Percentage
Male	21	38%
Female	34	62%
TOTAL	55	100%

Gym Activities Among Participants

All participants were active gym users, with 71% attending the gym three or more times a week. The most popular gym activities among participants were cardiovascular exercises (76%) followed by weight and resistance training (58%) with fewer undertaking class or group-based routines (24%). Many of the participants in this sample maintained a varied programme while visiting the gym with over half the respondents (56.4%) completing more than one activity; of these 47.3% engaged in two areas of exercise or training and 9% engaged in three or more activities.

Table 3. Participants by Type of Gym Use

Gym Activity Participation	Percentage
Cardiovascular exercise	76%
Weight/resistance training	58%
Class/group routines	25%
Other	6%

Awareness of Infection Risk in the Gym

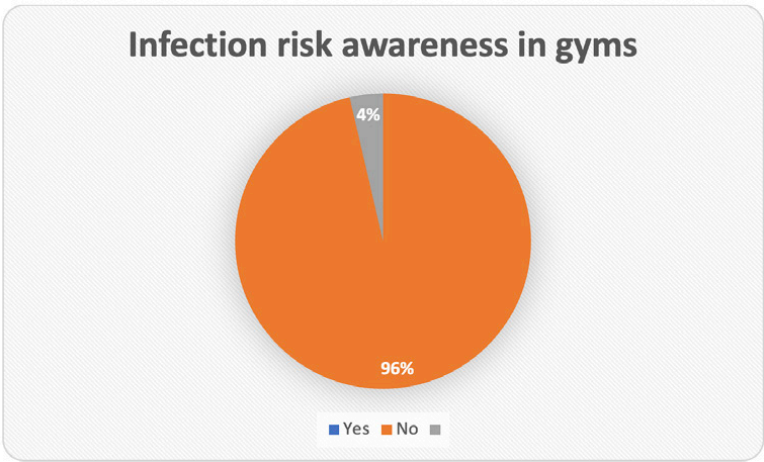


Figure 1. Infection Risk Awareness

Participants were asked to report on their awareness of the gym as a potential reservoir of infectious agents which could lead to infection. Surprisingly, 97% of survey respondents (Figure 1) demonstrated awareness that gyms can harbour contaminants which can act as a source of infection. The survey did not explore factors that may have influenced their understanding and awareness, consequently it is not clear why this group was so aware of the potential risk of infection. Level of education and age (less than 40 years) are shown to be two key factors influencing health literacy; health literacy and prior knowledge are, in turn, identified as determinants of health behaviour (Sun et al., 2013). While the educational background of participants was not explored, 80% of participants were 44 years or younger; hence age may be related to increased infection awareness in this study.

Hand Hygiene

The study was undertaken prior to the global Covid-19 pandemic, when hand washing received less attention and hand sanitiser use in public areas was not as apparent, nor were these widely promoted as public health measures. In the survey, 'hand washing' was used as a generic and familiar term in items which aimed to establish hand hygiene practices among the gym users. Participants in this pilot study appeared to demonstrate good adherence to recommended hand hygiene practice guidelines for gym users (Dalton et al., 2020). Users were more conscious of their hand hygiene practice while in the gym, with 32% reporting they were 'always' and 60% 'sometimes' compliant with the practice (Figure 2). However, the results show there is room for improvement, with few participants using hand hygiene as a protective mechanism. Good hand hygiene prior to and after gym use reduces microbial colonisation of areas and avoids transmission of contaminants into the community. In the 'COVID-19' era, public awareness of the importance of hand hygiene has increased, as has the availability of hand sanitiser, including users carrying their own, so if this study was to be carried out now, the survey may produce different results.

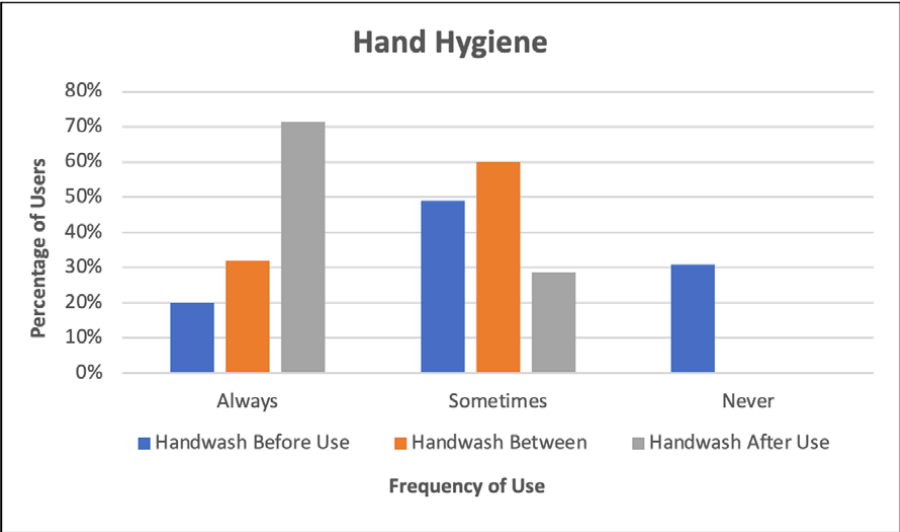


Figure 2. Hand Hygiene Practices Among Gym Users

When comparing hand hygiene practice among male and female gym user groups, the study found that female users tended to be more diligent with their hand hygiene practice before and during gym use, and less likely to avoid cleaning their hands when actively involved at the gym compared with male gym users. Female gym users did report a tendency to ignore hand hygiene when leaving the gym, however this difference was not statistically significant (Table 4).

Table 4. Hand Hygiene Practice by Occasion and Gender

Before			
	Always n (Percentage)	Sometimes n (Percentage)	Never n (Percentage)
Male	3 (14.3%)	10 (47.6%)	8 (38.1%)
Female	8 (23.5%)	17 (50%)	9 (26.5%)
Between			
Male	3 (14.3%)	5 (23.8%)	13 (61.9%)
Female	5 (14.7%)	10 (31.3%) *	17 (50%)
After			
Male	13 (61.9%)	4 (19.1%)	1 (4.8%)
Female	22 (64.7%)	10 (29.4%)	5 (14.7%)

* Two did not respond, % has been calculated based on 32/ 34 respondents

When comparing the overall hand hygiene practices (always and sometimes) reported by gym users by gender (within group comparison) females' use of hand hygiene (73.5%) exceeded that of males on each occasion of use; (Before: 61.9%, Between: 34.41% and After: 51.41%, within group comparison), as depicted in Table 5.

Table 5. Overall Hand Hygiene Practice by Gender

Hand Hygiene Practice: Always and Sometimes; Before, Between and After, by Gender		
	Before %	Total Participants %
Male	61.90% (n=21)	23.64% (n=55)
Female	73.53% (n=34)	45.45% (n=55)
	Between %	Total Participants %
Male	26.81% (n=21)	12.09 (n=55)
Female*	34.41% (n=32)	23.87 (n=53)
	After %	Total Participants %
Male	32.05% (n=21)	20.27 (n=55)
Female	51.41% (n=34)	40.18 (n=55)

* Two female participants did not respond, % has been calculated based on 53/55 respondents

However, when a chi-square test of independence was undertaken to investigate the relationship between gender and hand hygiene before and after gym use, a different pattern was revealed. The relationship between the gender and hand hygiene variables was shown to be significant: males $\chi^2 (1, n = 20) = 14.1186, p = < .001, (.000859), p < .05$, compared with females $\chi^2 (1, n = 33) = 4.9126, p = > .05, (.085753), p < .05$. Therefore, males undertook hand hygiene practices after gym use significantly more often than females.

Table 6. Overall Combined Hand Hygiene Practice by Users by Occasion

Totals	Always <i>n</i>	Sometimes <i>n</i>	Total Combined (Always & Sometimes) %
Before	11	27	60.1
Between	8	15	35.3
After	35	14	60.5

The overall analysis of gym users' hand hygiene practices before, during, and after gym use, shows that over half of all users made some effort to complete hand hygiene before (60.1%) and after (60.5%). Participants showed less awareness of hand hygiene while moving between equipment or changing routines.

Table 7. Hand Hygiene Practice by Age Group

Before			
	Always <i>n</i> (Percentage)	Sometimes <i>n</i> (Percentage)	Never <i>n</i> (Percentage)
18-24	3 (33.3%)	4 (44.4%)	2 (22.2%)
25-34	4 (16.7%)	14 (58.3%)	6 (25%)
35-44	2 (18.2%)	5 (45.5%)	4 (36.4%)
45-54	2 (33.3%)	3 (50%)	1 (16.7%)
55-64	0	1 (25%)	3 (75%)
65+	0	0	1 (100%)
Between			
18-24	3 (33.3%)	2 (22.2%)	4 (44.4%)
25-34*	3 (13%)	8 (34.8%)	12 (52.2%)
35-44**	0	4 (40%)	6 (60%)
45-54	1 (16.7%)	1 (16.7%)	4 (66.7%)
55-64	1 (25%)	0	3 (75%)
65+	0	0	1 (100%)
After			
18-24	8 (88.9%)	0	1 (11.1%)
25-34	12 (50%)	9 (37.5%)	3 (12.3%)
35-44	8 (72.7%)	3 (27.3%)	0
45-54	5 (83.3%)	0	1 (16.7%)
55-64	2 (50%)	1 (25%)	1 (25%)
65+	0	1 (100%)	0

* One 25-34-year-old did not respond, % calculated based on 23/24 respondents

** One 34-44-year-old did not respond, % calculated based on 10/11 respondents

An analysis of hand hygiene practice by age was undertaken to identify whether hygiene practices varied during gym attendance across the selected age groups. In this study, more consistent hand hygiene practice (always or sometimes) during gym sessions was observed among those who were somewhat older. However, overall, advancing age is seen to more commonly be associated with the lack of hand hygiene during a gym visit. It remains unclear whether the observed lack of engagement with hand hygiene practices among older users in this study, reflects a lack of awareness of infection-related risks associated with gym use among older people in the pre-COVID-19 environment. Due to the small number of participants in each group, no further analysis to evaluate age-related hygiene practices was undertaken. Further investigation of the general awareness of infection risk among the population of older, potentially more vulnerable, gym users is warranted.

Use of Gym Cleaning Products

Figure 3 illustrates the frequency of use of gym cleaning products among participants. A similar percentage of participants wiped equipment always, or sometimes, before use (93% in total) as compared to always, or sometimes, wiping equipment after use (94% in total). However, on further investigation, the number of people who always wiped equipment before use was significantly lower ($p<0.05$) than those who wiped it after use.

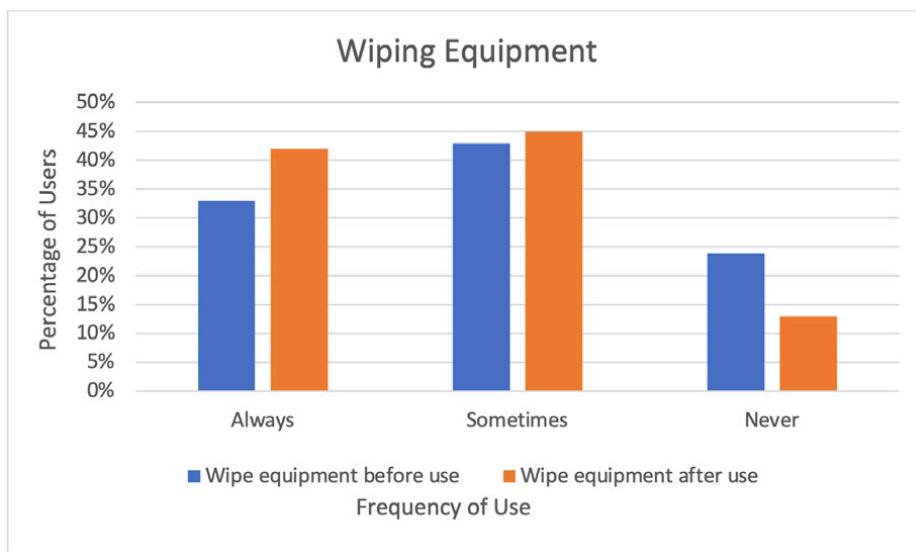


Figure 3. Frequency of Wiping of Gym Equipment

Table 8. Equipment Cleaning by Gender

Before			
	Always <i>n</i> (Percentage)	Sometimes <i>n</i> (Percentage)	Never <i>n</i> (Percentage)
Male	7 (33.3%)	9 (42.9%)	5 (23.8%)
Female*	13 (41.9%) *	14 (45.2%) *	4 (12.9%)
After			
Male	8 (38.1%)	11 (52.4%)	2 (9.5%)
Female*	18 (52.9%) *	11 (32.4%) *	2 (5.9%)

*Three female participants did not respond, % calculated based on 31 respondents

Consistent wiping of equipment (always) before use, appears lower than after use for both male and female users (Table 7). Occasional cleaning of equipment appears slightly higher; however, the three female participants who failed to respond to this section of the survey have limited the analysis and comparison. As a group, females wipe equipment (always and sometimes) before use more often than males do, while males appear more diligent with this practice after equipment use in general, (Table 8). The results indicate that the wiping of equipment before and after use as a precautionary decontamination measure may not be strong among this group of participants. It is concerning that some users report they do not wipe down equipment during gym sessions. These findings suggest that education of gym users is required to increase their awareness and practice of gym hygiene to protect themselves and other users by reducing microbial colonisation levels and contamination of shared gym equipment.

Table 9. Overall Equipment Cleaning by Gender

Equipment Cleaning by Gender		
	Before <i>n</i> (Percentage)	After <i>n</i> (Percentage)
Male	49.86 (<i>n</i> =21)	60.38 (<i>n</i> =21)
Female*	58.16 (<i>n</i> = 31)	53.48 (<i>n</i> =31)

* Three female participants did not respond to this question

Table 10. Equipment Cleaning by Age

Before			
	Always n (Percentage)	Sometimes n (Percentage)	Never n (Percentage)
18-24*	4 (50%)	4 (50%)	0
25-34**	10 (43.5%)	11 (47.8%)	2 (8.7%)
35-44***	2 (20%)	5 (50%)	3 (30%)
45-54	2 (33.3%)	2 (33.3%)	2 (33.3%)
55-64	2 (50%)	1 (25%)	1 (25%)
65+	0	0	1 (100%)
After			
18-24*	4 (50%)	4 (50%)	0
25-34**	10 (43.5%)	10 (43.5%)	3 (13%)
35-44***	4 (40%)	5 (50%)	1 (10%)
45-54	4 (66.7%)	2 (33.3%)	0
55-64	3 (66.7%)	1 (25%)	0
65+	1 (75%)	0	0

*One 18-24-year-old participant did not respond, % calculated based on 8/9 respondents

** Two 25-35 -year-old participants did not respond, % calculated based on 23/24 respondents

*** Three 35-44-year-old participants did not respond, % calculated based on 10/11 respondents

An analysis of post use cleaning of equipment by age shows a similar pattern of results as for hand hygiene practices. Generally younger gym users more consistently (always), or occasionally (sometimes), wipe equipment before and after use compared with older users (Table 9). However, when overall post use equipment cleaning (always and sometimes) is combined across each age group (Table 10), younger gym users appear to demonstrate more frequent practice than those who are middle aged and older. Again, due to the smaller age group sizes and the failure of several participants to respond to this section of the study, no further analysis was undertaken. Thus, it is not clear why older participants were less inclined to wipe equipment when using the gym. Further research is required to assess whether this finding points to less awareness or understanding of the risk of infections posed by gym use among older gym users. This research result might change if the survey was carried out now, due to publicity about infection spread in the COVID-19 climate. Increased infection risk general awareness since the onset of COVID-19 may translate to high levels of surface cleaning by gym users during gym visits.

Table 11. Equipment Cleaning by Age Group

Equipment Cleaning by Age Group		
Age Groups	Always and Sometimes by Age Group (Percentage)	Always and Sometimes Total Respondents (Percentage)
18-24*	54.0	4.0 (n=54)
25-34*	57.8	14.7 (n=54)
35-44*	52.0	10.6 (n=54)
45-54	35.3	5.6 (n=55)
55-64	27.0	2.8 (n=55)
65+	0.0	1.8 (n=55)

* One participant in each of the identified age groups did not respond, % has been calculated based on 54/55 respondents

DISCUSSION

Variability of Hygiene Practices

There is a high level of awareness among study participants of infection risks in gyms related to hand hygiene practices and wiping of equipment either always or sometimes, before and after a visit to the gym. However, inconsistencies in gym hygiene practices are apparent among males and females and across various ages groups, for example, hand hygiene measures are less frequently practised between use of gym equipment during a gym session. A lack of awareness and variable use of hygiene practices and self-protection measures among gym users are a potential infection risk, as soft tissue infections or a disease outbreak may occur. Female users, in general, appeared to be more consistent in their hand hygiene practice while there appeared to be awareness across all age groups about the need for hand hygiene practice after completing a programme of exercise/before leaving the gym. In this study, participants demonstrated more consistent use of hand hygiene measures after gym use, a finding that aligns with research investigating health professionals' hand hygiene practices (Fouad & Eltaher, 2020); higher rates of hand hygiene compliance were seen among health staff after patient care than before. Various strategies are employed to increase hand hygiene compliance rates in healthcare settings, however variable compliance with hand hygiene practices remains a persistent challenge in health care.

A longitudinal study of hand hygiene compliance among health care professionals in an acute health care setting illustrates this challenge. After direct observation and feedback strategies were implemented, hand hygiene compliance among the studied group increased over a five-year period from 76.4% to 88.5% (Ojanperä et al., 2020). Hand hygiene is promoted in health care settings due to the ever-present threat of hospital acquired infections and the recognition that hand hygiene is a critical decontamination approach in controlling the spread of nosocomial infections (World Health Organisation, 2002).

Awareness of Infection Risk

The results of the survey of 55 participants at local gyms in Rotorua showed a significant level of awareness of the risk of infection present in a gym and of the benefits of adhering to hand hygiene measures during a gym visit. More than 60% of survey respondents reported use of hand hygiene measures, indicating a baseline of personal awareness. Promotional measures such as posters displayed in gyms, remind users about the need for hygiene practices; these have been shown to translate hand hygiene intention into action in a gym setting (Elba & Ivy, 2018) and may have an important impact on improving communal spread of infection beyond the gym.

Wiping Equipment to Reduce Infection Risk

While over half of the participants in this study reported wiping equipment at some point during a gym visit, more consistent use among users would contribute towards reduced colonies of microorganisms on gym surfaces, and limit or eliminate subsequent transmission among users. When surface cleaning is undertaken to remove organic material and accompanied by disinfection, contamination load is reduced along with the risk of transmission (Assadian et al., 2021). A study comparing rates of MRSA contamination of health workers gloved hands following skin contact, and contact with common environmental surfaces in patient isolation rooms, found similar colonisation levels (40-45%) from both sources (Stiefel et al., 2011), highlighting that surfaces are a key source of contamination. Daily disinfection of high touch surfaces in a hospital setting contributes to a significant reduction in microbial colonisation found on the hands of health care workers who have regular contact with the surfaces (Kundrapu et al., 2012). When the aim of cleaning is to reduce the transmission of infection, the choice of disinfection method is important. In a hospital environment applying disinfectant spray to surfaces is effective in reducing colonisation but the extended drying time is a disadvantage in high contact areas (Rutala et al., 2012). However, wiping using pre-saturated disposable disinfectant wipes produces a significant reduction in surface contamination and microbial transmission, with the added advantage of reduced drying times, leader to better protection against infection risk (Rutala et al., 2012; Rutala & Weber, 2016).

As well as users adopting responsibility for equipment wiping following use, the Centers for Disease Control and Prevention (2019) recommend a programme of equipment and surface decontamination for gym facilities, to reduce infection spread through skin contact. Chlorine has been identified as an ideal disinfectant for use at appropriate dilutions to reduce CA-MRSA transmission through skin contact in a gym (Grindle et al., 2014). The need for a rigorous cleaning programme has been highlighted by increased demand for and use of gym and fitness facilities by the travelling public in the hotel industry. Infection outbreaks amongst hotel guests have been tracked to high touch equipment surfaces; this has led to calls for relevant policies to be developed, and special attention being given to surface cleaning by patrons and household staff to prevent when seeking to reduce the transmission of infection the spread of contaminants in hotels (Kravitz, 2012).

Promoting Behaviour Change

Governments across the globe have been making efforts to minimise the spread of infectious diseases by promoting individual behaviour change and interventions that include building awareness among the general population and encouraging protective behaviors such as hand washing and social distancing (World Health Organisation, 2021). Population behaviour plays an important role in determining the success of these preventive measures, specifically social distancing and handwashing, during a pandemic (Centers for Disease Prevention and Control, 2021b). However, these same measures are promoted as sound advice for the general public to prevent infection spread in shared spaces such as schools and workplaces (Ministry of Health, 2021).

Therefore, the gym user population of gym should receive specific messaging appropriate to this community 'island' space. The study results indicate that people's behaviour and awareness of their risk of becoming infected from equipment and surfaces in a shared exercise facility varies, and is related to their age. Use of hand hygiene between use of equipment during a workout was rare.

LIMITATIONS

As members of participating gyms, survey respondents may have been more conscious of the risk of infection and more likely to use hygiene strategies due to increased awareness generated by promotion of infection control practices. N.B., this study differentiated between gym users who may have been employees and those who were enrolled members.

PRACTICAL APPLICATIONS

- Many gym users have some awareness of infection risk in gyms, but this study found gym members were inconsistent in using hygiene practices designed to decontaminate surfaces and minimise transmission of the pathogens commonly found in gyms. Therefore, it is recommended that gym owners and staff take responsibility for regular cleaning of equipment and surfaces in gyms.
- Awareness of infection risk among gym user was high, therefore education to promote hygiene practices should be well received.
- Enhanced hygiene practices among gym users may be contingent upon ready access to hand hygiene products for regular hand sanitisation, and upon the availability of disposable disinfectant wipes for cleaning equipment.
- A range of prompts including signage throughout the gym may reinforce awareness and prompt gym users to implement hygiene practices, actively contributing to greater decontamination of high contact surfaces.
- With increasing rates of CA-MRSA reported in the community in general (Williamson et al., 2013), and in gym and fitness centres (Braun & Kahanov, 2018), more proactive measures by both gym owners and users are required to limit spread in this high surface contact environment.
- Gyms should specifically encourage the wiping down of equipment before use.

FUTURE DIRECTIONS

Future studies should investigate how public health pandemic messaging has affected hygiene awareness and practices in gyms, i.e., researchers should explore how pandemic-related messaging might have increased infection transmission awareness and altered users' hygiene-enhancing behaviours. Future researchers should aim to recruit larger numbers of participants, and also consider their computer access or digital literacy, if an online survey method is used.

Future research could be undertaken to investigate the specific microbial ecology of gym surfaces in New Zealand by growing cultures from swabs taken from gym surfaces. This may establish the infection risks and transmission patterns specific to the New Zealand gym and fitness centre context.

Researchers could consider exploring the effects of infection risk education programmes for older gym users, who are increasing in number as the population ages and the benefits of physical fitness for older adults become more widely known.

Finally, it would be of interest to understand gym users' hygiene-related habits in the context of COVID-19 to determine the effects of the pandemic on hygiene practices in gyms.


CONCLUSION


Hygiene education in the past has focused on wiping equipment to clean it after use. But disease spread is increasing, and individuals are now undertaking infection risk management precautions such as limiting contact through social distancing and using PPE and masks to protect personal 'bubbles'. Therefore, gyms should ensure that messaging about wiping down equipment before and after use, focuses on before use cleaning, to limit the spread of infectious diseases. This study also highlights the general need for increased awareness of, and compliance with hand hygiene and decontamination strategies in gyms, which should be promoted and practised in similar ways as in healthcare settings. Lastly, as gyms are considered high-density environments, i.e., they are warm and humid, gym users who are unwell should be actively discouraged from visiting the gym. The elimination of infectious diseases in New Zealand (an island nation) has been very successful, and therefore as gyms are 'islands', this approach should be highly effective.


FUNDING AND ACKNOWLEDGMENTS


This research was funded by the Toi Ohomai Institute of Technology School of Research through a student summer scholarship. The authors would like to thank the School of Research for the funding for the research assistant associated with this project (\$5,000).

Rolyn Sullano, as the research assistant, was responsible for the data collection and the promotion of this research over the summer of 2018/2019, the authors would like to thank him for his valuable contribution.

Mary Cooper  <https://orcid.org/0000-0002-7029-9103> is a senior lecturer within the Health Department at Toi Ohomai Institute of Technology, leading programmes in infection risk management and health, with a research focus in infection risk management and sterilisation sciences. Mary was part of the development team for the Diploma in Sterilising Technology and has taught on the programme since its inception in 2019.

Pavitra Dhamija  <https://orcid.org/0000-0001-5882-1168> is a senior academic staff member at Toi Ohomai Institute of Technology, with research interests in infection risk management. Pavi is currently teaching on the New Zealand diploma in sterilisation technology and has a leadership role in the sterilisation suite of programmes.

Elizabeth Youard  <https://orcid.org/0000-0001-8784-0579> is a senior academic staff member at Toi Ohomai Institute of Technology, with research interests in health and wellbeing and education. She is in the process of gaining her Masters with a focus on online education. Elizabeth has previously taught on the infection risk management programme.

Campbell Macgregor  <https://orcid.org/0000-0001-6161-8945>: Ko Tākitimu, ko Hananui kā mauka, Ko Kāi Tahu kā iwi and is a principal lecturer and academic lead – health at Toi Ohomai Institute of Technology with an interest in incorporating Mātauranga Māori and cultural responsiveness. Campbell has managed gyms in New Zealand and Australia. Furthermore, he is active in research in the bone health of older athletes, and indigenous solutions. Campbell, was identified by the American College of Sports Medicine, as their 2013 International Clinical Scholar.

Correspondence to: Campbell Macgregor, 70 Windermere Dr, Tauranga, 3112
Email: Campbell.macgregor@toiohomai.ac.nz

REFERENCES

- Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckman (Eds.), *Action control: From cognition to behaviour*. Springer-Verlag.
- Andrade, A., Dominski, F. H., Pereira, M. L., de Liz, C. M., & Buonanno, G. (2018). Infection risk in gyms during physical exercise. *Environmental Science & Pollution Research*, 25(20), 19675–19686. <https://doi.org/10.1007/s11356-018-1822-8>
- Assadian, O., Harbarth, S., Vos, M., Knobloch, J. K., Asensio, A., & Widmer, A. F. (2021). Practical recommendations for routine cleaning and disinfection procedures in healthcare institutions: A narrative review. *Journal of Hospital Infection*, 113, 104–114. <https://doi.org/10.1016/j.jhin.2021.03.010>
- Australasian Leisure Management. (2021). *Fitness/wellness*. <https://www.ausleisure.com.au/news/new-zealand-set-for-massive-wellness-growth/>
- Bilung, L. M., Tahar, A. S., Kira, R., Mohd Rozali, A. A., & Apun, K. (2018, 01 / 01 /). High occurrence of *Staphylococcus aureus* isolated from fitness equipment from selected symnasiums [Article]. *Journal of Environmental and Public Health*, 2018, 1–5. <https://doi.org/10.1155/2018/4592830>

- Braun, T. I. M., & Kahanov, L. (2018). Community-associated methicillin-resistant *Staphylococcus aureus* infection rates and management among student-athletes. *Medicine & Science in Sports & Exercise*, 50(9), 1802–1809. <https://doi.org/10.1249/MSS.0000000000001649>
- Centers for Disease Control and Prevention. (2019). *Athletic facilities: Cleaning and disinfecting*. https://www.cdc.gov/mrsa/community/environment/athletic-facilities.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fmrsa%2Fcommunity%2Fenvironment%2Fathletic-facilities.html
- Centers for Disease Prevention and Control. (2021b). *COVID-19: How to protect yourself and others*. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>
- Cohen, P. R. (2008). The skin in the gym: A comprehensive review of the cutaneous manifestations of community-acquired methicillin-resistant *Staphylococcus aureus* infection in athletes. *Clinics in Dermatology*, 26(1), 16–26. <https://doi.org/10.1016/j.clindermatol.2007.10.006>
- Dalton, C., Katelaris, A., & Wilson, N. (2020). Open with Care: Minimising COVID-19 Superspreading Settings in Australia. SSRN online. 1–12. <http://dx.doi.org/10.2139/ssrn.3625655>
- Desai, R., Pannaraj, P. S., Agopian, J., Sugar, C. A., Liu, G. Y., & Miller, L. G. (2011). Survival and transmission of community-associated methicillin-resistant *Staphylococcus aureus* from fomites. *AJIC: American Journal of Infection Control*, 39(3), 219–225. <https://doi.org/10.1016/j.ajic.2010.07.005>
- Elba, I., & Ivy, J. W. (2018). Increasing the post-use cleaning of gym equipment using prompts and increased access to cleaning materials. *Behavior Analysis in Practice*, 11(4), 390–394. <https://doi.org/10.1007/s40617-018-0217-0>
- Fouad, M., & Eltaher, S. (2020). Hand hygiene initiative: Comparative study of pre- and postintervention outcomes. *Eastern Mediterranean Health Journal*, 26(2), 198–205. <https://doi.org/10.26719/2020.26.2.198>
- Grindle, M., Games, K. E., Eberman, L. E., Kahanov, L., & Caswell, S. (2014). Appropriate disinfection techniques for playing surfaces to prevent the transmission of bloodborne pathogens. *International Journal of Athletic Therapy & Training*, 19(5), 12–15. <https://doi.org/10.1123/ijatt.2014-0032>
- Health Protection Agency. (2010). *Sports infection and prevention control guidance*. <https://www.biocote.com/wp-content/uploads/2017/11/Health-Protection-Agency-North-West-Sports-Infection-Prevention-Control-Guidance-July-2010.pdf>
- Junnila, J., Hirvioja, T., Rintala, E., Auranen, K., Rantakokko-Jalava, K., Silvola, J., Lindholm, L., Gröndahl-Yli-Hannuksela, K., Marttila, H., & Vuopio, J. (2020). Changing epidemiology of methicillin-resistant *Staphylococcus aureus* in a low endemicity area – new challenges for MRSA control. *European Journal of Clinical Microbiology & Infectious Diseases* 39(12), 2299–2307. <https://doi.org/10.1007/s10096-020-03824-9>
- Kravitz, R. (2012). Thinking outside the box to keep hotels clean and healthy. *Executive Housekeeping Today*, 34(10), 12–21. <https://ezproxy.toiohoma.ac.nz/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=v1h&AN=83238138&site=eds-live>
- Kundrapu, S., Sunkesula, V., Jury, L. A., Sitzlar, B. M., & Donskey, C. J. (2012). Daily disinfection of high-touch surfaces in isolation rooms to reduce contamination of healthcare workers' hands. *Infection Control and Hospital Epidemiology*, 33(10). <https://doi.org/http://www.jstor.org/stable/10.1086/667730?origin=JSTOR-pdf>
- Lee, G., & Bishop, P. (2016). *Microbiology and infection control for health professionals* (6th ed.). Pearson.
- Loewen, K., Schreiber, Y., Kirlaw, M., Bocking, N., & Kelly, L. (2017). Community-associated methicillin-resistant *Staphylococcus aureus* infection: Literature review and clinical update. *Canadian Family Physician / Medecin de Famille Canadien*, 63(7), 512–520. <https://ezproxy.toiohoma.ac.nz/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=28701438&site=eds-live>
- Meade, T. (2015). Disinfect the rec: Creating and implementing a disinfection campaign at gyms using the theory of planned behavior. *Recreational Sports Journal*, 39(2), 157–169. <https://doi.org/http://dx.doi.org/10.1123/rsj.2015-0037>
- Ministry of Health. (2021). *Prevent the spread of infectious disease*. <https://www.health.govt.nz/your-health/healthy-living/environmental-health/infectious-disease-prevention-and-control/prevent-spread-infectious-disease>
- Montgomery, K., Ryan, T., Krause, A., & Starkey, C. (2010). Assessment of athletic health care facility surfaces for MRSA in the secondary school setting. *Journal of Environmental Health*, 72(6), 8–11. <https://doi.org/https://www.jstor.org/stable/26328056>
- Moriya, M., Tsurukiri, J., Nakaminami, H., Yamanaka, H., Kobayashi, T., Tsubouchi, N., Yokomori, R., Takadama, S., Noguchi, N., Matsumoto, T., & Arai, T. (2020). A risk as an infection route: Nasal colonization of methicillin-resistant *Staphylococcus aureus* USA300 clone among contact sport athletes in Japan. *Journal of Infection and Chemotherapy: Official Journal of the Japan Society of Chemotherapy*, 26(8), 862–864. <https://doi.org/10.1016/j.jiac.2020.04.027>
- Mukherjee, N., Dowd, S. E., Wise, A., Kedia, S., Vohra, V., & Banerjee, P. (2014). Diversity of Bacterial Communities of Fitness Center Surfaces in a U.S. Metropolitan Area of fitness center surfaces in a U.S. metropolitan area. *International Journal of Environmental Research and Public Health*, 11(12), 12544–12561. <https://doi.org/10.3390/ijerph111212544>

- New Zealand Institute of Health and Fitness. (2021). *What makes up the New Zealand fitness industry?* <https://nzihf.ac.nz/personal-training-careers/new-zealand-fitness-industry-overview/>
- Núñez-Corrales, S., & Jakobsson, E. (2020). The epidemiology workbench: a tool for communities to strategize in response to COVID-19 and other infectious diseases. *medRxiv*, 7, 1–31 : <https://doi.org/10.1101/2020.07.22.20159798>
- O'Connor, R. (2018). *Using exercise psychology: Theory of planned behaviour*. <https://absolutebalance.com.au/using-exercise-psychology-theory-of-planned-behaviour/>
- Ojanperä, H., Kanste, O. I., & Syrjala, H. (2020). Hand-hygiene compliance by hospital staff and incidence of healthcare-associated infections, Finland. *Cumplimiento de la higiene de las manos entre el personal de los hospitales y la incidencia de las infecciones relacionadas con la atención médica, Finlandia.*, 98(7), 475–483. <https://doi.org/10.2471/BLT.19.247494>
- Otto, M. (2013, 01 / 01 /). Community-associated MRSA: What makes them special? *International Journal of Medical Microbiology*. <https://doi.org/10.1016/j.jimm.2013.02.007>
- Redziniak, D. E., Diduch, D. R., Turman, K., Hart, J., Grindstaff, T. L., MacKnight, J. M., & Mistry, D. J. (2009). Methicillin-resistant *Staphylococcus aureus* (MRSA) in the athlete. *International Journal of Sports Medicine* 30, 557–562. <https://doi.org/10.1055/s-0029-1214382>
- Rutala, W. A., Gergen, M. F., & Weber, D. J. (2012). Efficacy of different cleaning and disinfection methods against *Clostridium difficile* spores: Importance of physical removal versus sporicidal inactivation. *Infection Control and Hospital Epidemiology*, 33(12), 1255–1258.
- Rutala, W. A., & Weber, D. J. (2016). Disinfection, sterilization, and antisepsis: An overview. *American Journal of Infection Control*, 44(5, Supplement), e1–e6. <https://doi.org/https://doi.org/10.1016/j.ajic.2015.10.038>
- Ryan, K. A., Ifantides, C., Bucciarelli, C., Saliba, H., Tuli, S., Black, E., & Thompson, L. A. (2011). Are gymnasium equipment surfaces a source of staphylococcal infections in the community? *AJIC (American Journal of Infection Control)*, 39(2), 148–150. <https://doi.org/10.1016/j.ajic.2010.06.006>
- Stiefel, U., Cadnum, J. L., Eckstein, B. C., Guerrero, D. M., Tima, M. A., & Donskey, C. J. (2011). Contamination of hands with methicillin-resistant *Staphylococcus aureus* after contact with environmental surfaces and after contact with the skin of colonized patients. *Infection Control Hospital Epidemiology*, 32(2), 185–187.
- Sun, X., Shi, Y., Zeng, Q., Wang, Y., Du, D., Wei, N., Xie, R., & C., C. (2013). Determinants of health literacy and health behavior regarding infectious respiratory diseases: A pathway model. *BMC Public Health*, 13(1), 1–8. <https://doi.org/10.1186/1471-2458-13-261>
- White, K. M., Jimmieson, N. L., Obst, P. L., Graves, N., Barnett, A., Cockshaw, W., Gee, P., Haneman, L., Page, K., Campbell, M., Martin, E., & Paterson, D. (2015). Using a theory of planned behaviour framework to explore hand hygiene beliefs at the '5 critical moments' among Australian hospital-based nurses. *BMC Health Services Research*, 15(29), 2–9. <https://doi.org/https://doi.org/10.1186/s12913-015-0718-2>
- Williamson, D. A., Roberts, S. A., Ritchie, S. R., Coombs, G. W., Fraser, J. D., & Heffernan, H. (2013). Clinical and molecular epidemiology of methicillin-resistant *Staphylococcus aureus* in New Zealand: Rapid emergence of Sequence Type 5 (ST5)-SCCmec-IV as the dominant community-associated MRSA clone. *PLoS ONE*, 8(4), 1–7. <https://doi.org/10.1371/journal.pone.0062020>
- Wong, J. W. H., Ip, M., Tang, A., Wei, V. W. I., Wong, S. Y. S., Riley, S., Read, J. M., & Kwok, K. O. (2018). Prevalence and risk factors of community-associated methicillin-resistant *Staphylococcus aureus* carriage in Asia-Pacific region from 2000 to 2016: A systematic review and meta-analysis. *Clinical Epidemiology*, 10, 1489–1501. <https://ezproxy.toiohoma.ac.nz/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=edsdoj&AN=edsdoj.48b9dab0edca4be0af5461531dc70bb&site=eds-live>
- World Health Organisation. (2002). *Prevention of hospital-acquired infections*. <https://www.who.int/csr/resources/publications/whocdscsreph200212.pdf>
- World Health Organisation. (2021). *Coronavirus disease (COVID-19) advice for the public*. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>
- Zinder, S. M., Basler, R. S., Foley, J., Scarlata, C., & Vasily, D. B. (2010). Athletic Trainers' Association Position Statement: Skin diseases. *Journal of Athletic Training (National Athletic Trainers' Association)*, 45(4), 411–428. <https://doi.org/10.4085/1062-6050-45.4.411>

IMPROVING NEW ZEALAND HEALTH OUTCOMES WITH ARTIFICIAL INTELLIGENCE

Tavish Sehgal and Marianne Cherrington

INTRODUCTION

Aotearoa New Zealand has a quality, government funded health care system with public health services plus primary (first point-of-contact) and secondary (specialist) health care. Private healthcare providers are also utilised for overall assured care. Around the motu, islands of healthcare inequity exist.

Significant inequality is evident in various demographics within New Zealand (Ministry of Health, 2002). Health inequalities are a major health issue that affect society as a whole in complex and compounding ways. For example, health is correlated with poverty, and the latter is linked to education, profession, earnings and deprivation (Moore et al., 2018; Khan, 2012); cultural background, social groups, and nationality are additional factors that influence health (Arcaya et al., 2015). Solutions to health inequity can be complex and often have unintended consequences that may be hard to predict.

Artificial intelligence (AI) can be thought of as “a system’s ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation” (Kaplan, & Haenlein, 2019, p. 15). Machine learning (ML) is a subfield of AI that automates processes to achieve objectives, improve predictions or inform decisions (Cherrington et al., 2019c). Deep Learning (DL) uses artificial neural networks to activate AI applications. These technologies can be relatively easy and cost effective to apply. For example, AI supported swift, effective COVID-19 response:

- by detecting and diagnosing SARS-CoV-2 virus, also known as COVID-19 (Cherrington et al., 2021b),
- via intelligent, analytic platforms to monitor or predict the spread of Covid-19 (Kvalsvig et al., 2020),
- by using contact tracing technologies of individuals (Lalmuanawma et al., 2020),
- through the prediction of the spread of infection and possible mortality rates (Vaishya et al., 2020),
- with the creation of efficacious drugs and vaccines (Kannan et al., 2020).

The beauty of digitised data systems is that machine learning trains itself better with more and more data; AI learns continually from every interaction and application, without respite (Maddox, 2019). Healthcare solutions using AI and machine learning are already in use globally and feature in parts of the healthcare system in New Zealand. This report does not consider ethical issues relating to privacy, consent, autonomy and so on, as extensive scholarship and debate is on-going. Rather, the next section will summarise transformative AI health applications with implications for health equity. Following this section, superior AI healthcare applications in New Zealand will be given. The conclusion will highlight a visionary pathway utilising AI that can lead to more equitable health coverage and better health outcomes.

ARTIFICIAL INTELLIGENCE APPLICATIONS IN HEALTHCARE

Artificial Intelligence and associated ML technologies are becoming ubiquitous in society and in business. In particular, AI is used in healthcare, especially with applications that are too expensive or complex to be solved by human beings (Davenport & Kalakota, 2019). Medical practice is being revolutionised with artificial intelligence. AI applications are emerging into realms that were previously recognised to be only the domain of human expertise, now accessible with advances in digitised data collecting, machine learning, and computing infrastructure (Yu et al., 2018). According to Jiang et al. (2017), the objective of artificial intelligence (AI) is to imitate human intelligence, and with ML, AI can augment human decision-making. A radical shift in healthcare is on the horizon, due to the increasing availability of digitised healthcare data via a variety of structured or unstructured sources that are linked in ways that were previously not viable (Cherrington et al., 2019a, 2019b). The rapid advancement of ML techniques makes AI applications formidable and powerful tools.

Structured ML data, such as support vector machines or deep learning (DL) using artificial neural networks (ANNs), alongside natural language processing are all popular AI techniques (Cherrington et al., 2020, 2021a; 2021c) and are particularly utilised in health applications (Figure 1):

	Artificial Intelligence Applications	Machine Learning Applications
Neurology	clinical decision support (Pedersen et al., 2020) prognosis of neurological disorders (Patel, 2021)	precision psychiatry/ specificity (Bzdok et al., 2018) neuroimaging biomarkers (Bernstein et al., 2018)
Oncology	precision oncology diagnostic tools (Bera et al., 2019) radiomics/ biomarker models (Forghani et al., 2019)	cancer genomics/ precision medicine (Xu et al., 2019) inter-drug response/ prediction (Ali & Aittokallio, 2020)
Cardiology	cardiac imaging/ preventatives (Dilsizian et al., 2018) interventions/ procedure support (Sardar et al., 2019)	foetal imaging/ diagnosis (Garcia-Canadilla et al., 2020) digital-led disease prevention (Vervoort et al., 2020)
Genetics	pharmaceutical drug repurposing (Zhou et al., 2020) immunoprofiling/ image analysis (Koelzer et al., 2019)	disease/ gene functional analysis (Asif et al., 2018) genotype disease prediction (Katsaouni et al., 2021)

Figure 1. Selected Artificial Intelligence and Machine Learning uses in Neurology, oncology and cardiology

Fields such as neurology, oncology, cardiology and genetics are four specific branches of medicine that use artificial intelligence (Yu et al., 2018) (Figure 1); health applications can range from context specific (Madanian et al., 2018, 2019) to general well-being solutions (Airehrour et al., 2020). AI is particularly useful in certain aspects of healthcare, yet less appropriate in others. While machine learning can always support data-driven discovery and decision-making, advances in imaging and AI automation are making these technologies more useful many more branches of medicine, and advances are intensifying.

The volume and variety of data due to digitisation has led to innovative solutions using big data ML methodologies in healthcare. Powerful AI algorithms can reveal clinically important information hidden in vast amounts of data, which can aid clinical decision making, when guided by relevant clinical queries (Jiang et al., 2017). Research has

proven that AI can perform as well as or better than humans at crucial healthcare activities like disease diagnosis (Davenport & Kalakota, 2019). For example, algorithms are already surpassing radiologists in terms of detecting dangerous tumours as well as advising researchers on how to build cohorts for expensive clinical trials. Concerns about AI taking human jobs in the healthcare sector are likely unfounded; it will be years before AI can begin to replace humans in extensive healthcare process domains for a variety of reasons (Meskó et al., 2018). There is a dire need for healthcare workers, exacerbated by the COVID-19 pandemic. AI is best used as a support and safeguard.

Clinicians, managers, and decision-makers can use healthcare data for education or to target a wise use of healthcare resources. Machine learning is used to produce data-driven prediction but also to drive a variety of AI technological advancements that are creating ground-breaking treatments and supporting patient rehabilitation. The future of AI in medicine will ameliorate many healthcare challenges; robotic process automation, computer vision, natural language processing, reinforcement learning, and generalised deep learning are in use already; enhanced equity can be attained now, via AI applications.

STATE-OF-THE-ART ROBOTICS IN HEALTHCARE

Just as the world is grappling with how to live with a pandemic and the incalculable toll of COVID-19, strategies and forward progress is being made. As vaccination rates progress, former health dilemmas that were pushed aside are being debated again. Health equity and 'haves-and-have-nots' are key issues.

Fortunately, we are at a point where a confluence of technological solutions is combining to make artificial intelligence and machine learning pertinent for the moment. Healthcare challenges such as those linked to resourcing, can be assuaged with novel technological applications. Currently, the opportunity to make the most of data to foster and leverage equity in healthcare has never been greater.

For example, machine learning can be used for prediction, vital in healthcare. Forecasting treatment efficacy, pharmaceutical regimes or likely patient behaviours can be conflated and nuanced with trained data. Data used in conjunction with deep learning (inspired by human thinking) or robotics can transform access to healthcare for more people to close inequities and inaccessibility that leads to poor health.

Digital disruption in medical fields, enabled by big data accessibility is already supporting personalised healthcare (Puaschunder et al., 2020). Benefits such as greater efficiency, quality and accuracy can be realised for more people with less financial outlay. Rather than de-valuing the need for specialised health workers and medical experts, artificial intelligence can become their ally in a quest for health equity. In particular, great strides have been made in functionality of robotics in the healthcare sector, including:

- **Surgical robots** used in therapeutic areas for minimally invasive robotic surgery
- **Care robots** to assist with routine, emotional or palliative nursing rounds
- **Exoskeletons** created to support patient recovery/ rehabilitate regimes, as well for prosthetics
- **Hospital robots** navigate wards with medications or specimens using, sensors and maps.

Precision operations and accuracy measures with robots have been explicitly adapted for computer-integrated surgery (CIS). In CIS, a tracked device is typically steered (directed) to various positions and orientations along a well-defined set of landmarks (fiducials). An independent localiser, usually an optical tracking system, is used to record these positions (Haidegger et al., 2019). Robotic surgery necessitates a high degree of accuracy and CIS provides a number of ways to improve and complement human dexterity.

Robot-assisted initiatives have been around since the mid-1980s, but are now extensively used in surgical fields due to their intensifying adaptability and operating theatre consistency. In neurosurgical fields, they improve quality of

various operative practises, especially those demanding a greater precision or safety profile (Kapoor et al., 2019). Robot-assisted surgery has sophisticated surgical incision which results in a lowered pain in recover and less time in hospital; fewer drugs and days in hospital care is cost-effective.

Physical robots are becoming a part of everyday life in key industries; what was once considered science fiction has now become reality. The advancements in robotics in everyday life benefit everyone in the developed world today, with flow-on effects and ubiquitous technologies (Hockstein et al., 2007). Physical robots can execute pre-defined activities in situ, such as lifting, repositioning, and transporting supplies in hospitals. Robots have recently become more collaborative with people and are easier to teach by guiding them through a desired job. They are also becoming smarter as more AI capabilities are integrated into their 'brains', or operating systems. The same advancements in intelligence that we have seen in other areas of AI are likely to be applied into physical robots over time (Runciman, 2019).

Surgical robots, which were first approved in the United States in 2000, support surgeons, allowing them to see better, make more precise and least invasive incisions, stitch wounds, and so on. However, human surgeons continue to make important judgments. Gynaecologic surgery, prostate surgery, and head and neck surgery are all common surgical procedures that use robotic surgery (Davenport & Glaser, 2002).

Surgery has proven to be a comprehensive discipline capable of treating a wide range of diseases and disorders as technological improvements continue to develop throughout the decades. In response, as computer technology and software improve, similar technologies are being implemented in the operating room as well. Finely operated robotic surgery platforms have found a rich young market in the medical technology sector; thanks to the late popularisation of minimally invasive procedures and surgeries. In fact Minimally Invasive Surgery (MIS) robotics operations account for the bulk of the surgical robotics market.

MIS techniques and MIS robotics help the general population as well; laparoscopic surgery, is used on patients diagnosed with many different conditions and has replaced many complex surgeries that have long recovery times. MIS robotics is already creating more equitable and affordable health outcomes, especially in cities with large populations, such as in Auckland where the da Vinci surgical system has been used. The da Vinci robotic system from Intuitive Surgical Inc. is arguably the most successful surgical robot in use and is currently the only complete teleoperation surgical robot accessible. Developed with a \$500 million investment, it can carry out sophisticated surgical procedures using laparoscopic technology while being guided remotely by a competent physician (Haidegger et al., 2019).

One aim of robotic surgery is to be able to do a surgical procedure from a distance without having to touch the patient. The Arthrobot, followed voice directions to help in patient positioning during an orthopaedic surgery operation and the Unimation Puma 200, which was used to orient a needle for brain biopsy were the first surgical robots (Smith et al., 2016). ZEUS, a comprehensive robotic surgical system with tremor reduction and motion scaling, was the first robotic surgical system (Ranev & Teixeira, 2020) approved by the U.S.A. Food and Drug Administration. The first long-distance, tele-surgical procedure, a laparoscopic cholecystectomy on a French patient in Strasbourg while the surgeon was in New York, was performed with the help of ZEUS (Marescaux et al., 2006). Another innovation was Intuitive Surgery's Da Vinci robotic system, which is utilised in a range of surgical specialties for a variety of operations to conduct technically demanding treatments (Troccaz et al., 2019). Several other robotic devices for various surgical procedures across several disciplines have since been created and are now more commercially accessible for general use.

Medical science is finding ways to utilise robots to liberate a stressed and often over-worked healthcare labour force. Robots are now interacting with patient, staff and assisting administrators. Routine and complex surgical techniques are now more commonly performed by skilled robotics. Increasingly healthcare management is turning to ML and AI to assist with countless aspects of hospital and health management, as routing patient care and complex processes can be handled or at least supported by these innovative technologies (Alotaibi & Yamin, 2019).

Can the benefits of AI in healthcare become a solution for beleaguered hospitals and our workforce? Robotics is a particularly visible and innovative application that is being used in healthcare (Bogue, 2011). Research and innovation can add value in New Zealand as well, but it is vital to assess what is feasible and what is not, with possible impacts and ways in which New Zealand might proceed.

THE CURRENT STATE OF HEALTHCARE

Charitable organisations that ‘fill in the gaps’ can use ML and AI to do more with less. Where aid or education is needed to improve health or for public health initiatives, virtual medical centres can use digital instrument data, with cloud diagnostics for holistic treatment plans can be delivered (Field & Butler, 2018). Even as wearable activity trackers have become more affordable, they are being used routinely to aid health programmes that foster health, wellness and wellbeing (Madanian et al., 2018).

At the other end of the scale, innovations in high dimensional DNA sequencing and micro-array analysis impact significantly on the personalised healthcare market (Peng et al., 2018); novel applications include:

- computational biology where bioinformatic genetic data have breakthroughs revolutionise diagnosis and treatment of disease
- diagnostics and health research using AI visualisation for applications such as tomography, use digitisation to visualise insights or support diagnoses
- data mining and machine learning fast-track pharmaceutical innovations and design, with high throughput methods automating processes by specifying candidate features
- medical imaging processes which can be automated with AI and can detect malignant cancers with accuracy, for example
- deep learning that drives AI, which can also be used to search for solutions that may not be discernible by experts, due to the sheer volume of data accessed.

New genetic discoveries are resulting from AI, which in turn can create new and unique insights for human health. Personalised prescriptions are becoming available with pharmacogenomics that merge genetic testing and biomarker data from electronic health records. The discoveries that AI advance will not only help those wealthy enough to afford novel treatments, but as these innovations become more ubiquitous and affordable, personalised prescription will become a more efficacious method of treatment (Hall, 2020).

The COVID-19 epidemic has altered our planet, impacting people from all walks of life. Frontline workers, especially those in direct contact with patients, are put in grave danger. We have seen the use of robots as a shielding layer, physically isolating healthcare professionals from patients, as a significant technique for combating pathogen contamination fears and maintaining surgical volumes (Zemmar et al., 2020).

COVID-19 has severely limited health services, with cancellation of elective surgeries to reduce the spread of disease and protect healthcare personnel and patients. This has resulted in a significant burden for patients and a significant financial loss for hospitals. Yet even in New Zealand, where COVID-19 has largely been kept at bay, the “health system is failing to cope” and services are under stress due to “demand, the complexity of procedures, industrial action and workforce shortages” (Jones, p. A1., 2021).

Nurses are set to strike in New Zealand again. Emergency rooms have been overflowing across the country for months, even without any community COVID-19 transmission. Reports are of junior nurses, left to triage with more than 40 patients, some of whom have 24 hour plus waiting times to access ward admission. To manage patient demand and keep staff safe, new measures include monitoring of clinical staffing during peak periods, access to security backup, plus a review of visitor policy (Campbell, 2021). It is perplexing that a supply of COVID-19 syringes must suddenly be urgently ordered now, even after a vaccination slowdown as New Zealand had to wait for a new supply of vaccine (Coughan, 2021).

These issues and stop-gaps will not resolve healthcare inequity or improve access to expert care.

Machine Learning can better predict ebbs and flows in healthcare services and AI robotics can support doctors and nurses while augmenting safety practices. Exhaustion leads to mistakes. AI platforms can streamline or scale hospital operational processes, optimise surgeries and predict downtimes or specialist availability (Graue, 2013). Such scheduling support can save untold hours, resources and expense for more efficient medical and hospital care when and where it is needed most, such as triage (Levin et al., 2018).

STATE-OF-THE-ART HEALTHCARE IN AOTEAROA

As nurses are in short supply and under-paid while hospitals are overcrowded in New Zealand, we might be thankful that the ravages of COVID-19 have largely been kept at bay in this country. We might wonder if state-of-the-art, equitable healthcare is a possibility; it surely must be a case of re-resourcing.

Machine learning, when used well, can support wise decisions based on real data, including behavioural information. In a predictive sense, this can allow for wise deployment of skilled labour, funds and assets.

Digital people are a product of amazing AI research by Soul Machines, begun in New Zealand. The lifelike creations deliver amazing customer experience in sectors like entertainment, financial services, retail and education and are used in healthcare too (Soul Machines, 2020). As Digital Healthcare aides, they answer questions about health conditions, speak several languages and so office clerical tasks on a 24/7 basis.

Dr. Lance O'Sullivan says the "opportunity with Soul Machines digital health professionals is to be able to deliver more care to more patients for less cost." Combined with the digital teacher abilities, it is easy to imagine how routine hospital tasks could be performed by digital people to release expertise where it is most needed in medical settings.

For health initiatives like MAiHEALTH delivering health outcomes via virtual medical centres or iMoko, where digital instrument data is used virtually with cloud-storage, processes from diagnosis to multi-faceted treatment plans are fast and efficacious (eHealth News Features, 2019). iMoko offers personalised healthcare not for the rich and famous, but for underprivileged children, to ensure better health outcomes and more time in class rather than in doctor's rooms. Partnerships make schemes work, so iMoko also partnered with Otago Polytechnic for micro-credentialing for the new digital health work-force behind the digital iMoko project.

Targeted campaigns can improve health outcomes and with continuous data from wearables, mHealth plans deliver cost-effective healthcare quickly, before health issues escalate into ICU crises. Even insurers are getting on-board with discounted rates and benefits for members who utilise wearables and share their data (AIA, Sovereign and You, 2019).

Another way to share data is through research. New Zealand is uniquely placed to develop AI technologies due to exceptional longitudinal research like "The Dunedin Study", with over twenty years of human health data (Belsky et al., 2020); new insights into genetic predisposition and hereditary conditions are being found.

Other firms in New Zealand are at the forefront of healthcare. Pinnacle Ventures pharmacogenomics programme is pioneering personalised prescriptions with biomarker information on electronic health records (Health Informatics New Zealand, 2019). Similarly, Precision Driven Health is focusing healthcare decisions in conjunction with genetic testing (Health Informatics New Zealand, 2019) and oDocs is auto-diagnosing with a world-first AI platform (Orion Health, 2019). Artificial Intelligence is already world-class in New Zealand and already being used to create more equitable and exquisite healthcare solutions for a range of New Zealanders.

CONCLUSIONS

Attaining equity in healthcare matters more than ever. Across the world and our nation, gaps in health are great, persistent and increasing—many of them caused by barriers set up at all levels of our society. After all, it is hard to be healthy without access to good jobs and schools and safe, affordable homes. Health equity means increasing opportunities for everyone to live the healthiest life possible, no matter who we are, where we live, or how much money we make.

Both in New Zealand and globally, our ability to address equity challenges in health has improved significantly over the past decades, yet gaps are growing. Persistent disparities in health access, quality of services and outcomes remain. In Aotearoa New Zealand, Māori and Pacific peoples and those in low socioeconomic groups are still the most disadvantaged. The Government has mandated the Ministry of Health to take a bold approach to addressing healthy inequities that delivers tangible changes to health system behaviour, with measurable results over a three- to five-year horizon. The Ministry is developing a cyclical approach that operates around deepening the understanding of equity gaps, shifting thinking about where priorities for investment of time and resources should lie, followed by increasing direct action to address inequality. AI must be part of the solution, building on key strengths and initiatives already successful in Aotearoa such as those using:

- machine learning prediction for scheduling, notably to ease peak usage, resources and surgeries
- digital assistants to educate, answer multi-lingual queries and perform administrative tasks around the clock
- AI digital health professionals, to assess digitised readings and support patient care for less cost
- teachers to fill demand for health experts, dealing with new health challenges in our communities
- machine learning from wearables, to predict health models alongside human longitudinal studies
- auto-diagnosis, pharmacogenomics and personalised treatments with or without genetic testing.


Technology is not a solution; it is part of the solution. Machine learning has incredible predictive power and the ability to learn in supervised or unsupervised systems. Artificial intelligence supports health experts to do more, with new standards of quality. As an investment, AI outcomes rival the investment needed to train teams of doctors and nurses. As an investment in our health, AI has come of age.


There are philosophical and ethical considerations behind a data-led, AI approach. Realities about widening gaps in access to healthcare and issues in health equity are even more complex and cause us to look at ways in which diverse cultural barriers can be ameliorated. If health is our greatest wealth, then addressing health equity must evolve (UNSDG Goal 3, 2021); AI can improve progress in healthcare to address some equity issues.

Artificial Intelligence is transforming health, wellbeing and patient care and some data-driven initiatives in New Zealand can work alongside the behemoth healthcare system to address gaps in health and wellbeing. New Zealand's response to the COVID-19 pandemic is as unique as this country and its people. We can create more equitable healthcare in Aotearoa New Zealand despite some clear and observable gaps as well as appalling statistics. It is in our DNA to do so.

The word 'motu' can mean island, to distance, sever or wound. It can mean a heavy stone or even whooping cough. It can also mean to set free. Addressing healthcare inequity must be a priority.

The capability is here and the will to life health outcomes can overcome barriers to implementation. Health is an investment and it impacts every aspect of life. The opportunity to use data, ML and AI with robotics is vast. With wise partnerships, health equity can be achieved, perhaps even alongside our public health system, because the cost of illness and infirmity is enormous. AI is part of the solution for equitable health and New Zealand can model the pathway to quality healthcare for all New Zealanders and for the world.

Tavish Sehgal  <https://orcid.org/0000-0001-6502-786X> is an information technology professional and Otago Polytechnic Ltd, Auckland International Campus peer tutor. He specialises in IT cyber security and accessibility and is currently perfecting carbon emission prediction prototypes. Research includes an MS Excel prototype to predict carbon emissions and track individual company emissions plus business applications of IT technologies.

Marianne Cherrington  <https://orcid.org/0000-0002-1240-2010> is a principal lecturer at Otago Polytechnic Ltd, Auckland International Campus with a focus on Computer Analytics and Sustainability. A lecturer in disruptive innovation, her research into machine learning feature selection algorithms applies in many fields, producing interesting collaborations with local and international partners in many disciplines and sectors. Email: marianne.cherrington@op.ac.nz

Correspondence to: Marianne Cherrington, Otago Polytechnic | Te Kura Matatini ki Otago, Forth Street, Private Bag 1910, Dunedin 9054, New Zealand. Email: Marianne.cherrington@op.ac.nz

REFERENCES

- AIA, Sovereign and You (2019). Championing a healthier, better protected NZ. (20 May, 2019). Retrieved from <https://www.aia.co.nz/en/campaign/championing-a-healthiermore-protected-nz.html>
- Airehrou, D., Cherrington, M., & Rajagopal, K. (2020, November). Odour Detection System for Allergy Sufferers. In *2020 11th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)* (pp. 0193-0200). IEEE.
- Ali, M., & Aittokallio, T. (2019). Machine learning and feature selection for drug response prediction in precision oncology applications. *Biophysical Reviews*, 11(1), 31–39.
- Alotaibi, M., & Yamin, M. (2019, March). Role of robots in healthcare management. In *2019 6th International Conference on Computing for Sustainable Global Development (INDIACom)* (pp. 1311–1314). IEEE.
- Arcaya, M. C., Arcaya, A. L., & Subramanian, S. V. (2015). Inequalities in health: definitions, concepts, and theories. *Global Health Action*, 8(1), 27106.
- Asif, M., Martiniano, H. F., Vicente, A. M., & Couto, F. M. (2018). Identifying disease genes using machine learning and gene functional similarities, assessed through Gene Ontology. *PLoS one*, 13(12), e0208626.
- Belsky, D. W., Caspi, A., Arseneault, L., Baccarelli, A., Corcoran, D. L., Gao, X., ... & Moffitt, T. E. (2020). Quantification of the pace of biological aging in humans through a blood test, the DunedinPoAm DNA methylation algorithm. *Elife*, 9, e54870.
- Bera, K., Schalper, K. A., Rimm, D. L., Velcheti, V., & Madabhushi, A. (2019). Artificial intelligence in digital pathology—new tools for diagnosis and precision oncology. *Nature reviews Clinical oncology*, 16(11), 703–715.
- Bernstein, A., Burnaev, E., Kondratyeva, E., Sushchinskaya, S., Sharaev, M., Andreev, A., ... & Akzhigitov, R. (2018). Machine Learning pipeline for discovering neuroimaging-based biomarkers in neurology and psychiatry. *arXiv preprint arXiv:1804.10163*.
- Bogue, R. (2011). "Robots in healthcare". *Industrial Robot*, 38 (3), 218–223. <https://doi.org/10.1108/01439911111122699>
- Bzdok, D., & Meyer-Lindenberg, A. (2018). Machine learning for precision psychiatry: opportunities and challenges. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, 3(3), 223–230.
- Campbell, G. (2021, August 3). Terminal but 31-hr wait in ED bed. *The New Zealand Herald*, p. A7.
- Cherrington, M., Airehrou, D., Lu, J., Xu, Q., Wade, S., & Madanian, S. (2019a, December). Feature Selection Methods for Linked Data: Limitations, Capabilities and Potentials. In *Proceedings of the 6th IEEE/ACM International Conference on Big Data Computing, Applications and Technologies* (pp. 103–112).
- Cherrington, M., Lu, J., Airehrou, D., Thabtah, F., Xu, Q., & Madanian, S. (2019b, November). Feature Selection: Multi-source and Multi-view Data Limitations, Capabilities and Potentials. In *2019 29th International Telecommunication Networks and Applications Conference (ITNAC)* (pp. 1–6). IEEE.
- Cherrington, M., Thabtah, F., Lu, J., & Xu, Q. (2019c, April). Feature selection: filter methods performance challenges. In *2019 International Conference on Computer and Information Sciences (ICIS)* (pp. 1–4). IEEE.
- Cherrington, M., Lu, Z. J., Xu, Q., Airehrou, D., Madanian, S., & Dyrkacz, A. (2020). Deep learning decision support for sustainable asset management. In *Advances in Asset Management and Condition Monitoring* (pp. 537–547). Springer, Cham.
- Cherrington, M., Lu, J., Xu, Q., Airehrou, D., & Wade, S. (2021a). Deep learning for sustainable asset management decision-making. *International Journal of COMADEM*, 24(2), 35–41.

- Cherrington, M., Dunn, I., Airehrour, A., (in press). (2021b). Cracking the Covid-19 Code: Cutting-edge Collaboration. Scope: *Contemporary Research Topics (Health and Wellbeing)*, 2021.
- Cherrington, M., Lu, J., Xu, Q., Airehrour, D., & Wade, S. (2021c). Deep learning for sustainable asset management decision-making. *International Journal of COMADEM*, 24(2), 35–41.
- Coughan, T. (2021, August 2). Urgent order for 3m Covid syringes. *The New Zealand Herald*, p. A5.
- Davenport, T. H., & Glaser, J. (2002, July 1). Just-in-Time Delivery Comes to Knowledge Management. *Harvard Business Review*. <https://hbr.org/2002/07/just-in-time-delivery-comes-to-knowledge-management>
- Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future Healthcare Journal*, 6(2), 94.
- Dilsizian, M. E., & Siegel, E. L. (2018). Machine meets biology: a primer on artificial intelligence in cardiology and cardiac imaging. *Current Cardiology Reports*, 20(12), 1–7.
- eHealth News Features. (2019, February 18). iMOKO tackling issue of inequitable access to healthcare. Health Informatics New Zealand (Aibany, Auckland). <https://www.hinz.org.nz/news/438034/iMOKO-tackling-issue-of-inequitable-access-to-healthcare.htm>
- Field A., Butler R. 2018. Virtual Health: Rapid review of evidence and implications. Hamilton: Waikato District Health Board.
- Forghani, R., Savadjiev, P., Chatterjee, A., Muthukrishnan, N., Reinhold, C., & Forghani, B. (2019). Radiomics and artificial intelligence for biomarker and prediction model development in oncology. *Computational and structural biotechnology journal*, 17, 995. www.ncbi.nlm.nih.gov/pmc/articles/PMC6667772/pdf/main.pdf
- Garcia-Canadilla, P., Sanchez-Martinez, S., Crispi, F., & Bijmens, B. (2020). Machine learning in fetal cardiology: what to expect. *Fetal diagnosis and therapy*, 47(5), 363–372. <https://www.karger.com/Article/Pdf/505021>
- Health Informatics New Zealand. (May 2020). Genetic testing to drive prescribing. www.hinz.org.nz/news/449084/Genetic-testing-to-drive-prescribing
- Graue, R. M. (2013). Prediction and optimization techniques to streamline surgical scheduling. (Doctoral dissertation, Massachusetts Institute of Technology). <https://dspace.mit.edu/bitstream/handle/1721.1/82482/862229484-MIT.pdf?sequence=2&isAllowed=y>
- Haidegger, T., Kovacs, L., Benyo, B., & Benyo, Z. (2019). Spatial accuracy of surgical robots. 2009 5th *International Symposium on Applied Computational Intelligence and Informatics*, 133–138. <https://doi.org/10.1109/SACI.2009.5136227>
- Hall, G. L. (2020). Delivering Consistent and Equitable Healthcare. In *Patient-Centred Clinical Care for African Americans* (pp. 23–35). Springer, Cham.
- Hockstein, N. G., Gourin, C. G., Faust, R. A., & Terris, D. J. (2007). A history of robots: From science fiction to surgical robotics. *Journal of Robotic Surgery*, 1(2), 113–118. <https://doi.org/10.1007/s11701-007-0021-2>
- Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. *Stroke and Vascular Neurology*, 2(4), 230–243. <https://doi.org/10.1136/svn-2017-000101>
- Jones, N. (2021, August 2). Health system failing to cope. *The New Zealand Herald*, p. A1.
- Kannan, S., Subbaram, K., Ali, S., & Kannan, H. (2020). The role of artificial intelligence and machine learning techniques: Race for covid-19 vaccine. *Archives of Clinical Infectious Diseases*, 15(2). <https://sites.kowsarpub.com/archcid/articles/103232.html>
- Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Business Horizons*, 62(1), 15–25.
- Kapoor, I., Mahajan, C., & Prabhakar, H. (2019). Robot-Assisted Neurosurgery. In *Textbook of Neuroanesthesia and Neurocritical Care* (pp. 503–510). Springer, Singapore.
- Katsaouni, N., Tashkandi, A., Wiese, L., & Schulz, M. H. (2021). Machine learning based disease prediction from genotype data. *Biological Chemistry*. <https://www.degruyter.com/document/doi/10.1515/hsz-2021-0109/html>
- Khan, S. (2012). Vulnerability assessments and their planning implications: a case study of the Hutt Valley, New Zealand. *Natural Hazards*, 64(2), 1587–1607.
- Koelzer, V. H., Sirinukunwattana, K., Rittscher, J., & Mertz, K. D. (2019). Precision immunoprofiling by image analysis and artificial intelligence. *Virchows Archiv*, 474(4), 511–522.
- Kvalsvig, A., Barnard, L. T., Gray, L., Wilson, N., & Baker, M. (2020). *Supporting the COVID-19 pandemic response: Surveillance and Outbreak Analytics*. Ministry of Health. https://www.health.govt.nz/system/files/documents/publications/report_for_moh_covid-19_surveillance_outbreak_analytics_final.pdf
- Lalmuanawma, S., Hussain, J., & Chhakhuak, L. (2020). Applications of machine learning and artificial intelligence for Covid-19 (SARS-CoV-2) pandemic: A review. *Chaos, Solitons & Fractals*, 139, 110059.
- Levin, S., Toerper, M., Hamrock, E., Hinson, J. S., Barnes, S., Gardner, H., ... & Kelen, G. (2018). Machine-learning-based electronic triage more accurately differentiates patients with respect to clinical outcomes compared with the emergency severity index. *Annals of emergency medicine*, 71(5), 565–574. <https://www.sciencedirect.com/science/article/abs/pii/S0196064417314427>

- Madanian, S., Airehrour, D., Kumar, N., & Cherrington M., (2018). Smart Cap for Visually Impaired in Disaster Situations. In *ISCRAM Asia Pacific 2018 Proceedings-1st International Conference on Information Systems for Crisis Response and Management Asia Pacific*. Wellington.
- Madanian, S., Airehrour, D., Cherrington, M., and Joy A., "mHealth and Big-Data Integration: Promises for Healthcare System in India" *BMJ Health & Care Informatics*, 2019. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7062344/pdf/bmjhci-2019-100071.pdf>
- Maddox, T. M., Rumsfeld, J. S., & Payne, P. R. (2019). Questions for artificial intelligence in health care. *JAMA*, 321(1), 31–32.
- Marescaux, J., Leroy, J., Gagner, M., Rubino, F., Mutter, D., Vix, M., Butner, S. E., & Smith, M. K. (2001). Transatlantic robot-assisted telesurgery. *Nature*, 413(6854), 379–380. <https://doi.org/10.1038/35096636>
- Mesko, B., Hetényi, G., & Györfy, Z. (2018). Will artificial intelligence solve the human resource crisis in healthcare? *BMC health services research*, 18(1), 1–4.
- Ministry of Health. (2002). *Reducing Inequalities in Health*. Wellington, New Zealand: Author. www.health.govt.nz/system/files/documents/publications/reducineqal.pdf
- Moore, C., Patrick, S., Morris, M., Hough, K., Nordstrom, S., Thompson, R., & Mahoney, L. (2018). Temuka, South Canterbury, New Zealand: Community Assessment, Needs Analysis And Health Promotion. *Scope: Contemporary Research Topics (Health and Wellbeing)*, 2018. <https://www.thescope.org/assets/Uploads/f5d8f2acc0/173-Scope-Health-and-Wellbeing-3-Moore-et-al.pdf>
- Orion Health. (3 April, 2019). *AI Day 2019: Building trustworthy AI for the future*. Retrieved from <https://orionhealth.com/nz/knowledge>.
- Patel, U. K., Anwar, A., Saleem, S., Malik, P., Rasul, B., Patel, K., ... & Arumaithurai, K. (2021). Artificial intelligence as an emerging technology in the current care of neurological disorders. *Journal of Neurology*, 268(5), 1623–1642. <https://link.springer.com/article/10.1007/s00415-019-09518-3>
- Pedersen, M., Verspoor, K., Jenkinson, M., Law, M., Abbott, D. F., & Jackson, G. D. (2020). Artificial intelligence for clinical decision support in neurology. *Brain Communications*, 2(2), fcaa096. <https://academic.oup.com/braincomms/article/2/2/fcaa096/5869431>
- Peng, L., Peng, M., Liao, B., Huang, G., Li, W., & Xie, D. (2018). The advances and challenges of deep learning application in biological big data processing. *Current Bioinformatics*, 13(4), 352–359.
- Puaschunder, J. M., Mantl, J., & Plank, B. (2020). Medicine of the future: The power of Artificial Intelligence (AI) and big data in healthcare. *RAIS Journal for Social Sciences*, 4(1), 1–8. <http://journal.rais.education/index.php/raiss/article/download/83/62>
- Ranev, D., & Teixeira, J. (2020). History of Computer-Assisted Surgery. *The Surgical Clinics of North America*, 100(2), 209–218. <https://doi.org/10.1016/j.suc.2019.11.001>. https://link.springer.com/chapter/10.1007/978-3-642-29728-1_1
- Runciman, M., Darzi, A., & Mylonas, G. P. (2019). Soft robotics in minimally invasive surgery. *Soft robotics*, 6(4), 423–443. <https://www.liebertpub.com/doi/pdfplus/10.1089/soro.2018.0136>
- Sardar, P., Abbott, J. D., Kundu, A., Aronow, H. D., Granada, J. F., & Giri, J. (2019). Impact of artificial intelligence on interventional cardiology: from decision-making aid to advanced interventional procedure assistance. *Cardiovascular Interventions*, 12(14), 1293–1303.
- Smith, J. A., Jivraj, J., Wong, R., & Yang, V. (2016). 30 Years of Neurosurgical Robots: Review and Trends for Manipulators and Associated Navigational Systems. *Annals of Biomedical Engineering*, 44(4), 836–846. <https://doi.org/10.1007/s10439-015-1475-4>.
- Troccaz, J., Dagnino, G., & Yang, G.-Z. (2019). Frontiers of Medical Robotics: From Concept to Systems to Clinical Translation. *Annual Review of Biomedical Engineering*, 21, 193–218. <https://doi.org/10.1146/annurev-bioeng-060418-052502>
- UNSDG Goal 3 (2021). Department of Economic and Social Affairs. Sustainable Development. <https://sdgs.un.org>
- Vaishya, R., Javaid, M., Khan, I. H., & Haleem, A. (2020). Artificial Intelligence (AI) applications for COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 14(4), 337–339.
- Vervoort, D., Marvel, F. A., Isakadze, N., Kpodonu, J., & Martin, S. S. (2020). Digital cardiology: opportunities for disease prevention. *Current Cardiovascular Risk Reports*, 14(8), 1–7.
- Xu, J., Yang, P., Xue, S., Sharma, B., Sanchez-Martin, M., Wang, F., ... & Parikh, B. (2019). Translating cancer genomics into precision medicine with artificial intelligence: applications, challenges and future perspectives. *Human Genetics*, 138(2), 109–124.
- Yu, K. H., Beam, A. L., & Kohane, I. S. (2018). Artificial intelligence in healthcare. *Nature Biomedical Engineering*, 2(10), 719–731. <https://drive.google.com/file/d/10U3KnmY8lgQk3GXn14sMv7Tp4wsxk-n/view>
- Zhou, Y., Wang, F., Tang, J., Nussinov, R., & Cheng, F. (2020). Artificial intelligence in COVID-19 drug repurposing. *The Lancet Digital Health*. <https://www.sciencedirect.com/science/article/pii/S2589750020301928>
- Zemmar, A., Lozano, A. M., & Nelson, B. J. (2020). The rise of robots in surgical environments during COVID-19. *Nature Machine Intelligence*, 2(10), 566–572. <https://doi.org/10.1038/s42256-020-00238-2>

REDUCING SECLUSION USE FOR TĀNGATA WHAI I TE ORA THROUGH INTEGRATION OF MĀORI CULTURE INTO PRACTICE

Natasha Moore

INTRODUCTION

The definition of seclusion under the Mental Health (Compulsory Assessment and Treatment) Act 1992 (as cited in Ministry of Health [MoH], 2010) is “where a consumer is placed alone in a room or area, at any time and for any duration, from which they cannot freely exit” (MoH, 2010, p. 7). Seclusion is meant only to be used as a last resort for patients, or proposed patients, admitted to New Zealand mental health services under the Mental Health (Compulsory Assessment and Treatment) Act 1992 (as cited in MoH, 2010). Seclusion can be likened to being stranded alone on an island, disconnected from resources and any potential help. Studies have shown little or no therapeutic value in the use of seclusion, and it has been proven to both negatively influence welfare and disrupt the therapeutic relationship between consumers and healthcare staff (Mellow et al. as cited in Jury et al., 2019; Whitecross, Seeary & Lee, 2013). The purpose of this literature review is to explore the benefits of integrating Māori cultural practices into nursing practice in an acute inpatient setting, and the potential impact this could have on reducing inequities between Māori and non-Māori in regard to the use of seclusion.

ISSUE

In March of 2018, with the help of Te Pou o te Whakaaro Nui, the Health Quality and Safety Commission (HQSCNZ) initiated a plan for ‘Zero Seclusion’ by 2020 (HQSCNZ, 2018a). However, recently released statistics show the use of seclusion in mental health practice has been on a steady incline since 2017 (Cooke, 2021). A study completed by McLeod, King, Stanley, Lacey and Cunningham (2017) identified that Māori patients admitted to inpatient mental health units had a rate of seclusion 39 per cent higher than non-Māori patients.

While the end goal is to completely remove seclusion as a practice in New Zealand mental health services (HQSCNZ, 2018a), in the interim there needs to be significant progress made in reducing the inequities between Māori and non-Māori regarding seclusion statistics (Cooke, 2021; HQSCNZ, 2018b). A study by Sambrano and Cox (2013) explored indigenous Australians’ experiences of seclusion and noted that seclusion served as a continuation of the power imbalance between health service providers and indigenous consumers that has been present since colonisation (Sambrano & Cox, 2013). These sentiments can also be applied to Māori, the indigenous population of New Zealand. This study indicates seclusion is much more damaging for indigenous people, as it is a continuation of treatment they already expect from healthcare professionals.

Initially, the research question was focused on what could be done to reduce the use of seclusion for Māori patients. However, this is a large topic and much of what is being done to reduce seclusion applies to those of all ethnicities, not Māori specifically. Therefore, the focus became looking at whether integration of Māori culture and practice into mental health care could reduce the use of seclusion for adult Māori patients in acute inpatient mental health care.

DISCUSSION

Wharewera-Mika et al. (2016) identified that Māori patients felt that they would benefit from access to a Māori world view. They discussed that freedom for *tāngata whai i te ora* to access cultural practices and procedures was integral to reducing seclusion and restraint practices. Te Pou o te Whakaaro Nui (2014) and Wharewera-Mika et al. (2016) both discuss the importance of *kanohi kitea* or *kanohi ki te kanohi*, meaning 'to be seen' or 'face-to-face'. The presence of Māori staff members in a face-to-face environment can be reassuring to Māori patients due to the nature of the connection among Māori to a shared cultural heritage (Te Pou o te Whakaaro Nui, 2014). Te Pou o te Whakaaro Nui (2014) also suggests this connection can lead to stronger therapeutic relationships between staff and patients, therefore reducing the need for seclusion and restraint due to increased effectiveness of de-escalation techniques. Wharewera-Mika et al. (2016) also discusses *kanohi ki te kanohi* care in the context of approaching newly admitted Māori patients. By following protocols of sitting face to face with a person, offering food or drink, and using cultural healing practices, such as song or prayer, can restore the *mana* of the Māori patient (Wharewera-Mika et al., 2016). Following protocols also serves to prevent tension between staff and patients and provides a basis for building working relationships with *tāngata whai i te ora*. Te Pou o te Whakaaro Nui (2014) explains the pre-entry and admission process into inpatient mental health care can be influential on the entire experience of the patient's mental health journey. Showing hospitality and respecting Māori protocols upon the first interaction with a patient can help form rapport and a therapeutic relationship that can benefit the patient in the long run, as well as reduce agitation and anxiety in the short term, reducing the likelihood for seclusion.

Similarly, it is important for staff, both Māori and non-Māori, to recognise the importance of incorporating Te Reo into their practice. Plessas, McCormack and Kafantaris (2019) identify the use of Te Reo within mental health practice as a recognition of identity as well as a show of respect. Te Pou o te Whakaaro Nui (2014) also discusses the use of Te Reo in engaging and connecting with *tāngata whai i te ora* to aid in building stronger therapeutic relationships. They identify the use of Te Reo Māori as necessary in conveying ideas and understanding of a situation that other languages cannot. It is also valuable in engaging *tāngata whai ora* in conversation with staff. Wharewera-Mika et al. (2019) also explains use of Te Reo in *waiata*, *karakia*, or *kapa haka* can also be useful in culturally appropriate sensory modulation and as a healing practice for Māori patients. Use of Te Reo is also conducive in establishing a strong sense of cultural identity. Wharewera-Mika et al. (2019) identify Māori-specific sensory modulation as beneficial when offering alternative strategies to more restrictive interventions, like seclusion.

Te Pou o te Whakaaro Nui (2014), Wharewera-Mika et al. (2016), Plessas et al. (2019) and Wharewera-Mika et al. (2019) all suggest that by integrating Māori culture and practices into mental health care practice, use of seclusion could be reduced through formation of stronger therapeutic relationships, and use of culturally specific de-escalation and sensory modulation techniques. However, it is important to recognise complexities of cultural identity. As Plessas et al. (2019) point out, some Māori may not hold traditional values, or see Māori cultural practices as relevant or appropriate regarding their care. As with all nursing care, it must be based on the individual's preferences which can be ascertained through thorough communication with the Māori patient (Plessas et al., 2019).

Another barrier in the path to reducing seclusion practices is the accessibility of Māori healthcare staff. Both Wharewera-Mika et al. (2016) and Te Pou o te Whakaaro Nui (2014) identify the importance of Māori healthcare staff in providing a culturally safe environment for patients who identify as Māori, as well as building therapeutic relationships that lead to a reduction in use of seclusion. However, employment of Māori healthcare staff into mental health relies on availability of these staff for employment. Māori make up an estimated 16.7 per cent of the New Zealand population in total as of June 2020 (Statistics New Zealand, 2020), but only 8.5 per cent of the total healthcare workforce identifies as Māori and only 9 per cent of district health boards' mental health and addictions employees are Māori (Te Rau Matatini, 2017). The Māori nursing workforce is even smaller, with only 7 per cent of nurses identifying as Māori (New Zealand Nurses Organisation, n.d.). This is particularly an issue in mental

health as Māori are more likely, of all ethnicities, to be seen by mental health and addiction services (MoH, 2021), making the disparity between the number of Māori staff when compared to the percentage of Māori patients only more apparent. While there are programmes in place to support and encourage more Māori to enter healthcare as a profession, for example: the University of Otago's Māori Health Workforce Development Unit (University of Otago, n.d.), there are still disparities in the number of Māori entering the healthcare profession. This, therefore, impacts on the benefits of having Māori staff as outlined above due to lower numbers of Māori staff in employment, and hinders any progress to be made in reducing seclusion rates of Māori patients. While there are still barriers to change being made, it is evident from the literature above that there are still many options and ways that care could be improved for Māori in an acute inpatient setting in order to reduce the inequities in seclusion statistics.

RECOMMENDATIONS

Integration of Māori culture and practices into mental health care

Wharewera-Mika et al. (2016) and Te Pou o te Whakaaro Nui (2014) both suggest that to reduce seclusion rates for Māori, there needs to be changes made to mental health practice at all levels to integrate Māori culture and practices into care, as discussed above. This can include having a Māori staff member, cultural advisor, or kaumatua present, as advised by Te Pou o te Whakaaro Nui (2014), or involve offering the patient food or drink, alongside use of cultural healing practices, such as waiata or karakia (Wharewera-Mika et al., 2016). By welcoming Māori patients onto the ward in a way that respects them and their culture, it can have a positive impact on their own view of the environment and can provide a sense of calm and safety that is integral in reducing the anxiety and agitation, or tension, they might feel otherwise. This reduces the likelihood of the use of seclusion being a necessary factor in the admission process and builds the basis for a strong therapeutic relationship with the patient that will not only benefit their health outcomes, but also improve the chances of having no further use of seclusion while on the ward (Te Pou o te Whakaaro Nui, 2014; Wharewera-Mika et al., 2016).

Involve Māori staff in the care of Māori patients

Wharewera-Mika et al. (2016) and Te Pou o te Whakaaro Nui (2014) both conclude that having Māori staff, including Māori nurses, involved in the care of Māori patients can reduce the use of seclusion on these patients, as well as improve overall health outcomes. This includes having Māori health practitioners involved in all levels of care, as well as the input of Māori mental health assistants and Māori cultural advisors. It is expected that the use of seclusion will reduce due to the stronger therapeutic relationship built between Māori staff and tāngata whai i te ora, with Māori staff better equipped to de-escalate the patient due to the shared relationship. However, this recommendation relies on the availability for Māori staff, therefore, it is also implied that inpatient mental health providers should put emphasis on employing and retaining Māori staff members as they are invaluable in potential to reduce Māori seclusion rates. It is also advised for facilities to have input of cultural advisors, including kaumatua and kuia, to provide guidance and education for both staff and patients and to promote culturally specific interventions in place of seclusion use (Te Pou o te Whakaaro Nui, 2014; Wharewera-Mika et al., 2016).

Improve staff knowledge of Māori practices/culture

In order to achieve the goal of integrating Māori culture into practice, it is important that the staff knowledge base of Māori culture and practices improves, and staff recognise the benefits of integrating this into their care. While it is required for both registered nurses and enrolled nurses to provide culturally safe care and apply the principles of Te Tiriti O Waitangi to nursing practice (Nursing Council of New Zealand [NCNZ], 2007; NCNZ, 2012), it is oftentimes up to the nurse's own personal judgement on whether they meet this requirement. Te Pou

o te Whakaaro Nui (2014) suggests it would be appropriate to allow opportunities for experienced Māori mental health professionals to provide cultural and practical advice to non-Māori staff, including nurses. The findings of Wharewera-Mika et al. (2016) saw value in developing and facilitating Māori peer support initiatives. More general education provided to staff of common Te Reo phrases or Māori practices could also slowly build up the knowledge base of staff and increase their confidence in day-to-day use of this knowledge in practice. This could be achieved in ways as simple as having an accessible list of common Māori phrases available to staff. Cultural advisors could also play a role in education of staff through in-service training. By having non-Māori staff engaging with Māori culture and practice when providing care, it can create an environment that is less hostile and more inclusive of tāngata whai i te ora, and therefore reduce seclusion use and improve health outcomes (Te Pou o te Whakaaro Nui, 2014; Wharewera-Mika et al., 2016).

CONCLUSION

In summary, seclusion is not a useful practice in mental health care as it is essentially leaving consumers stranded alone on an empty island. Seclusion use is particularly damaging to tāngata whai i te ora. This is because seclusion is a continuation of the degrading and discriminatory treatment Māori have been facing since colonisation. Maori also have much higher rates of seclusion than any other ethnicity in New Zealand. According to the literature, reducing seclusion for tāngata whai ora can be achieved by integration of Māori culture and practices, such as use of Te Reo, culturally specific de-escalation techniques, and Māori protocols into mental health care, and the involvement of Māori staff members the care of Māori consumers, at all levels. Therefore, it is necessary to implement changes in practice to accommodate integration of Māori culture and practices to reduce seclusion use. This can be done through a stronger focus on building the therapeutic relationships integral in care starting at admission, employing more Māori staff to meet the needs of Māori patients, and educating staff on Māori culture and practices. The ideal outcome being to reduce or eliminate seclusion use, or other restrictive practices, in inpatient mental health care for tāngata whai i te ora.

Natasha Moore is a third-year nursing student completing her Bachelor of Nursing with Otago Polytechnic. Her interest in seclusion reduction and equity in mental health care developed throughout her experiences on placement during her studies. She hopes to apply this to her future practice.

Correspondence to: Natasha Moore. Email: natasha.moore307@gmail.com

REFERENCES

- Cooke, H. (2021). Huge growth in use of 'last resort' seclusion indicates mental health system in crisis, and in worse shape than when Labour elected in 2017. *Stuff News*. Retrieved from <https://www.stuff.co.nz/national/politics/300266892/huge-growth-in-use-of-last-resort-seclusion-indicates-mental-health-system-in-crisis-and-in-worse-shape-than-when-labour-elected-in-2017>
- Health Quality & Safety Commission New Zealand. (2018a). *New projects seek to eliminate seclusion and improve service transitions for mental health consumers*. Retrieved from <https://www.hqsc.govt.nz/our-programmes/mental-health-and-addiction-quality-improvement/news-and-events/news/3162/>
- Health Quality & Safety Commission New Zealand. (2018b). *Zero seclusion: Towards eliminating seclusion by 2020* [Infographic]. Retrieved from https://www.hqsc.govt.nz/assets/Mental-Health-Addiction/Resources/Zero_seclusion_infographic_Mar_2018.pdf
- Jury, A., Lai, J., Tuason, C., Koning, A., Smith, M., Boyd, L., Swanson, C., Fergusson, D., & Gruar, A. (2019). People who experience seclusion in adult mental health inpatient services: An examination of health of the nation outcome scales scores. *International Journal of Mental Health Nursing*, 28(1), 199–208. doi:10.1111/inm.12521
- McLeod, M., King, P., Stanley, J., Lacey, C., & Cunningham, R. (2017). Ethnic disparities in the use of seclusion for adult psychiatric inpatients in New Zealand. *New Zealand Medical Journal*, 130(1454), 30–39. Retrieved from <https://journal.nzma.org.nz/journal-articles/ethnic-disparities-in-the-use-of-seclusion-for-adult-psychiatric-inpatients-in-new-zealand>
- Ministry of Health. (2021). *Mental health and addictions: Service use 2017/18 tables*. Retrieved from <https://www.health.govt.nz/publication/mental-health-and-addiction-service-use-2017-18-tables>
- Ministry of Health. (2010). *Seclusion under the mental health (Compulsory Assessment and Treatment) Act 1992*. Retrieved from <https://www.health.govt.nz/system/files/documents/publications/seclusion-guidelines-feb10.pdf>
- New Zealand Nurses Organisation. (n.d.). *NZNO strategy for nursing 2018–2023*. Retrieved from https://www.nurses.org.nz/nursing_workforce
- Nursing Council of New Zealand. (2007). *Competencies for registered nurses*. Retrieved from https://www.nursingcouncil.org.nz/Public/Nursing/Standards_and_guidelines/NCNZ/nursing-section/Standards_and_guidelines_for_nurses.aspx
- Nursing Council of New Zealand. (2012). *Competencies for enrolled nurses*. Retrieved from https://www.nursingcouncil.org.nz/Public/Nursing/Standards_and_guidelines/NCNZ/nursing-section/Standards_and_guidelines_for_nurses.aspx
- Plessas, A., McCormack, J., & Kafantaris, I. (2019). The potential role of applied behaviour analysis in the cultural environment of Māori mental health. *Behaviour Analysis in Practice*, 12(4), 854–868. doi:10.1007/s40617-019-00359-0
- Sambrano, R. & Cox, L. (2013). 'I sang Amazing Grace for about 3 hours that day': Understanding indigenous Australians' experience of seclusion. *International Journal of Mental Health Nursing*, 22(6), 522–531. doi:10.1111/inm.12015
- Statistics New Zealand. (2020). *Māori population estimates: At 30 June 2020*. Retrieved from stats.govt.nz/information-releases/maori-population-estimates-at-30-june-2020
- Te Rau Matatini. (2017). *Profiling the Māori health workforce 2017*. Retrieved from https://terauora.com/wp-content/uploads/2019/05/Profiling-of-the-Ma%CC%84ori-Health-Workforce-2017_Te-Rau-Matatini.pdf
- Te Pou o Te Whakaaro Nui. (2014). *Supporting seclusion reduction for Māori: "Taiheretia tatou kia puta te hua"*. Retrieved from <https://www.tepou.co.nz/resources/supporting-seclusion-reduction-for-māori>
- University of Otago. (n.d.). *Māori health workforce development unit*. Retrieved from <https://www.otago.ac.nz/mhwd/index.html>
- Wharewera-Mika, J., Cooper, E., Wiki, N., Field, T., Haitana, J., Toko, M., Edwards, E., & McKenna, B. (2016). Strategies to reduce the use of seclusion with tāngata whai i te ora (Māori mental health services users). *International Journal of Mental Health Nursing*, 25(1), 258–265. doi:10.1111/inm.12219
- Whitcross, F., Seery, A. & Lee, S. (2013). Measuring the impacts of seclusion on psychiatry inpatients and the effectiveness of a pilot single-session post-seclusion counselling intervention. *International Journal of Mental Health Nursing*, 22(6), 512–521. doi:10.1111/inm.12023

OBESITY STIGMA: THE ROLE OF HEALTHCARE PRACTITIONERS IN IMPROVING PATIENT OUTCOMES

Olivia Austen

INTRODUCTION

Obesity stigma is a common occurrence for people that are labelled either by society or more often by the measure of body mass index (BMI) as 'obese' or 'overweight.' Within healthcare, perpetuation of this stigma occurs at alarming rates with harmful psychological and physiological repercussions for patients (Phelan et al., 2015). It is the professional responsibility of healthcare practitioners to ensure that the care they provide is non-stigmatising and ethical for all patients, but commonly this is not the case. Isolation of people from healthcare and other personal support networks can be a response to experiencing stigmatising healthcare. (Puhl & Brownell, 2006). Isolation due to obesity stigma can be linked to this year's SCOPE Health & Wellbeing theme of islands, as patients being isolated from adequate healthcare is similar to an island being disconnected from the mainland. In this analogy, stigma experienced is the boundary that separates those experiencing it from healthcare and further can cause avoidance of healthcare (Phelan et al., 2015). Isolation from healthcare services needs to be avoided if therapeutic relationships between healthcare professionals and patients are to be preserved. This article will explore the effects of obesity stigma on patients, the source of these attitudes and the role of healthcare professionals in improving care for all higher-weight patients, and will make two suggestions for how the isolating impact of stigmatisation can be remedied. This article has been written from a nursing perspective but the findings and information included are applicable to all healthcare professions and their interactions with higher-weight patients.

BACKGROUND

In order to understand the issue of obesity stigma, first an understanding of the terms used in this article is required. The use of terms 'overweight' and 'obese' are recognised as contributing to weight-based stigma, but will be used in this article to form a connection to the terminology used within the reviewed evidence-based literature. The terms 'overweight' and 'obese' are used in relation to their categories under the body mass index. The terms weight stigma, weight bias, obesity bias and obesity stigma are used interchangeably throughout this article. In New Zealand and around the world, being overweight is classified as having a BMI of 25 kg/m² or more, and being obese as a BMI of 30 kg/m² or more (Ministry of Health [MOH], 2017; World Health Organization [WHO], 2020). BMI is the international standardised measure for indicating and diagnosing overweight and obesity in patients, but some research has found that it is not always an accurate indicator of increased risk for morbidity and mortality, and consequently obesity does not always signify an increase in adverse health risks (Essayli, Murakami, Wilson & Latner, 2017; Tylka et al., 2014). People who are outside of 'average weight' BMI range can still be 'healthy' and equally people with an 'average' BMI can still be 'unhealthy' (Bacon & Aphramor, 2011; Tylka et al., 2014). Research by Puhl and Brownell (2006) indicates that people who are categorised as overweight or obese by BMI, experience stigma in over half of their interactions with healthcare professionals (69 per cent from doctors and 46 per cent from nurses). Patients' experiences of weight stigma from healthcare professionals can include, insufficient non-verbal communication (lack of eye contact), inappropriate comments and use of undesirable

weight descriptors (that is, 'too fat' and the terms 'overweight' and 'obesity'), rejection, and negative assumptions about abilities (Essayli et al., 2017; Puhl & Brownell, 2006; Wakefield & Feo, 2017). These incidents happen due to health professionals learned and internalised weight bias. The stigma surrounding people who are overweight or obese often includes an assumption that they are 'unhealthy' for the reason that they do not fit into the 'average-weight' BMI category (18.5-24.9 kg/m²), and stereotypical assumptions that they are weak-willed, stupid, lack self-discipline and personal control (Phelan et al., 2015; Puhl & Brownell, 2006; Tylka et al., 2014). Stereotypes about people with obesity impact the care provided by healthcare professionals (Phelan et al., 2015). In New Zealand, 66.2 per cent of the population is considered overweight or obese (MOH, 2020a), with about one in three adults (30.9 per cent) falling into the obese category (MOH, 2020b). These statistics represent a large portion of the population that have the potential to be negatively impacted by weight bias in Aotearoa.

DISCUSSION

Sources of Weight-Bias Attitudes

Origins behind health professionals' strong negative attitudes and preconceptions about weight often come from the education they receive during training. The main focus on obesity in this training, is that it should be seen an avoidable risk factor, and this misconstrues weight as something that can be controlled solely through determination and appropriate diet and exercise (Phelan et al., 2015; Puhl & Brownell, 2006; Tylka et al., 2014). This places unfair blame on overweight and obese people regarding their weight. Obesity is widely viewed by those in the field of healthcare as being a risk factor for illness and disease, however data suggests that this is not the case. The evidence presented in Bacon and Aphramor (2011) indicates that a higher BMI is linked to, but not the cause of, increased risk for disease, and also states that due to the 'obesity paradox' higher BMI has been associated with decreased mortality when compared to people with lower BMI, in certain diseases (chronic kidney disease, hypertension and so on) (Bacon & Aphramor, 2011; Puhl & Brownell, 2006). It is also important to highlight here that the medical model of health often uses a simplistic view of obesity, one that does not take into account that there are many more factors to obesity than just diet and exercise; genetics, environment, social and other factors also influence weight (Phelan et al., 2015). The attitudes that healthcare professionals hold about people with overweight and obesity can impact the way they provide care to these patients, this can happen through preconceptions being translated into discriminatory behaviours (Puhl & Brownell, 2006). This may occur through implicit and explicit means. Examples of behaviours that implicit and explicit attitudes may result in are, respectively, poor non-verbal communication and alterations in decision making (Phelan et al., 2015).

Effects of Stigmatising Healthcare Experiences

Common themes that appeared throughout the literature include wide-ranging impacts on physiological health and psychological well-being (Phelan et al., 2015). Physical effects include exposure to high levels of stress hormones such as cortisol (which over time can have multiple negative health impacts) and not being taken seriously by health professionals for other non-weight related health concerns, resulting in lack of adequate treatment and the prolongation of health issues (bias causes health professionals to assume the health concern being presented is related to excess weight) (Phelan et al., 2015). Psychological effects from being subjected to weight bias attitudes from health professionals can include risk of depression, negative self-talk, lower self-esteem and disordered eating (Essayli et al., 2017; Phelan et al., 2015; Puhl & Brownell, 2006; Puhl, Himmelstein, Gorin, & Suh, 2017).

Experiencing weight stigma in a range of healthcare settings has also been shown in correlation with patient disengagement with health services, decrease in perceived quality of care, less patient-centred care and a mistrust of health professionals by patients with overweight or obesity (Phelan et al., 2015). Thus it can be inferred that weight stigma can have a major negative impact on the likeliness of an overweight or obese patient accessing essential healthcare services.

Weight-Normative vs. Weight-Inclusive Approaches to Care

Patient-centred, non-stigmatising healthcare on the other hand, can help reduce the patient perceived threat of conversations about weight (Phelan et al., 2015). A case study by Wakefield and Feo (2017) showed that common impacts of non-stigmatising care can include an increase in positive feelings and self-esteem and increased ability to self-manage. Non-stigmatising, person-centred care also promoted spiritual and emotional well-being, and resulted in improved patient outcomes (Wakefield & Feo, 2017).

A review of weight-normative and weight-inclusive approaches to health by Tylka et al., (2014) found that the universally used, weight-normative approach (which emphasises weight as the main determinant of health and where the key focus is on weight management and loss to treat and prevent a variety of health problems and generally improve health) is not effective for the majority of people, as they are likely to regain previously lost weight, and continue the process of weight cycling (losing and gaining weight periodically). With a weight-normative approach, patients are more likely to experience and internalise weight stigma, and are therefore more likely to suffer its harmful effects of body shame, body dissatisfaction, and disordered eating (Tylka et al., 2014).

The inverse of this is the weight-inclusive approach. This approach to health focuses on working holistically with patients and shifts the attention from weight loss to being and achieving health, independent of weight (Tylka et al., 2014). This is accomplished by bringing attention to the complexity of obesity, and an appreciation that there is no 'normal' size that bodies should be, it recognises that variety in body size and shape is natural and that there is no one size that a person needs to be in order to achieve health. It also refutes the well-established idea with the healthcare community that a higher BMI is a direct cause of poor health (Tylka et al., 2014). Weight-inclusive care is non-stigmatising and patient-centred, and is about assessing the individual needs of individual patients. This approach reduces weight stigma experienced by patients in the healthcare setting.

One of the models of weight-inclusive healthcare that the review by Tylka et al. (2014) supports is the Health at Every Size (HAES) model. This model's purpose is to shift the driving factor of health away from weight loss towards an improvement in health promoting behaviours (Bacon & Aphramor, 2011). This is done through recommending and education around intuitive eating and encouraging body acceptance (Bacon & Aphramor, 2011; Tylka et al., 2014). Intuitive eating is where instead of using a prescribed diet or restricting any food or food groups, patients are encouraged to notice and become aware of their body's signals, to eat when they actually feel hungry, and to cease eating when they feel full (Bacon & Aphramor, 2011). This type of regulation of food consumption is related to improved intake of nutrients, and reduced disordered eating. Although there have been concerns that a body positive and accepting approach to obesity would cause an increase in the amount of people with obesity, this is not supported by evidence (Bacon & Aphramor, 2011).

A weight-inclusive and non-stigmatising approach to health upholds the bioethical principles of beneficence and nonmaleficence and has implications for all healthcare practitioners to keep the focus on being patient-centred and non-judgemental (Bacon & Aphramor, 2011; Tylka et al., 2014). The relevance of this evidence-based literature to nursing practice is that within the healthcare workforce, nurses make up the majority, and thus it falls to the profession of nursing to become leaders in championing the drive to eradicate weight stigma from all healthcare practice (Wakefield & Feo, 2017). The benefits of this evidence is that there is already a patient-centred basis for change, and there are already established and tested ideas and approaches which can be used to help inform future strategies to overcome healthcare professional weight stigma, and to help patients cope with experienced weight bias (Phelan et al., 2015; Puhl & Brownell, 2006). Two recommendations follow on how these goals, however ambitious they may seem, could lead to increased quality of care and health outcomes for higher-weight people.

RECOMMENDATIONS

Education Programs for Health Professionals

One evidence-based recommendation that would be likely to decrease obesity stigma in the context of healthcare, would be to have focused education programs for health professionals regarding the complexity of obesity and obesity care (Phelan et al., 2015). This would be most beneficial if integrated throughout all healthcare professions' curricula, so that students and current practitioners would have the same levels of knowledge on this complex issue. This education would need to concentrate on the multifaceted causes for obesity and the need for non-stigmatising care for people with overweight and obesity, and would include identifying the ways that health professionals carry obesity bias and how this can translate to discrimination of patients. This education would also need to highlight the negative health impacts of obesity stigma for patients.

Education programs could include the use of weight-neutral, non-stigmatising language when discussing weight with patients in order to keep the patient engaged and reduce their negative views of the healthcare system. The rationale behind implementing this sort of educational training for nurses and other health professionals in New Zealand lies with the positive impacts on patients, which include increases in positive feelings and self-esteem, increases in spiritual and emotional well-being, and improved patient outcomes (Bacon & Aphramor, 2011). It ensures that the care provided by nurses is effective, compassionate, inclusive, and based on best practice evidence. Once the evidence-based facts are known, nurses and other healthcare professionals are able to gain the competence to implement change in their practice.

Making the Shift to a Weight-Inclusive Model of Health

The second recommendation to benefit patient care would be pushing for change from the current weight-normative to a weight-inclusive model of health. This should be within national health policy, but also driven by individual practitioners in the healthcare sector. The implementation of this type of model could be accomplished by nurse-led initiatives, such as education sessions for all healthcare professionals, around a weight-inclusive approach to care. The Health At Every Size (HAES) framework is an evidenced-based example of a weight-inclusive model that can be used to promote body acceptance and long-term healthy behavioural changes (Bacon, Stern, Van Loan, & Keim, 2005; Bacon & Aphramor, 2011).

Specific changes to practice could include a push for patient inclusive motivational interviewing, and a focus on forming habits that promote health rather than focusing solely on weight loss. Intuitive eating and educating patients on how to tune into signals of hunger and satiety (as well as how their body and mood responds to different foods), allows for the formation of lasting habits rather than the short-lived results of restrictive dieting (Bacon & Aphramor, 2011). Promoting self-acceptance is another key aspect of the HAES approach; compassion-focused behaviour change theory suggests that having higher self-esteem makes a person more likely to implement positive health changes (Bacon & Aphramor, 2011). This can be achieved through helping patients to identify the value of their bodies as they are, despite how this may differ to a desired body weight or image (Bacon & Aphramor, 2011). Focusing on what a patient's body is able to do and the activities that they enjoy creates an environment of well-being and self-care rather than forcing them into a generalised box that says they must exercise for a set time however many times a week, in a certain manner. Personalising care and shifting the focus from weight loss to well-being is the essence of a weight-inclusive model of health.

Based on the previously presented evidence, the clinical outcomes of implementing this type of change would include an increase in patient self-esteem, body satisfaction and adherence to behavioural change recommendations, and would also seek to address systemic and institutionalised weight discrimination within healthcare (Tylka et al., 2014).

CONCLUSION

Due to the high rates of overweight and obesity in New Zealand, it is important the care that nursing and other health professionals provide is non-stigmatising and free of bias to improve the health and well-being of patients with overweight and obesity. In order to accomplish this, there must be adequate education of students and current practitioners alike to recognise and challenge internally-held weight biases. In order to provide more effective, beneficial, stigma-free care to higher-weight patients, there should be a shift in language used when talking about weight with patients. A global healthcare move towards a weight-inclusive system of health is a way of increasing patient benefits and moving towards inclusive, ethical, evidence-based care. This will also assist in minimising the isolating effects of obesity stigma for patients and allow them to reconnect with healthcare services. This reconnection can be likened to that of a boat that restores connection to an isolated island after a storm; through weight-inclusive healthcare those people isolated through obesity stigma can be brought back to the mainland of evidence-based healthcare. People whose bodies are obese or overweight deserve the same level of respect and care as any other patient and deserve to not be discriminated against within the realm of healthcare. To accomplish this, the preconceived attitudes of health practitioners about weight must be challenged to address this issue of obesity stigma, and to inform best patient care.

Olivia Austen is a third-year student completing her Bachelor of Nursing at Otago Polytechnic in Dunedin, New Zealand. She is interested in understanding how health practitioner biases can affect patient care and outcomes. She has a passion for ensuring nursing care is patient-centred, compassionate, and free of stigma.

Correspondence to: Olivia Austen. Email: olivia.austen13@gmail.com

REFERENCES

- Bacon, L., Stern, J., Van Loan, M., & Keim, N. (2005). Size acceptance and intuitive eating improve health for obese, female chronic dieters. *Journal of the American Dietetic Association*, 105(6), 929–936. doi:10.1016/j.jada.2005.03.011.
- Bacon, L., & Aphramor, L. (2011). Weight science: Evaluating the evidence for a paradigm shift. *BMC Nutrition Journal*, 10(9). doi:10.1186/1475-2891-10-9.
- Essayli, J., Murakami, J., Wilson, R., & Latner, J. (2017). The impact of weight labels on body image, internalized weight stigma, affect, perceived health, and intended weight loss behaviours in normal-weight and overweight college women. *American Journal of Health Promotion*, 31(6), 484–490. doi:10.1177/0890117116661982.
- Ministry of Health. (2017). *Clinical guidelines for weight management in New Zealand Adults*. Wellington, New Zealand: Author.
- Ministry of Health. (2020a). *Annual Data Explorer: Overweight or obese: BMI of 25.0 or greater (or IOTF equivalent for 15-17 years)*. Retrieved from https://minhealthnz.shinyapps.io/nz-health-survey-2019-20-annual-data-explorer/_w_e809c1b0/#/explore-indicators
- Ministry of Health. (2020b). *Obesity Statistics*. Retrieved from <https://www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/obesity-statistics>
- Phelan, S., Burgess, D., Yeazel, M., Hellerstedt, W., Griffin, J., & van Ryn, M. (2015). Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obesity Reviews*, 16(4), 319–326. doi:10.1111/obr.12266.
- Puhl, R., & Brownell, K. (2006). Confronting and coping with weight stigma: An investigation of overweight and obese adults. *Obesity: A Research Journal*, 14(10), 1802–1815.
- Puhl, R., Himmelstein, M., Gorin, A., & Suh, Y. (2017). Missing the target: Including perspectives of women with overweight and obesity to inform stigma-reduction strategies. *Obesity Science and Practice*, 3(1), 25–35. doi:10.1002/osp4.101.
- Tylka, T., Annunziato, R., Burgard, D., Daniélsdóttir, S., Shuman, E., Davis, C., & Calogero, R. (2014). The weight-inclusive versus weight-normative approach to health: Evaluating the evidence for prioritising well-being over weight loss. *Journal of Obesity*, 2014(special issue), 9–26. doi:10.1155/2014/983495.
- Wakefield, K., & Feo, R. (2017). Confronting obesity, stigma and weight bias in healthcare with a person centred care approach: A case study. *Australian Nursing & Midwifery Journal*, 25(1), 28–31.
- World Health Organization. (2020). *Obesity and overweight*. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

FROM ONE ISLAND TO ANOTHER – MIGRANT WORKERS FROM THE PHILIPPINES LIVING AND WORKING IN GERALDINE, NEW ZEALAND

Tessa Lee, Gemma Hooton, Olivia Hyslop, Hinemoa Julien,
Maia Love-Williams, Amy McCarthy, Natasha Moore,
Stella Murchie, and Laurie Mahoney

No man is an island, entire of itself; every man is a piece of the continent, a part of the main.

John Donne (1624)

INTRODUCTION

Citing John Donne's poem, hbgelett's (20.2.2018) blog refutes the idea that people can be an island metaphorically. He claims that "[These] island metaphors suggest that people, thinking, and knowledge are not isolated or separate. They are all interconnected, just like everything else". Albeit, both hbgelett and Donne are referring to the reliance humans have on a spiritual world or 'god'. It is the claim of the authors of this article, that they refute hbgelett and Doone and offer an alternative claim, that being, when people are isolated from their culture and are in a minority, they can be considered as an island. The Filipino migrants living in Geraldine are often working on farms (geographically isolated), which are run by New Zealanders (culturally and socially isolated) and can therefore metaphorically be considered as an island.

Geraldine or Heratini, is a small town in the South Canterbury region of the South Island of New Zealand. It is about 140 km south of Christchurch, and inland from Timaru, which is 35 km to the south. A team of nine third year Bachelor of Nursing learners undertook a community partnership project with professionals from the Heratini area in August 2021, building on a project conducted in 2017 by previous nursing students on the Heratini District. In the former project, two health needs were identified: migrant health and HPV immunisation. An impact analysis of the former project was undertaken in 2021 and the community stakeholders identified continued concern for the health of the migrant population of Heratini.

The current project, focused on the migrant population in Heratini in particular; the Filipino workers employed in the dairy industry. The learners identified medication compliance and access to health care were the main ongoing concerns for migrant workers and they created resources for the local health workforce to use to support Filipino workers.

The one thing in common that New Zealand and the Philippines has, is that both countries are archipelagos (island-based) in the Pacific region. This article contrasts relevant statistics between these two island-based countries and will then discuss a project that 3rd year Nursing students presented for their community health placement, when their population aggregate for a community health development project focused on the migrant (mainly Filipino) workers in Geraldine, New Zealand.

PART ONE

Migrants

Geographically, islands are a piece of land surrounded by water. Metaphorically people can be considered as islands when they are separated or isolated from others, in this instance Filipinos in New Zealand are separated from the Philippines and their culture. They are a minority. Hence, Filipinos in New Zealand can be considered as “islands” from a metaphorical perspective.

The Philippines is the 13th most populous country in the world with a population of 111,464,904 million, with a median age of 25.7 years; compared to New Zealand's population of 4,872,317 and a median age of 37.4 (www.worldometers as of 6/10/2021). Both countries are island based and of similar sizes. According to NZ Stats (2021) there are 72,612 Filipinos living in New Zealand which is the third largest Asian population group in New Zealand. Most Filipinos come here to undertake study, work in health care or in business (Immigration NZ, 2021), and more than 20% of Asian peoples living in New Zealand being born here (NZ Stats 2021). There are up to 187 different languages spoken in the Philippines, with Tagalog Cebuano and English being the official language, while in New Zealand English, Te Reo and Sign are the official languages (Wikipedia).



Figure 1. Philippines Source: Map of South East Asia.png – Wikimedia commons

Dairy farming in New Zealand is a key export industry that is often closely linked to the national economy yet is dependent on a substantial labour force of work visa holders who have limited rights and who have very narrow pathways to citizenship (Collins & Bayliss, 2020). Collins and Bayliss (2020) looked at temporary migration and the stereotypes of migrants created by nationalism on dairy farms. Dairy farming is one of the main occupations for many Filipino migrants living in Heratini. In 2018/19, 50.7% of work visas issued for dairy farming were issued to Filipinos with 91.7% of dairy farm visa holders identifying as male.

Heratini

Heratini is in the Timaru District of South Canterbury. Heratini has an ethnic mix including European, Māori, Pacifica, Asian, and others (Table 1). Europeans make up most of the population, with 94.7% identifying as European in the 2018 census (Statistics New Zealand, 2018). English is the most common language spoken, followed by Te Reo.

Table 1. Ethnic groups in Geraldine Source: Statistics New Zealand (2018)

Ethnic groups for people in Geraldine, 2006–18 Censuses

	2006 (%)	2013 (%)	2018 (%)
European	85.2	95.4	94.7
Māori	5.9	5.2	7.2
Pacific peoples	0.6	0.8	1.0
Asian	0.9	1.2	2.3
Middle Eastern/Latin American/African	0.3	0.6	0.7
Other ethnicity	13.4	2.6	0.9

The agricultural industry is the heart of Heratini's economy, with a substantial increase in dairy farms over the region in the last 20 years. The core forms of agriculture involve agricultural crops, dairy farming, and rearing of livestock.

Migrant Population in Heratini

The migrant population in Heratini can be defined as individuals and families who are living in Heratini on a temporary basis for work purposes. In the 2018 census, 1.4% of the Heratini population had lived overseas one year prior to the statistics being taken (Statistics New Zealand, 2018). 13% of the population had been in Heratini for 5-9 years since their arrival. Although Tagalog is the official language if the Philippines there are over 120 languages spoken there. English is an official language and is commonly spoken there.

In 2015/16, 1,772 people found employment as permanent migrants (Skilled Migrant Category principal applicants) in the Canterbury region (Immigration New Zealand, 2017). The Philippines, India, and the United Kingdom were the most source countries. 7,204 people were approved for the Essential Skills work visa in Canterbury. The Philippines and India were the two most source countries, with livestock farmers being the main occupations of Essential Skills workers in Canterbury in 2015/16 (Immigration New Zealand, 2017).

Needs Analysis of Migrant Workers

The learners completed a SWOT (strengths, weaknesses, opportunities and threats) and needs analyses of the migrant community in Heratini and found the following issues:

A lack of spaces in General Practitioners Services because the practices were fully enrolled, cost of appointments due to visa restrictions, a lack of routine screening, a lack of health services for migrants including COVID vaccinations and mental health services. Other issues the learners identified were medication adherence, hypertension, and Diabetes. Medication compliance and access to health care were the two issues this group of learners considered that they could analyse further.

PART TWO

Medication adherence

Ethnicity and cultural background are intertwined with medication adherence with Filipinos having the lowest adherence rate to prescribed medication compared to other ethnicities, particularly those in the 18–39-year age group which many of the Filipinos in Heratini includes (Taira et al., 2007, Villanueva, 2013). Additionally, Shahin et al. (2020), found that education level is significantly associated with medication adherence in migrant populations. This is significant when Filipino individuals are more at risk of developing cardiovascular disease (Taira et al., 2007). Other key factors that influence adherence were perceptions of illness, personal control over illness, and coherence. Migrants who felt they had control over their illness and positive perceptions about treatment options had increased medication adherence.

In New Zealand, barriers for medication compliance in new migrant group includes financial barriers such as paying for GP visits and medication, lack of affordability to purchase over the counter medications, problems with family sharing prescribed medications, misconceptions due to language barriers, not understanding information such as why they are taking medication and when (Babar, Pengelly, Scahill, Garg, & Shaw, 2012; De Guzman et al., 2013).

De Guzman et al. (2013) explored factors influencing medication adherence in the elderly Filipino population taking medications prescribed for chronic illnesses. The elderly Filipino population typically has a lower adherence rate than younger generations (De Guzman et al., 2013). De Guzman et al. (2013) discusses the ways adherence to medications could be improved for this population, including increased trust of prescribing physicians, satisfaction with the consultation, and event-based memory tasks such as developing routines. De Guzman et al. (2013) also explained that older Filipino's believe prescribed medications are a cure for the condition, rather than as a preventive for further complications or worsening of the condition. For Filipino migrants living in New Zealand this could potentially be a major barrier in medication adherence as any relationship with a physician is based on a short-term intervention. An important function of the healthcare team is to provide an environment that establishes optimal patient-physician communication or develop a trusting relationship with the prescribing physician. This is a challenge as there may be barriers to effective communication for Filipino migrants visiting New Zealand GPs, including language barriers, cultural differences, and appointment time limits.

Ethnicity has an important role in facilitating or hindering access to primary health care in New Zealand, and as a result, new policies to address these challenges are advised. A lack of familiarity with New Zealand's medication laws can lead to a mistrust or lack of understanding in the health system, becoming yet another barrier for migrants. This barrier for migrants prevents them from taking advantage of community services and exemption cards, which are intended to help them settle here (Babar et al., 2012). The authors contend that the lack of trust or understanding in the New Zealand primary health care system, may be another reason why migrants may consider themselves isolated from health services, and see themselves in a similar way to that of an 'island'.

Additionally, lower levels of education and ethnic backgrounds, limits awareness about western medicines. According to a study conducted in Auckland to assess consumers' knowledge, perceptions, and attitudes about medicines it was noted that a lack of culturally relevant treatments is a barrier to receiving services, which they believe contributes to Chinese patients' low levels of involvement with oncology treatment programs (Twarog & Kapoor, 2004).


Babar et al. (2012) concurs with Twarog and Kapoor, with a study exploring attitudes, beliefs, and perceptions of a cohort of migrants about medicine access and use in New Zealand. They identified several barriers in migrant health. First, the lack of availability of traditional medicine in New Zealand, with many Asian migrants believing that Western remedies are seen as pseudoscience. Second, the barrier of language and culture, which includes, understanding referrals processes, primary v's secondary care, and availability of subsidies on certain medications in

New Zealand. Finally, some migrant's perceptions regarding the use of medication were inaccurate, with migrants believing in sharing medications with others when they first arrived in New Zealand. Two reasons offered by migrants sharing medications were the cost of visiting doctors and pharmacies to obtain medications, and because they are unaware of government subsidies. If all medication is equally priced (prescribed versus over the counter), they were concerned about using up all the medication at home before buying new ones, even if the medication is the wrong strength or not the correct prescription.



Nursing Recommendations

1. Utilising a medication chart with clients to promote control and positive perceptions about treatment
2. Provide pamphlets in Tagalog about health conditions to enhance understanding and adherence
3. Provide information about health-lines and support services

The learners created a tear-off pad (Resource 1 below) for use by Pharmacists when dispensing medication, reminding clients when prescription medications should be taken. The client can tick off when they take their medications. This was uses both English and Tagalog for Filipino migrants to use. An additional pamphlet on managing hypertension was also created and translated into Tagalog. This has been shared with the local health services.



TSART NG GAMOT / MEDICATION CHART

Panuto / Instructions:

GAMOT 1: GAMOT 2: GAMOT 3:	AGAHAN / BREAKFAST	TANGHALIAN / LUNCH	HAPUNAN / DINNER	ORAS NG PAGTULOG / BEDTIME
LUNES / MONDAY	1 2 3	1 2 3	1 2 3	1 2 3
MARTES / TUESDAY	1 2 3	1 2 3	1 2 3	1 2 3
MARTESDAY / WEDNESDAY	1 2 3	1 2 3	1 2 3	1 2 3
HUWEBES / THURSDAY	1 2 3	1 2 3	1 2 3	1 2 3
BIYERNES / FRIDAY	1 2 3	1 2 3	1 2 3	1 2 3
SABADO / SATURDAY	1 2 3	1 2 3	1 2 3	1 2 3
LINGGO / SUNDAY	1 2 3	1 2 3	1 2 3	1 2 3

Figure 2. Medication chart. Source Authors.

Barriers to access health care

The authors indicated why Filipino migrants found engaging with the New Zealand healthcare system challenging. They identified the following as barriers to health care in New Zealand; Language barrier, culture constraints - difference in cultural views, poor health literacy, a lack of knowledge about accessing healthcare services in New Zealand, poor experiences with healthcare services, divergent understandings of health and the extent of local support networks and legal/visa restrictions - causing racial stratification and workplace inequalities. The barriers give way for enablers to be created for Filipinos to access and benefit from NZ healthcare services

Legal barriers

Dairy farming in New Zealand is a key export industry that is often closely linked to the country's economy yet is dependent on a substantial labour force of work visa holders who have limited rights and who have very narrow pathways to citizenship (Collins & Bayliss, 2020). A temporary migration regime excludes labour migrants from universal rights that are otherwise offered to workers - freedom to change employers, to seek welfare or health support, or to build a family (Anderson, 2008). This reinforces the concept that the Filipinos are isolated from health services and can be considered an island within New Zealand.

Temporary migration is based on the provision of limited rights to migrants, which is a kind of civic stratification (Collins & Bayliss, 2020), limiting the possibilities, length of stay, and rights granted to migrants, as well as the prospect of integration through residence and citizenship. In this sense the Filipino migrants in New Zealand can be considered politically isolated island. Temporary visa holders' rights are restricted. For example, they have restricted access to healthcare (maintaining the metaphor of migrants as an island), and are bound to a single employment, which has a substantial influence on migrants' well-being and the embodied experience of migration (Collins, 2019). The negative consequences of temporary status illustrate how civic stratification and denial of rights work to keep migrants on the outside of society and limit their opportunities for advancement (Rajkumar et al., 2012), or can be seen as a socially isolated island.

Health service barriers

As migrants began the move to another country their health is considered 'good', although the wellbeing of the migrants is seen to gradually deteriorate as various barriers such as restrictions to health services, cultural and language barriers, lack of health insurance, and poor knowledge of the health system within New Zealand (Kanengoni et al. 2018). Language is a significant barrier that many migrants face, not only for the knowledge of healthcare services available, but it also impacts on health considerably as information from healthcare workers is often not understood by the migrants' accessing healthcare. Health literacy is an important component to any individual's health as it is important for patients to understand various conditions, medications, and ease of access to services required (Kanengoni et al., 2018). Additional communication support for migrant workers is an enabler, for instance access to timely interpreters. The importance of interpretation services gives migrant workers a voice within the care received, helping migrant workers to understand health issues, and relevant information on medications (Montayre Neville and Holroyd, 2017).

Montayre, et al., (2017), looked at the experiences of Filipino migrants adjusting to living in New Zealand, and identified multiple challenges for Filipinos while engaging in healthcare services. The key challenges were, lack of knowledge of the nature of health services (low health literacy), language barriers, and differences in cultural views towards healthcare. Accessing health services and having good health literacy is important as they both support a person's health and wellbeing; however, some Filipino migrants have low health literacy and the lack of knowledge about the New Zealand health system and social services, contributes to underutilisation of services available (Montayre et al., 2017). Low health literacy is associated with poorer health outcomes, lack of engagement with healthcare providers, decreased compliance with medication, and lack of knowledge about managing medical

Health beliefs/perspectives and systems

Adjusting to a new country creates a barrier as there is a difference in cultural views or practices (culturally isolated reinforcing the sense that a migrant is culturally like an island). Many Filipino migrants identified in Montayre's 2017 study, said their cultural practices were not considered by health professionals. Multiple Filipino migrants stated that in the Philippines it is accepted practice to stay with and be the main carer of the family member in hospital. However, in New Zealand this practice was not upheld in their experiences (with Paediatrics being the exception).

In the Philippines, it is common for health practices to use herbal remedies and traditional beliefs. However, this contributes to a reluctance or a lack of the willingness for Filipino migrants to access healthcare services in New Zealand (Montayre et al., 2017).

The effectiveness of health systems to promote health and minimise illness is dependent on their accessibility, acceptance, and availability to all parts of society. Some minority ethnic groups in Western countries have limited access to the use of health services, contributing to health disparities (Collins & Bayliss, 2020). Anderson (2008) investigated migrants' knowledge and their utilisation of New Zealand primary health services. These were influenced by their own experiences with health care systems in their home countries, language difficulties, structural barriers, divergent understanding of health, and the extent of their local support networks. The Ministry of Health (2012) conducted a survey on the Asian populations and reported low use of healthcare services mostly in primary health areas. Further research identified health disparities between Asian migrants and the New Zealand born population, for instance Asian born people have higher rates of tuberculosis (TB), cardiovascular disease, and type 2 diabetes (Anderson, 2008).

The New Zealand primary health care system, particularly general practitioners is complex and a conundrum for many migrants to New Zealand to understand. Anderson's (2008) study showed participants have varied understanding of New Zealand's health care structure. The knowledge of this was influenced by age, time spent in New Zealand, and information provided from friends, family, and health care professionals. Primary healthcare includes assessments and treatment completed by GP clinics, such as antibiotics for infections or illness, medication prescriptions, screening general workups, and diagnoses. Secondary or specialist care is the hospital level system in which patients must be referred by primary care practitioners for specialist assessment and treatment, a process which may have extended waiting times up to 6 months (Ministry of Health, 2012).

This system is in complete contrast to the user-pays system from many Asian countries, where individuals independently seek out the best doctors they could afford (Anderson, 2008). The Philippines has a dual approach of publicly and privately funded health system with primary services only available in large cities. The divergent understandings of the health system in New Zealand, makes navigating the system difficult for many migrants. Ultimately these barriers create in the health disparities for Asian migrants in New Zealand.

With low utilisation of primary health services comes an increased use of the emergency and accident clinics by the migrant population. These A&E clinics are open after hours and do not have an appointment system, often meaning they are more easily accessible to patients rather than regular centres. Alternatively, 'after hours' services are more expensive than general practice costs.

When understanding the enablers to help migrants navigate the system, Anderson (2008) highlighted the use of community. Simple actions from the community such as clear descriptions of where to go to seek help, costs, and the overall system of New Zealand health care served as successful enablers. Additionally, these can help identify culturally appropriate services for migrants that are going to meet their needs.

Some reasons why migrants experience inequalities when accessing primary health care include, a lack of awareness of the system, previous experience in healthcare, structural barriers and limited access to primary health services resulting in poor migrant health (Anderson 2008). In turn, this increases migrant use of A&E clinics, as they are often more accessible than regular centres. However, Anderson (2008) also identified enablers that could allow migrants to better navigate the primary health sector. Enablers could be using community support, social networks, and prompting community development in host countries. These will improve the utilisation through culturally appropriate frameworks and further contribute towards reducing health inequalities for migrants.

RECOMMENDATIONS

1. Clear health/social service provision policies to create positive migrant adjustment.
2. Providing pamphlets in Tagalog about accessing healthcare/emergency services to support Filipino migrants to access and benefit from New Zealand healthcare services.
3. Knowledge on translation services or apps to overcome the language barrier and increase health education.

To address these recommendations the learners created a pamphlet on the health system (see resource 2 below) and the legal requirements for migrants to access health care, which was also translated into Tagalog. This was shared with the Heratini health professionals.

ARE YOU ELIGIBLE FOR FREE PUBLIC HEALTHCARE?

- New Zealand Resident Class Visa Holders
- New Zealand citizens (including those from the Cook Islands, Niue or Tokelau)
- Australian citizen or permanent resident who has lived, or intends to live, in New Zealand for two years or more
- Work visa holder eligible to be in New Zealand for two years or more
- People aged 17 years or younger, in the care and control of an eligible parent, legal guardian, adopting parent or person applying to be their legal guardian
- Interim visa holders
- New Zealand Aid Programme student receiving Official Development Assistance (ODA) funding
- Commonwealth scholarship students
- Foreign language teaching assistant
- Refugees and protected persons, applicants and appellants for refugee and protection status, and victims of people trafficking offences

If your situation does **not** match any of the options listed above, you may still be eligible for a limited range of services in certain situations.

WHAT SHOULD I BRING IF I NEED TO PROVE MY ELIGIBILITY FOR PUBLICLY FUNDED HEALTHCARE?

To make sure we have the correct information, we recommend that a patient brings with them:

- Passport, including permits and visas
- Birth certificate (if born in New Zealand or Australia) or
- Confirmation of citizenship or
- Confirmation of permanent residency or other residency status
- Photo Identification (if no passport)

HOW TO ENROL?

If you are eligible, enrolling is easy and free!

Contact your local General Practice and ask if they are accepting patients.

It can take up to three months for enrolment to take place

FEES - WHAT YOU'LL HAVE TO PAY

General practices (GP) are private businesses that set their own fees for consultations and other health services.

Contact your GP for pricing and fees

When you enrol you pay less for visits to your GP!

HELPFUL TIPS:

- 1) Request text communication with your General Practitioner, this way you can utilize apps to translate.
- 2) Use apps to translate any information from your health care provider. This can be useful for reading information or sending texts. We recommend TextGrabber and say Hi.

SPECIALIST CARE

New Zealand uses a referral system for specialist care. This means you may be referred by primary care practitioners for hospital or specialist assessment and treatment.

AFTERHOURS CARE

New Zealand has services that offer after hours care for accidents and illness, that require immediate attention that can't wait for a General Practitioners appointment.

This care can include Urgent Doctors or A&E services.

Both GP services within Geraldine (Four Peak Health & Dr Diana Scott LTD) offer after hour care through PRIME (Primary Response in Medical Emergencies) practitioners.

Four Peak Health PH: (03) 693 8880
Dr Diana Scott LTD PH: (03) 693 9909

Figure 3. Pamphlet on access to NZ health care. Source: Authors

CONCLUSION

This project was a continuation of an earlier group of learners who had studied Geraldine as a geographic region for their primary health care paper as part of the Bachelor of Nursing programme. On completion of an impact analysis of that project this group of eight Dunedin based learners undertook a new profile of Geraldine, concentrating on the Filipino migrant community working on dairy farms.

They identified several challenges or barriers that indicate Filipino migrants find while engaging with the New Zealand healthcare system challenging. The barriers give way for enablers to be created for Filipinos to access

and benefit from New Zealand healthcare services. The barriers suggest a need for clear health and social service provision policies to create positive migrant adjustment. The barriers demonstrate the need for culturally safe integrated and enhanced migrant services that are specific to Filipino people. Providing these services means Filipino migrants can remain connected to their cultural identity whilst in New Zealand, and thus feel less like an island. If this were the case, then Filipino migrants may not perceive themselves as an island, however, the barriers discussed in the discussion are still evident in New Zealand and migrants are still a minority group who are isolated from their culture. The health promotion resources that the learners created and shared with the community goes some way to reducing isolation and inequities of health care for Filipino migrants and more as part of a clearly defined community of Heratini.

Correspondence to: Laurie Mahoney. Email: lauriemahoney18@gmail.com

REFERENCES

- Anderson, A. (2008). Understanding migrants' primary healthcare utilisation in New Zealand through an ethnographic approach. *Diversity in Health and Social Care*, 5, 291–301.
- Babar, Z., Pengelly, K., Scahill, S. L., Garg, S., & Shaw, J. (2012). Migrant health in New Zealand: Exploring issues concerning medicines access and use. *Journal of Pharmaceutical Health Services Research*, 4(1), 41–49. <https://doi.org/10.1111/j.1759-8893.2012.00105>
- Collins, F. L. (2019). Anxious desires: Temporary status and future prospects in migrant lives. *Emotion, Space and Society*, 31, 162–169. <https://doi.org/10.1016/j.emospa.2017.10.004>
- Collins, F. L., & Bayliss, T. (2020). The good migrant: Everyday nationalism and temporary migration management on New Zealand dairy farms. *Political Geography*, 80, 102193. <https://doi.org/10.1016/j.polgeo.2020.102193>
- De Guzman, A. B., Guevara, K. I., Guiang, F. J., Gutierrez, A. L., Habaluyas, A. S., Hizon, M. A., & Idanan, S. G. (2013). Developing a model of medication adherence among Filipino elderly. *Educational Gerontology*, 39(5), 298–313. <https://doi.org/10.1080/03601277.2012.661336>
- Hbgelette blog (21.2.2018) <https://hbgelette.wordpress.com/2018/02/21/no-one-is-an-island/>
- Immigration New Zealand. (2012). *Are you employing migrant dairy farm workers?* <https://www.immigration.govt.nz/employ-migrants/guides/employ-dairy-farm-workers>
- Immigration New Zealand. (2017). *Regional Migration Trends – Canterbury Overview 2015/16*. <https://www.mbie.govt.nz/assets/621e3318c5/regional-migration-trends-canterbury-2015-16.pdf>
- Immigration NZ (2021). The Philippines market. *Ministry of Business and Innovation and Employment*. <https://www.immigration.govt.nz/assist-migrants-and-students/assist-students/international-markets/the-philippines-market>
- Kanengoni, B., Andajani-Sutjahjo, S., & Holroyd, E. (2018). Setting the stage: Reviewing current knowledge on the health of New Zealand immigrants – an integrative review. *PeerJ*, 6, e5184. <https://doi.org/10.7717/peerj.5184>
- Ministry of Health. (2012, July 25). *Asian health chart book 2006*. <https://www.health.govt.nz/publication/asian-health-chart-book-2006>
- Montayre, J., Neville, S., & Holroyd, E. (2017). Moving backwards, moving forward: The experiences of older Filipino migrants adjusting to life in New Zealand. *International Journal of Qualitative Studies on Health and Well-being*, 12(1), 1347011. <https://doi.org/10.1080/17482631.2017.1347011>
- NZ Stats. (2021). <https://www.stats.govt.nz/news/new-zealands-population-reflects-growing-diversity>
- Rajkumar, D., Berkowitz, L., Vosko, L. F., Preston, V., & Latham, R. (2012). At the temporary–permanent divide: How Canada produces temporariness and makes citizens through its security, work, and settlement policies. *Citizenship Studies*, 16(3–4), 483–510. <https://doi.org/10.1080/13621025.2012.683262>
- Shahin, W., Kennedy, G. A., Cockshaw, W., & Stupans, I. (2020). The role of refugee and migrant migration status on medication adherence: Mediation through illness perceptions. *PLOS ONE*, 15(1), e0227326. <https://doi.org/10.1371/journal.pone.0227326>

- Statistics New Zealand. (2018). *Geraldine*. <https://www.stats.govt.nz/tools/2018-census-place-summaries/Geraldine#work>
- Taira, D. A., Gelber, R. P., Davis, J., Gronley, K., Chung, R. S., & Seto, T. B. (2007). Antihypertensive adherence and drug class among Asian Pacific Americans. *Ethnicity & Health*, 12(3), 265–281. <https://doi.org/10.1080/13557850701234955>
- Twarog, S., & Kapoor, P. (2004). *Protecting and promoting traditional knowledge: Systems, national experiences and international dimensions*. United Nations.
- Villanueva, J. G. (2013). Medication adherence and hospital admissions in Filipinos with cardiovascular diseases. California State University San Marcos. <https://scholarworks.calstate.edu/downloads/7p88cg922>
- Wikimedia Commons: Philippines Source: Map of South East Asia.png – Wikimedia commons
- Wikipedia. https://en.wikipedia.org/wiki/Languages_of_the_Philippines
- Worldometer. <https://www.worldometers.info/world-population/new-zealand-population/>