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Street redesign, active mobility and well-being for Pacific elders

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ABSTRACT

This qualitative study uses Talanoa methodologies to explore the everyday experiences of Pacific elders travelling around Māngere Central, Aotearoa New Zealand. A suite of street infrastructure changes for walking and cycling took place in the area between 2015 and 2017. While the evidence linking attributes of urban street design to physical activity behaviour is strong, there is little research on the impact of the built environment on Pacific elders' active mobility. The study seeks to address this knowledge gap by focusing on the impacts of streetscape changes on the active travel and social connectivity of this group of residents. Findings indicate that post-intervention, elders feel significantly safer while walking, with active travel increasing for some. All elders in the study feel that important amenities are now more accessible, with some of significant cultural and social importance. As such, opportunities for social connection appear to have increased. Furthermore, the enhanced look and feel of the local environment is important to the elders interviewed, enhancing feelings of community pride and well-being for some. Further desired changes to support active mobility are discussed, and a logic model highlighting factors theorised to be particularly important for achieving mode shift among Pacific elders is proposed.

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Pacific elders; active mobility; built environment; social connectedness; urban form

Introduction

The effects of the built environment on physical activity, and in particular people's uptake of active transport modes, are becoming increasingly clear. Several systemic reviews (Kärmeniemi et al. 2018; Smith et al. 2017) and recent longitudinal studies (e.g. Stappers et al. 2023) have shown that improvements in neighbourhood walkability, adequate active transport infrastructure, and quality recreational greenspaces are among key changes likely to generate positive impacts on physical activity across the population. There is also

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growing work focusing on impacts on certain subgroups in society (e.g. Tcymbal et al. 2020; Zhang et al. 2024), including examining environmental influences on the activity and well-being of older adults (Bonaccorsi et al. 2020; Graham et al. 2020). Despite significant work in this area over the past decade, gaps remain. Annear et al. (2014) highlight the need for more qualitative/mixed methods work and a lack of research coming out of Australasia. Research examining the impact of the built environment on the activity levels and active transport of specific ethnic groups or those living in lower socioeconomic communities remains sparse (Smith et al. 2017). Furthermore, investigations of the lived experiences of interventions for active transport are relatively rare (Salvo et al. 2018).

These knowledge gaps are strongly evident in the Aotearoa New Zealand context, in particular data focused on those population groups experiencing the poorest health outcomes. To our knowledge, no research has yet been published examining the impact of the urban built environment on physical activity, mobility, and social connectivity among Pacific elders. Alongside experiencing some of the poorest health outcomes, Pacific peoples also experience significant travel inequities when compared to their non-Pacific counterparts (Shaw and Tiatia-Seath 2022). These include fewer household bikes and cars despite larger household sizes, and lower walking and cycling levels and are likely indicative of the disproportionately high level of socioeconomic deprivation and poor health and disability (Shaw and Tiatia-Seath 2022).

While improving the health of older adults and Pacific people are high health priorities in Aotearoa New Zealand, the role of the built environment remains absent in the health strategies and guidelines promoting healthy behaviours, such as the Health of Older People Strategy 2001, and for Pacific Peoples, the 'Ola Manuia health plan for 2020–2025. This paper makes a contribution to addressing these knowledge gaps by drawing on the experiences of 10 Pacific elders (5 Samoan matua and 5 Tongan matu'a) and their responses to the Te Ara Mua Future Streets (Future Streets) built environment redesign in Māngere.

Study aims

This paper aims to understand the everyday lived experiences and outcomes of built environment redesign for Pacific elders in Māngere Central, Auckland, Aotearoa New Zealand. It examines how changes to the streetscape impact a group of elders, focusing on the relational and material enablers or barriers to active mobility and social connectivity within their neighbourhoods. Additionally, drawing on literature in combination with the study findings, the paper proposes a logic model of the mix of interventions likely to support Pacific elders in adopting more active travel.

Te Ara Mua future streets

Future Streets is a long-term controlled intervention study for walking and cycling in Māngere Central. Māngere is a primarily low-income Pacific and Māori community in South Auckland, located near the northeastern shore of the Manukau Harbour.

South Aucklanders experience high rates of road traffic injuries, and those on low income, and Māori and Pacific people are at greater risk (Hosking et al. 2023). Māngere residents also face other health issues at higher rates than other Aucklanders, including the highest prevalence of diabetes (Warin et al. 2016), cancer and

cardiovascular mortality in Auckland (Auckland District Health Board 2016). As such, residents of the Māngere-Otāhuhu ward experience a lower life expectancy than other Aucklanders (Auckland District Health Board 2016). Māngere-Otāhuhu residents also have some of the lowest rates of active transport to work. In 2018, 75% of commuting trips in Auckland were made by car and 5% by active modes (walking, cycling and other wheeled vehicles). Figures for the Māngere-Otāhuhu local area were 84% and 2%, respectively (Knowledge Auckland 2020).

Future Streets seeks to measure the immediate and long-term impact of an equity-focused, participatory, suite of suburban redesign changes to make neighbourhood active travel safer and easier (Macmillan et al. 2020). Pedestrian infrastructure comprises key elements of the intervention design, with changes including the construction of new painted zebra crossings (Figure 1), raised table zebra crossings (Figure 2), and the upgrade of existing crossings. Raised zebra crossing were also installed leading into and through the Town Centre carpark (Figures 3 and 4), and footpaths and walkways widened to allow for pedestrians to walk more comfortably in groups (Figure 5). Separated footpath and on-road cycle lanes were introduced on key routes (Figure 6). Moving cars from residential streets to arterial roads was a desired outcome of the street changes, with the introduction of chicanes to narrow the road area and slow traffic (Figure 7), and speed humps. Further changes included indigenous plantings and wayfinding elements to reflect cultural identity, and a playground upgrade (Figure 8). The associated Future Streets research programme includes a range of measures to explore the impact of interventions, including resident perception surveys and focus groups, pedestrian, cyclist, and vehicle counts, and vehicle speed measurements. Further descriptions of designs and details of the research can be viewed on the project website (www.futurestreets.org.nz).

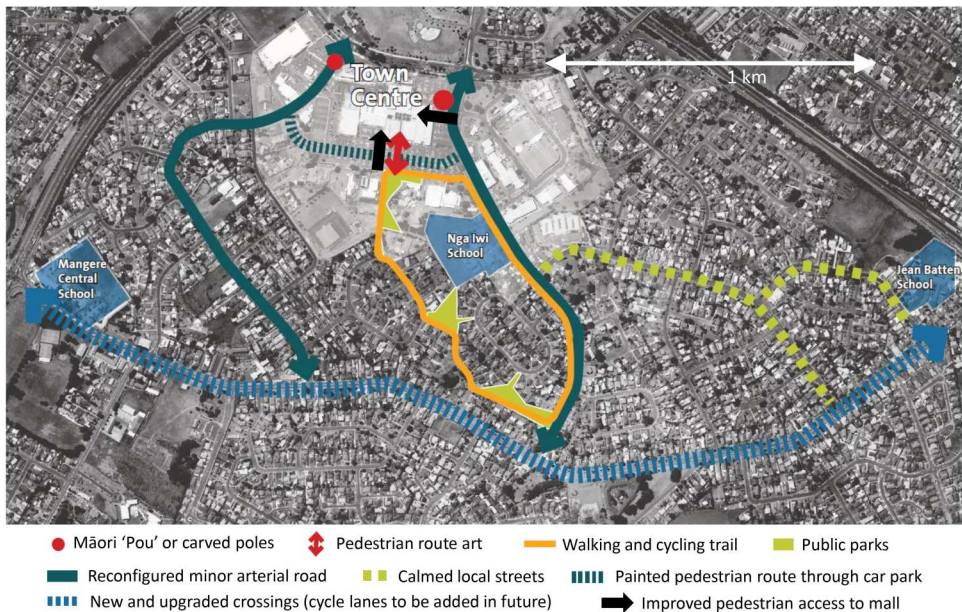


Figure 1. Map of Māngere and Future Streets intervention area.



Figure 2. Intersection of Mascot Avenue and Friesian Drive before and after instillation of a painted zebra crossing for pedestrians. In addition, a painted bicycle lane with plantings alongside it has been included.

Emerging findings indicate that many infrastructure changes have been generally well received and that residents feel that the safety of pedestrians in Central Māngere had been improved, with impacts particularly strong for older adults, those using mobility devices (Hirsch et al. 2022; Thorne 2019; Witten et al. 2022), and children (Witten and Field 2020). A before and after analysis of traffic incident data shows a decline in traffic accidents have taken place in the intervention area (Gilbert et al. 2022). However, some aspects of the street changes, particularly the bike lanes, have been criticised for reducing driving ease, and cycling is still perceived as unsafe despite the new lanes (Thorne et al. 2020). Additionally, personal safety from crime remained a concern for residents (Thorne 2019; Witten et al. 2022).

These observations suggest additional interventions may be needed in Māngere to optimise the impacts of street changes on active travel levels. Logic modelling is a useful approach to depict how barriers (such as norms, access, and structural drivers) can be addressed by potential interventions and provide a reference point for evaluating their effectiveness (Funnel and Rogers 2011; McLaughlin and Jordan 2015; Savaya and Waysman 2005). Options for change are identified through an analysis of causal pathways (Figure 9).



Figure 3. Mascot Avenue before and after raised table pedestrian crossing instillation creating pedestrian access to the Town Centre.



Figure 4. Town Centre access from Windrush Close before and after instillation of a raised table zebra crossing connecting the Community Trail walkway with the Town Centre. In the 'after' image you can also see the maunga pou that were installed as part of the mana whenua engagement process.



Figure 5. Town Centre on Mascot Ave before and after raised zebra pedestrian crossing instillation through carpark.



Figure 6. Windrush close walkway before and after path upgrade.

Situating the study

Pacific peoples' health outcomes in Aotearoa New Zealand

Pacific peoples are the fourth largest ethnic group in Aotearoa New Zealand, making up 8.1% of the population (Statistics New Zealand 2018). The 382,000 Pacific peoples who



Figure 7. Mascot Avenue near the Town Centre before and after on-road bike lane instillation. Separated cycle lanes have been installed on both sides of the road, making it narrower, meaning that cars move slower. In addition, the footpath has been upgraded and there is a raised crossing in the foreground.



Figure 8. Friesian Drive before and after the instillation of chicanes, cycle lanes and the removal of parking. These changes narrowed the street to slow cars down, making it safer for pedestrians.



Figure 9. Windrush park before and after upgrade, with design input from local children from Nga Iwi School. The ‘after’ image also shows the path upgrade which is part of the 2 km Community Trail, as well as improved lighting, plantings, and signage.

reside in Aotearoa New Zealand are a largely urban population, with almost 250,000 (64%) living in Auckland (Statistics New Zealand 2018). Pacific peoples experience poorer health outcomes compared to their non-Pacific counterparts, with higher prevalence rates of non-communicable diseases such as type 2 diabetes, stroke, heart disease

and cardiovascular disease (CVD) (Ministry of Health 2020). CVD is currently the leading cause of death followed by diabetes and stroke. An estimated 63.4% of Pacific adults aged 15–65 years are obese, a significant risk factor for CVD, diabetes, and stroke, compared to 30.9% of the total New Zealand population (Ministry of Health 2020). However, Pacific elders are less likely to experience mental health-related issues and associated challenges such as loneliness, as relationships with families are central to their lifestyles (Ataera-Minster and Trowland 2018). With physical inactivity a risk factor for CVD, diabetes and stroke, these statistics highlight the importance of active mobility to the health of Aotearoa New Zealand's Pacific population. Although not a particular concern for Pacific elders, physical activity is also positive for mental well-being (Scrivano et al. 2023).

Cultural context for Pacific elders

Older adults or the elderly are generally defined as those aged 65 years or older (Associate Minister of Health 2016). In Pacific contexts, older adults are generally referred to as Pacific elders, 'matua', 'elders' or 'elderly'. In the Samoan context, matua is used to refer to an elder, while matu'a is used in the Tongan context. While these terms were used by interviewers for this study, in the paper we use the term 'elder' to refer to the group of Samoan and Tongan participants.

Most Pacific elders in Aotearoa New Zealand belong to the first or second generations of migrants from their homelands (Lee 2009). In diaspora communities such as Aotearoa New Zealand, Pacific elders play crucial roles nurturing cultural traditions, language, and knowledge (Ihara and Vakalahi 2012; Vakalahi and Hafoka-Kanuch 2019). Christian faith and maintaining strong family and community connections are key ways through which traditions are preserved and health and well-being fostered (Ihara and Vakalahi 2011; Pulotu-Endemann 2009).

Pacific elders' role and esteemed position in their families, and their strong ties to tradition can impact the nature and location of physical activity, including interaction with urban spaces. Most Pacific families prefer to care for their elders in their homes (Tautolo et al. 2017) and it is customary for a family member to always be present (Tamasese et al. 2014). Living in close proximity with families and the giving and receiving of mutual support (Tautolo et al. 2017; Tamasese et al. 2014) means that activity is generally related to family and household systems, with indoor activities traditionally considered appropriate for women, and outdoor tasks for men (Sa'u Lilo 2021).

However, the Pacific diaspora is witnessing a shift from this traditional view, with elders increasingly engaging in activities within their wider neighbourhoods and communities. An Auckland qualitative study using Talanoa methodologies found that Pacific elders have a strong desire to engage in activities outside the home. However various social, economic, and environmental barriers can restrict active participation in community life (Tamasese et al. 2014). This finding challenges the cultural norm that Pacific elders are homebound and suggests they are open to exploring their surrounding urban neighbourhoods to connect with others. It highlights the critical importance of urban spaces where Pacific elders feel comfortable engaging socially with others of shared cultural backgrounds for their health and well-being and the need for further research *with* Pacific elders on the use of public spaces to support healthy lifestyles.

Active mobility in urban environments

The evidence base for the impact of walking and cycling for transport on physical activity levels and health is strong (Sahlqvist et al. 2012; Shaw et al. 2017), as well as bringing numerous community and environmental co-benefits (Xia et al. 2013). The neighbourhood-level built environment plays a key role in peoples' uptake of active transport modes, with improvements in neighbourhood walkability, adequate active transport infrastructure, and quality recreational greenspaces among key changes likely to generate positive impacts on physical activity (Kärmeniemi et al. 2018; Smith et al. 2017; Stappers et al. 2023; Witten et al. 2012). In terms of mobility types, a causal relationship between the urban built environment and transportation walking appears particularly strong (McCormack and Shiell 2011; Stappers et al. 2023).

Despite a growing number of longitudinal studies examining the impact of infrastructural changes on activity (Kärmeniemi et al. 2018), there is limited research on the factors influencing active travel uptake in the specific context of active transport interventions. Notably, there is a significant gap in understanding the factors that affect active transport in low-socioeconomic communities in the context of such interventions (Smith et al. 2017).

Environmental influences on the activity and well-being of older adults

Walking outdoors is a key source of physical activity in older adults (Fisher et al. 2002). Walkability can be defined as the extent to which the built environment facilitates walking (Liao et al. 2020). A growing body of evidence shows the key built environment design factors that contribute to elders' experiences and perceptions of their urban environment's walkability, thereby promoting walking behaviour. High-level reviews identify pedestrian infrastructure, street lighting, destination accessibility, street lighting and connectivity as key elements associated with enabling physical activity and active travel in older adults, while poor pedestrian infrastructure and footpath quality and high traffic volume and speed are significant deterrents (Annear et al. 2014; Bonaccorsi et al. 2020; Smith et al. 2017; Zhang et al. 2024). The following section explores aspects of these findings in more detail.

The extent and quality of pedestrian infrastructure are key elements of walkability, with the quality of footpaths highlighted as an important enabler in many studies. Fear of falling is a major concern among older adults when moving around outdoors, and the most common causes of pedestrian falls are uneven surfaces on streets, steep curb ramps, and poorly maintained street conditions (Lee et al. 2019).

As such, pavement evenness can significantly influence older adults' comfort and their willingness to walk (Matsuura 2020; Sun and Lau 2021). Narrow sidewalks can also induce fear of falling through and concern about encountering crowdedness and bumping into other pedestrians (Sun and Lau 2021). The importance of seamless connections across pedestrian surfaces in perceived walkability is also highlighted (Sun and Lau 2021; Matsuura 2020).

The experience crossing the road is a further significant factor influencing walkability and is found to be among the most anxiety-provoking situations for older adults (Matsuura 2020). Distefano et al. (2021) highlight the extent to which older pedestrians,

particularly those experiencing age-related decline in function, attach importance to comfort and safety when crossing the road. Crossing is described as ‘the most critical moment for older pedestrians’ because they are required to interact with vehicles (Distefano et al. 2021). Traffic signal time at crossings is a further consideration affecting walkability, due to the impact on time standing (Sun and Lau 2021).

Spaces to rest are also key to safe mobility, with Sun and Lau’s go-along study (2021) finding environments that enforce long periods of walking without a break can prevent older adults accessing spaces important for mobility and destination accessibility, such as transport hubs. Hubl (2021) notes the negative impacts of a general lack of seating possibilities for older adults in urban spaces, and that when available they are often inappropriate for those with limited mobility.

Furthermore, the relationship between perceived aesthetics and physical activity has been identified across many reviews (e.g. Kärmeniemi et al. 2018). Graham et al. (2020) find that a well-maintained street and residential environment encouraged walking and increased the enjoyment of doing so. Some studies point to the nuances of perceived aesthetics, for example, Borst et al. (2009) find aesthetic preferences when walking to be tied to the density of dwellings and higher volumes of human activity, such as front gardens close to pavements, and busier roads and streets, but not parks (potentially due to perceived lack of safety). As such, older adults are more likely to walk along busier routes (including traffic) (Borst et al. 2009).

While destination accessibility is widely noted as important for elders’ perceptions of walkability, the importance of everyday destinations such as shops, libraries, churches and bus stops is highlighted in one Auckland-based study (Tamasese et al. 2014).

Methodology

Study participants

The majority of participants were respondents from the Te Ara Mua Future Streets 2017 and 2021 face-to-face resident surveys who agreed to be recontacted, with the remainder contacted via snowball sampling and community researcher networks. Study inclusion criteria were that participants be over 55¹, resident in the intervention area and identify as Samoan or Tongan. Ten Pacific elders took part; five were Tongan, and five Samoan. Across the group, six elders were female and four were male and their ages ranged from 58 to 82 years. The Pacific elders had been living in central Māngere for 10–41 years and lived in a range of household configurations, with most in intergenerational households including children and their families, with others living alone or with a spouse.

Qualitative data collection methodology

Data collection was underpinned by Pacific methodologies – namely *Talanoa* – a term shared by Tongan, Tokelauan, Fijian and Samoan peoples broadly meaning ‘to talk’, ‘discuss’ and ‘tell stories’ (Tunufa’i 2016), and first and foremost a cultural practice before use as a research method and methodology (Naepi 2019). *Talanoa* is a responsive, non-linear form of dialogue in which relationships and reciprocity are primary, and as an exchange of ideas and experiences, respect, trust and sharing of power are crucial to

appropriate and effective talanoa (Vaioleti 2016). In the context of working and researching with Pacific communities, respect encompasses ‘acknowledging the primacy of the group and recognising that the individual is a valued member of the group’ (Bennett et al. 2013, p. 109) and includes awareness of participants’ role and standing in the community (Naepi 2019). When engaging in talanoa with Pacific elders, this respect is expressed by etiquette that acknowledges their significant roles within families, churches, and communities as sources of wisdom and protection and holders of traditional knowledge, including formality and deference as demonstrated through physical positioning and a slow and gentle tone (Sa’u Lilo 2021). Only through respecting such cultural principles can all voices be heard (‘Ofanoa et al. 2015; Otunuku 2011)

Teariki and Leau (2024) argue that an understanding of the principles that underpin Pacific worldviews must be held by all seeking to conduct Pacific-related research. These protocols were applied during the current study, with 10 talanoa taking place with our elders, conducted by trained community interviewers in Samoan and Tongan. Pacific ways of being were further embedded in the data collection approach through the use of prayer at the beginning and close of each session. Discussions took place between June 2021 and October 2022 and were audio recorded, transcribed, and then translated by interviewers into English for analysis. Talanoa are generally conducted in-person (Vaioleti 2016), and while most discussions were conducted as such in the elders’ homes, a small number took place over the phone due to a COVID-19 lockdown in Auckland. Discussions focused on understanding elders’ everyday experiences of their street environments, and any impacts on active mobility and social connectivity. During talanoa, interviewers asked the elders about their frequent travel destinations, active travel, recent personal experiences of neighbourhood changes within Māngere central and any desired neighbourhood changes. The talanoa process included sharing of photographs of key design changes as prompts for discussion. Each talanoa session was approximately 1–2 h long, including relationship building.

Data analysis

Qualitative content analysis of discussion data was undertaken to identify and cluster participant’s responses to and experiences of specific intervention design features (Elo and Kyngäs 2008). We acknowledge that while Pacific methodologies were key to data collection processes, the analytical processes followed a Western framework/methodology. Data was initially analysed independently by ethnicity with findings combined for the purposes of this discussion. Conclusions were reviewed by the community researchers (who are co-authors) to ensure their appropriateness.

Integrating Pacific elders lived experience into a logic model for increasing active travel

Drawing on the themes from these conversations, together with other related research, we developed a logic model (Funnel and Rogers 2011) that theorises the factors that support active mobility for Pacific elders in local neighbourhoods, encompassing the resources/inputs, potential interventions by selected actors, mechanisms for change and anticipated outcomes.

Findings

Key findings are discussed in the following sections. Firstly, an overview is provided of the everyday experiences of Pacific elders as they move around their neighbourhood, including travel destinations and activity modes and key barriers to active mobility which include trip hazards, narrow paths, and driver behaviour. Elders' perceptions of the street intervention changes are then explored, with general reflections followed by detailed discussion of changes the elders felt were most impactful on the walkability of their neighbourhood and their active mobility. The discussion then explores the impacts on well-being and behaviour, focusing on several key areas: changes to elders' active mobility, the implications of improved access to spaces for gathering and other important amenities, and elders' perceptions and experiences of aesthetic improvements. The discussion highlights how these changes have influenced elders' ability to move around, their social interactions, and their overall satisfaction with the urban environment. Elder's desired changes to further enhance physical activity are also discussed.

Everyday experiences of Pacific elders

Travel destinations

Most travel undertaken by the elders interviewed took place within a very localised spatial scale. The Māngere Town Centre, swimming pool, local churches and other key amenities such as Work and Income offices and funeral homes were highlighted as regular destinations. Other frequent travel destinations included visiting the homes of friends and family in the Māngere area and attending local sports matches and parks with grandchildren. A few elders frequently travelled by car to Māngere Mountain and Māngere Bridge to exercise.

Physical activity and daily life

The value placed on regular exercise and its importance for well-being featured strongly across interviews. Most elders shared that physical activity was important for their health and that they ensured it was part of their daily or weekly routine, with walking, swimming, gardening, and housework the main forms of activity. While preference for exercise inside or outside the home varied, all elders engaged in some form of regular physical activity within the public spaces of Māngere.

Walking was described as the key mode of activity for most interviewees, the majority utilising regular circuits around local streets, or in some cases inside their home properties. Generally, the elders preferred to walk in the same, very familiar places which were in most cases along main roads, and close to home. Local parks and walkways were infrequently used for walking or other activity unless accompanying grandchildren. Some also integrated walking for exercise into other aspects of their lives, such as accompanying family members on their activities:

I follow and go with where my grandchildren are going when they go shopping. They go inside the shops I go and walk inside and around the shopping centre for my exercise.

Many elders complemented their regular walks with swimming in the local pool and attending Zumba sessions at the Māngere Town Centre. Cycling was not seen to be an

appropriate or desirable form of active mobility for the elders interviewed. This was mainly attributed to elders' age and physical/mobility challenges, and to a lesser extent the perception that cycling is unsafe.

Environmental factors impacting active mobility

During discussions, elders shared many factors or concerns that influenced their ability or willingness to travel by foot in certain areas around Māngere. When elders discussed their concerns, causes were described as related to one of two closely related categories; environmental design factors, and driver behaviour.

Many of the design-related concerns raised presented fall or trip hazards, either because surfaces were inappropriate or poorly maintained, or spaces could become overcrowded and difficult to navigate safely. Uneven surfaces were a key area of concern, with cracks or 'potholes' in footpaths and pedestrian crossings frequently noted as hindering ease of movement. Transition areas where heights differ such as curbs and the edges of footpaths and crossings were also described as challenging to navigate.

Narrow spaces such as walkways, crossings, or footpaths where pedestrians or those using other active transport modes (such as wheelchairs or bicycles) might struggle to pass and bump into each other or become a trip hazard were also concerns and were therefore generally avoided. Most elders were also worried they may fall on the road when walking alongside or crossing, and some avoided walking out of sight of others for fear this may happen. Furthermore, unfamiliar spaces tended to feel less safe and were therefore generally avoided.

I walk on Bader Drive only. I feel it is safe for me as I'm very familiar with this street section. There is a park close to me on the other side of our street called Moyle Park, but I do not go there for exercise.

Long periods on foot were a concern, and elders tended to avoid spaces with inadequate access to seating to rest, or where they may be required to wait for long periods for an opportunity to safely cross busy roads or driveways. Similarly, access to public toilets influences choices around active mobility, with some interviewees choosing not to utilise local parks or reserves without facilities in favour of travelling by car to larger and better-equipped greenspaces beyond central Māngere. It is notable that in addition to the opportunities for sociability, Zumba and shopping, the availability of toilets and seating contributed to the amenity value of the Town Centre for elders.

Driver behaviour also significantly impacted elders' sense of safety and therefore active mobility. Speeding and vehicles failing to stop for pedestrians at crossings, driveways and in car parks were the most frequently cited concern and some elders were fearful of having to move quickly through these spaces in response. One interviewee described how these fears influenced how and when she walked in her neighbourhood. Her experience that drivers would often only stop once pedestrians had started traversing the crossing has led her to cross only when others are doing so in the same direction, which can result in waiting for long periods. She therefore limits her walking to mid-afternoon when there are plenty of pedestrians with whom she can cross, and who could also assist should she fall or be involved in an accident while crossing.

The pedestrian crossing is not too far from my abode. But sometimes, I feel scared otherwise a vehicle might run up and hit me ... The pedestrian crossing is fine for others but for me sometime vehicles are just only stopping when your feet are on [the] crossing ... I often feel scared of that, but it is good for me to cross over with someone.

Speeding drivers were seen to be a significant risk to the safety of pedestrians. Elders were also concerned that drunk drivers may either collide with pedestrians or force other vehicles to move into pedestrian spaces to avoid them. Furthermore, a few elders felt that narrow roads, including the introduction of traffic calming measures such as chicanes, may encourage unsafe driver behaviour (speeding and erratic driving), and impact pedestrian safety (discussed later in relation to intervention design changes).

Perceptions of street changes

The neighbourhood redesign was generally perceived to have made progress towards addressing many of the safety issues described above. The changes privileged pedestrians over vehicles and elders felt that in the intervention streets cars' speeds were reduced and they no longer 'fully ruled the road'. As such, pedestrians are now able to safely cross without long waits for a chance to do so, and traffic is generally calmer. Street changes were seen to have enhanced walkability and almost all interviewees felt that the interventions had made Māngere a safer place for pedestrians.

My memory goes back before the changes whereby cars were driven fast and in a dangerous manner as if they were the main and only users of the road with little regard for other road users. These changes, I wholeheartedly agree with and fully support because the safety of pedestrians has been increased. I am so pleased and excited ... because the changes have made the cars go at a much-reduced speed.

In line with other Future Streets findings (Hosking et al. 2023; Thorne et al. 2020; Witten and Field 2020; Witten et al. 2022), changes were seen to have particularly enhanced the safety of elderly people, children, and those with disabilities such as wheelchair users. The street changes that elders' felt were most impactful on their safety and active mobility are discussed in detail below.

Pedestrian crossings

Instillation of new raised zebra crossings and the upgrading of existing crossings through raising, widening, and painting were seen as the design changes most impactful in increasing safety and walkability. Elders highlighted they felt 'safer and secure' when walking to the Town Centre and the amenities within its proximity. All elders stressed that these crossings were very positive changes that had improved pedestrian safety.

Safe pedestrian pathways to and between key amenities

New crossings created safe pedestrian pathways to and between the key amenities accessed by elders on a regular basis. Across interviews, access to a range of amenities in the vicinity of the Māngere Town Centre was seen to be significantly improved. Of noteworthy impact was a new crossing linking the key pedestrian route Windrush close with the Town Centre (also home to the weekend flea market) and the eastern side of Mascot Ave (the location of Work and Income offices, a leisure centre and pools, and a funeral service).

These changes to the streets around Māngere Central, they are superb safety. I haven't heard of any accident, or someone died for a while after the reconstruction done to these streets recently. And now I walk more now as the streets are much safer. I walk to the MacDonalds, walk to the mall to the community free exercise, walk to the flea market on Saturday looking around at the crowds and meet with my cousins and friends, walk to the Social Welfare ... as these places are so close to home.

Raising crossing heights has created visibility and separation from traffic

The raised height of intervention zebra crossings featured strongly in elders' accounts of how their feelings of safety and comfort in walking around Māngere had been improved. Many described how the raised platforms of new crossings with ramped sides create a sense of separation on the road space and effectively distance pedestrians from cars. The effect of the raised height in forcing cars to come to a complete stop, as opposed to merely slowing when waiting for pedestrians to cross was noted.

It's so lovely the changes to this pedestrian crossing, so wide and it seems that the vehicles are being distanced from the actual white mark of the pedestrian crossing and I feel safe when crossing on it.

Enhanced visibility for pedestrians and drivers alike was also described as a further key benefit of the raised design with some elders noting they were now more confident that drivers could see them. Furthermore, increased height brings crossings level with the footpath, reducing trip hazard concerns.

Wider crossings enabled travel at comfortable speeds

The impact of the enhanced width of crossings was also highlighted. Elders explained how they feel more confident using these crossings because pedestrians can now pass each other with ease and travel at a range of speeds and subsequently feel able to move slowly and safely with less concern of slowing others' movements.

This new crossing is suitable for commuting ... it is good for the elderly people because there are some are walking very slowly which is safe for them and others are walking fast. Putting this new crossing is worthy and helpful for us elderly people.

Crossings and road markings enable safe passage through the Town Centre carpark

New crossings through the Town Centre carpark (Waddon Place) were highly regarded, with all elders stressing their impact on their sense of safety and confidence when moving around this busy area. Interviewees also noted the changes to signage and road markings, including that the markings delineating car parking areas are now clearer and easier to see and that it was safer for them to move from parked cars into the indoor shopping area. For some, these effects were particularly significant when the flea market operates on Saturdays. The Waddon Place crossings connect with adjoining footpaths, separating pedestrians from vehicles when moving to and from the Town Centre, thereby reducing the risk of reversing cars hitting pedestrians. One elder noted that the separation between cars and pedestrians afforded by the wide crossings in this area means she does not feel she has to run to ensure she is not in the path of moving vehicles.

The crossing is good, wide, and spacious ... it goes straight up to the footpath of the shopping centre [and is] very safe as I don't walk up to where the vehicles are parking so, no one reverses his/her vehicle and hit me. So, it should be like that with other part of the road around the shopping to have the same crossing to the shopping footpath.

Bright, contrasting colours enhanced visibility

As well as looking sharp and inviting, the fresh paint and lighter, brighter, and 'colourful' contrasting paintwork of the new crossings were seen by elders to increase the visibility of the crossing both for pedestrians and drivers. The value of this change for the elderly, children and cyclists was noted. The resurfacing and upgrading of walkways were also described as enhancing visibility and therefore usability.

The new changes to this pedestrian crossing [Mascot Ave 3] is for the safety of the elderly people of the village residents as well as the elderly people of the Samoan church also the pupils of the school. The painted crossing marks are so vivid, wider, and bright for eye.

Other street changes

Increasing the width of footpaths and walkways was highlighted as a further change increasing elders' feelings of safety and a few interviewees noted they now did use or were now more likely to access these spaces when moving around Māngere. As with widened crossings, interviewees described how these are now spaces where people of all ages and abilities can move freely and pedestrians can safely pass each other, including those in wheelchairs. That users can now travel at a range of speeds was significant for Matua/Matu'a, who noted they no longer feel they are slowing the movement of others. One elder shared that they were now more likely to use the upgraded Waddon to Windrush walkway for exercising, and another that the changes have enhanced usability because she is no longer afraid of being knocked over when passing others:

Walkways are wider now during when people are passing each other, tidy and clear. I remember when I used to go for my blood test the walkways before were narrow and I was afraid that somebody might bump up myself and fall down because of the narrowness of the walkways. But now they are wide enough for travelling.

Smooth surfaces and seamless transitions across pedestrian spaces, namely connections between crossings and walkways and footpaths, such as those at the Town Center were often highlighted as valuable changes that enhanced safety and reduced stress. Elders described how they can now move at a comfortable pace across significant areas without fear of encountering moving vehicles or the need to wait for long periods for vehicles entering the shopping centre car park. Furthermore, the surface of pedestrian areas was important to elders, particularly when crossing roads. Upgrading pedestrian surfaces and maintaining a consistent height has reduced tripping concerns.

I cross on that crossing to the footpath up to the centre of the shopping at the mall. I feel safe as vehicles are distanced away from the crossing and the footpath is so smooth for walking, no stumbling block [potholes] for us to be tumbling over and I can walk properly not running for scaring of the vehicles. Remember we are getting old, and our way of walking is so slow.

Beyond the installation of pedestrian infrastructure, speed humps were a further change that elders described as having a positive impact on pedestrian safety. Some noted their effectiveness at slowing traffic and a few felt that they should be used more in Māngere.

Given my current age and the improved safety by these new road designs, I enjoy and accept more time for me to walk safely and feel confident walking to places I normally go to ... I wholeheartedly support the changes, if I want to go to the WINZ Office from the Town Centre there are pedestrian crossings and road humps to slow the vehicles down.

Trade-offs and impacts for elders

While most street changes were well received, some were seen to be problematic, resulting in trade-offs between infrastructure and social and cultural impacts. In line with other Future Streets post-intervention findings (Thorne et al. 2020), on-road bike lanes were seen by some to be particularly problematic.

Driving challenges

Some modified streets were now seen as more challenging to navigate by car. Elders mentioned difficulties navigating on-road bike lanes close to the road space, perceived as unsafe for cars, especially low vehicles that could easily mount the concrete separators. Additionally, some elders felt that certain roads in Māngere had become busier or congested, leading them to avoid these areas.

Pedestrians' safety concerns

A small number of elders reported that the narrowed road spaces following the installation of chicanes could lead to erratic, unsafe driving. These streets were avoided due to concerns about speeding drivers intruding into pedestrian spaces. Concrete separators delineating bike lanes were also seen by some to be potential trip hazards.

Reduced parking

The introduction of on-road bike lanes has reduced street parking spaces, causing difficulties for some elders. The removal of street parking has compounded issues from new housing developments with limited car parking. This was seen to be particularly challenging for Pacific families, who often live in large households with multiple vehicles. One elder mentioned that the removal of street parking directly outside her home made it more difficult for friends and family to visit. Some interviewees also noted that visiting friends and family in the neighbourhood had become harder if travelling by car.

Desired changes to enhance physical activity

While infrastructure changes were generally seen to have significantly enhanced pedestrian safety and utility, further improvements were suggested to support elders' well-being and travel experience in Māngere. Concerns about driver behaviour led for some elders to call for driver education programmes and safety awareness campaigns to help the community fully benefit from the new infrastructure.

Elders recommended the introduction of more crossings on key roads such as Mascot Ave, as the walking distance between current crossings is too far for those with limited mobility. They also suggested additional crossings on smaller roads near the Town Centre to ensure safe access to this important amenity area. The need for more public toilets and seats across Māngere, including in parks and recreational spaces was also highlighted. Further suggestions included 'Drop off zones' near services frequented by elderly or disabled people, and more speed bumps to further reduce traffic speeds.

A logic model for a shift to active transport for Pacific elders

Based on the insights of this research, and other research noted in this review, we have developed a logic model to theorise the factors that can support a shift for active transport for Pacific elders.

A logic model illustrates how activities are understood to produce a series of results that contribute to achieving its intended impacts (Funnel and Rogers 2011). Logic models are commonly used to depict the way in which interventions can support expected changes in behaviours or environments, and their contribution to outcomes over the short to long-term. Logic models have widespread use in programme evaluation as well as programme design and are useful for providing a conceptual basis for exploring pathways of change and impact. These can inform the process for designing interventions, developing performance monitoring systems, and assessing and measuring the effectiveness of interventions (McLaughlin and Jordan 2015; Savaya and Waysman 2005).

We have developed this logic model as a synthesis of the findings of this research, and related research from the wider Te Ara Mua project, to offer potential directions for policy and planning to support active travel options for Pacific elders.

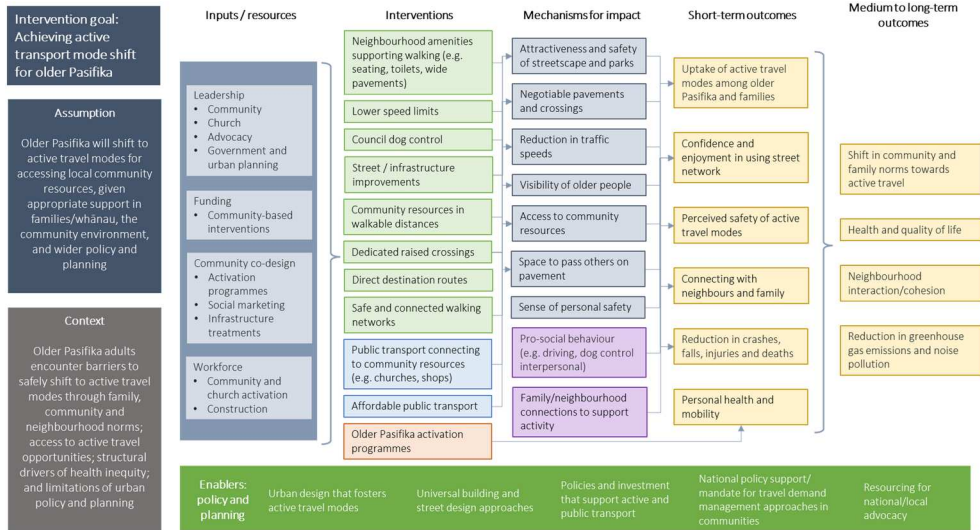
The logic model on the following page begins with a transport mode shift goal for the Pacific elder population; an underlying assumption of the possibility of achieving such shifts, and a general description of the contextual challenges facing Pacific elders. The logic model also notes the enablers in policy and planning underpinning mode shift.

The logic model then follows a stepwise approach to describing:

- The range of inputs or resources into achieving mode shift, across leadership at different levels, funding avenues, urban design, and community and construction sector workforces
- The potential interventions that could be delivered through councils (green boxes), transport agencies (blue boxes) and communities (orange boxes)
- The mechanisms (processes, capacities, or qualities) through which outcomes are generated (Pawson and Tilley 1997) for achieving change – that arise from the interventions themselves (grey boxes) and which may be pre-existing within communities and families (purple boxes)
- The short and medium to long-term outcomes from achieving mode shift (yellow boxes).

Notably, there are specific factors that are theorised to be particularly important for achieving mode shift among Pacific elders. These include linking with family networks;

direct and accessible routes that are safe and connected; having community resources within walking distance; and public transport access.



Discussion

Impacts on well-being and behaviour

The intervention street changes have positively impacted the experience and ability of the elders interviewed to move around their neighbourhood by increasing safety and perceived walkability. Our analysis suggests that impacts on activity and well-being cover three closely interrelated areas: increased active mobility due to greater feelings of safety and comfort when walking; enhanced opportunities for social gathering, and better amenity access. The importance of the look, feel, and safety of the ultra-local environment for Pacific elder well-being was evident across interviews.

Changes to active mobility

Te Ara Mua included changes to residential and collector roads. Both were important to the elders. Safer footpaths and crossings on residential streets provided safe connections to collector and arterial roads where new and safer crossing increased the elders sense of security on the street, their visibility to passing pedestrians and drivers if they were to fall, and extended the range of destinations they could reach in safety.

Gathering spaces and well-being

The importance of easy access to local destinations is a recurring finding in the literature (ref). For Māngere elders, the Māngere Town Centre with its Zumba classes, shopping and opportunities for social connection was an important local destination. Its interior was described as a safe space where elders could walk at a comfortable pace, with plenty of access to seats for rest when needed. Elders emphasised the opportunities the Town Centre and adjacent spaces provide for social gathering, serving a key location weekend fleamarket were particularly important and regular trips to the Town Centre

help some participants to relieve boredom and loneliness. These findings are in keeping with Tamasese et al. (2014) talanoa-based study that explored the health needs of Pacific elders across Auckland which also identified the importance of, and strong need for, accessible public spaces where Pacific elders can feel comfortable, connect with others and share knowledge and language.

Access to important amenities

The street changes had improved access to important amenities, most notably a new crossing linking the key pedestrian route of Windrush close with the Town Centre and the eastern side of busy Mascot Ave. Additionally, two new raised crossings on Mascot Ave have created safe pedestrian pathways to and between key amenities such as Work and Income offices, the Leisure Centre and Pools, and Ligaliga Funeral Services. Improved access to amenities had in turn increased physical activity and social connection for many participants.

An enhanced environment

Design attributes of the street changes were seen to have enhanced the local urban environment, fostered pride, and improved the communities' quality of life. Elders described the new streetscape as 'tidier', 'bright' and 'stunning', with one stating the changes had 'brought more colour and beauty to Māngere'. Elders appreciated the investment in Māngere's public spaces, feeling the changes indicated that their community is valued and cared for by local authorities. Aesthetic improvements, particularly through landscape design, integrated walking routes more closely with the natural environment, proximity to which Teariki and Leau (2024) identified as vital for the well-being of Pacific peoples.

Some felt that the changes challenge the previous 'low perception' of the area and several had enjoyed travelling around Māngere to see recent changes both to the streetscape and other development such as housing.

Reduction in traffic speeds enhanced feelings of safety

The elders appreciated the reduced speed of traffic, which parallels with the increasing slowness of their own walking. Reduced speeds were particularly noted to contribute to safer crossings. Objective measures support these experiences; Hosking et al. (2023) found evidence of reduced traffic speeds within the intervention area, especially in residential streets. The elders' perception of increased safety likely results from the combination of improved crossings and slower traffic speeds closer to their own movements. Given the New Zealand government's current proposal to raise local street speeds from 30 to 50 km/h, these findings hold significance for older residents everywhere.

Conclusions

Post-intervention, elders feel significantly safer while walking around central Māngere. The ability to comfortably cross busy roads, move to and through the Town Centre, and travel along upgraded pedestrian spaces at safe and comfortable speeds without tripping and bumping into others, were particularly impactful changes. For some elders, these changes have increased their active travel around their neighbourhood. Most

others are thinking more about walking more. All feel that important amenities are now more accessible, with some of these (the Māngere Town Centre) of significant cultural and social importance. Consequently, opportunities for connection and sociability appear to have been enhanced. The look and feel of the ultra-local central Māngere environment are important to the study group, and enhancements and design attributes have impacted pride and community well-being. However, the infrastructure and access gains have come with trade-offs. Loss of parking has caused stress and driving in some areas is harder. Further some elders feel there is a need for driver education to fully realise the positive benefits of the changes and further increase safety. More seating and public toilets were among other desired changes to support elders' active mobility.

Insights from this and other research have informed a logic model theorising the factors that support a shift for active transport for Pacific elders. Specific factors seen to be particularly important include linking with family networks, public spaces and activities, and direct and accessible routes that are safe and connected.

Note

1. In Pacific contexts, 'older adults' can be as young as 50 years of age, depending on their role within the family or community (Southwick et al. 2012).

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References

- Annear M, Keeling S, Wilkinson TI, Cushman G, Gidlow BO, Hopkins H. 2014. Environmental influences on healthy and active ageing: a systematic review. *Ageing & Society*. 34(4):590–622. doi:10.1017/S0144686X1200116X.
- Associate Minister of Health. 2016. Healthy ageing strategy. Ministry of Health. https://www.health.govt.nz/system/files/documents/publications/healthy-ageing-strategy_june_2017.pdf.
- Ataera-Minster J, Trowland H. 2018. Te Kaveinga: mental health and wellbeing of Pacific peoples. Results from the New Zealand Mental Health Monitor & Health and Lifestyles Survey. Health Promotion Agency.

- Auckland District Health Board. 2016. Local health profile: Otāhuhu. Retrieved from <http://www.adhb.health.nz/assets/Documents/About-Us/Otahuhu-Health-Profile.pdf>.
- Bennett J, Brunton M, Bryant-Tokalau J, Sopoaga F, Weaver N, Witte G. 2013. Pacific research protocols from the University of Otago. *Contemporary Pacific*. 25(1):95–124. doi:10.1353/cp.2013.0013.
- Bonaccorsi G, Manzi F, Del Riccio M, Setola N, Naldi E, Milani C, Giorgetti D, Dellisanti C, Lorini C. 2020. Impact of the built environment and the neighborhood in promoting the physical activity and the healthy aging in older people: an umbrella review. *International Journal of Environmental Research and Public Health*. 17(17):6127. doi:10.3390/ijerph17176127.
- Borst HC, de Vries SI, Graham JM, van Dongen JE, Bakker I, Miedema HM. 2009. Influence of environmental street characteristics on walking route choice of elderly people. *Journal of Environmental Psychology*. 29(4):477–484. doi:10.1016/j.jenvp.2009.08.002.
- Distefano N, Pulvirenti G, Leonardi S. 2021. Neighbourhood walkability: elderly's priorities. *Research in Transportation Business & Management*. 40:100547. doi:10.1016/j.rtbm.2020.100547.
- Elo S, Kyngäs H. 2008. The qualitative content analysis process. *Journal of Advanced Nursing*. 62(1):107–115. doi:10.1111/j.1365-2648.2007.04569.x.
- Fisher KJ, Pickering A, Li F. 2002. Healthy aging through active leisure: design and methods of SHAPE – a randomized controlled trial of a neighborhoodbased walking project. *World Leisure Journal*. 1:19–28. doi:10.1080/04419057.2002.9674257.
- Funnel SC, Rogers PJ. 2011. *Purposeful program theory: effective use of theories of change and logic models*. Hoboken (NJ): Wiley.
- Gilbert K, Luther R, Mackie H. 2022. Te Ara Mua – future streets crash trends five years following intervention. Paper presented at: Transport Knowledge Hub Conference; Dec 8. Wellington, New Zealand.
- Graham H, De Bell S, Flemming K, Sowden A, White P, Wright K. 2020. Older people's experiences of everyday travel in the urban environment: a thematic synthesis of qualitative studies in the United Kingdom. *Ageing & Society*. 40(4):842–868. doi:10.1017/S0144686X18001381.
- Hirsch L, Mackie H, Crombie C, Bolton L, Wilson N, Cornille Z. 2022. Road user interaction changes following street improvements from Te Ara Mua–future streets: a case study. *Journal of Transport & Health*. 25.
- Hosking J, Mackie H, Macmillan A, van der Werf B, Smith M, Witten K, Woodward A. 2023. Effects of Te Ara Mua–future streets suburban street retrofit on traffic speed and volume: controlled before-after study. *Journal of Transport & Health*. 30.
- Hubl M. 2019. An adaptive park bench system to enhance availability of appropriate seats for the elderly: a safety engineering approach for smart city. Proceedings of the 21st IEEE Conference on Business Informatics (CBI). July 15-17 2019; Moscow, Russia. doi:10.1109/CBI46540.2019.Ihara ES, Vakalahi HFO. 2011. Spirituality: The essence of wellness among Tongan and Samoan elders. *Journal of Religion & Spirituality in Social Work: Social Thought*. 30(4):405–421. doi:10.1080/15426432.2011.619916.
- Ihara ES, Vakalahi HFO. 2012. Collective worldviews and health of Pacific American elders. *Educational Gerontology*. 38(6):400–411. doi:10.1080/03601277.2011.559852.
- Kärmeniemi M, Lankila T, Ikäheimo T, Koivumaa-Honkanen H, Korpelainen R. 2018. The built environment as a determinant of physical activity: a systematic review of longitudinal studies and natural experiments. *Annals of Behavioral Medicine*. 52(3):239–251. doi:10.1093/abm/kax043.
- Knowledge Auckland. 2020. Analysis of the 2018 census results: travel to work and travel to education in Auckland. <https://knowledgeauckland.org.nz/media/2060/analysis-of-the-2018-census-results-travel-to-work-travel-to-education-auckland-at-october-2020.pdf>.
- Lee H. 2009. Pacific migration and transnationalism: historical perspectives. In: Lee H, Francis ST, editors. *Migration and transnationalism: Pacific perspectives*. Canberra: ANU Press; p. 7–42.
- Lee S, Lee C, Ory MG. 2019. Association between recent falls and changes in outdoor environments near community-dwelling older adults' homes over time: findings from the NHATS study. *International Journal of Environmental Research and Public Health*. 16(18):3230. doi:10.3390/ijerph16183230.

- Liao B, van den Berg PE, van Wesemael PJ, Arentze TA. 2020. Empirical analysis of walkability using data from The Netherlands. *Transportation Research Part D: Transport and Environment*. 85:102390. doi:10.1016/j.trd.2020.102390.
- Macmillan A, Smith M, Witten K, Woodward A, Hosking J, Wild K, Field A. 2020. Suburb-level changes for active transport to meet the SDGs: Causal theory and a New Zealand case study. *Science of the Total Environment*. 714:136678.
- Matsuura T. 2020. Effects of elderly people's walking difficulty on concerns and anxiety while walking on roads. In: Tira M, Pezzagno M, Richiedei A, editors. *Pedestrians, urban spaces and health*. London: CRC Press; p. 214–218.
- McCormack GR, Shiell A. 2011. In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *International Journal of Behavioral Nutrition and Physical Activity*. 8:1–11. doi:10.1186/1479-5868-8-1.
- McLaughlin JA, Jordan GB. 2015. Using logic models. In: Newcomer KE, Hatry HP, Wholey JS, editors. *Handbook of practical program evaluation*. Hoboken: Wiley; p. 62–87.
- Ministry of Health. 2020. Annual data explorer 2019/20: New Zealand health survey [Data File]. <https://minhealthnz.shinyapps.io/nz-health-survey-2019-20-annual-data-explorer/>.
- Naepi S. 2019. Pacific research methodologies. In: Noblit G, editor. *Oxford research encyclopedia of education*. New York: Oxford University Press.
- Ofanoa M, Percival T, Huggard P, Buetow S. 2015. Talanga: the Tongan way enquiry. *Sociology Study*. 5(4):334–340.
- Otunuku MA. 2011. How can talanoa be used effectively as an indigenous research methodology with Tongan people? *Pacific-Asian Education*. 23(2):43–52.
- Pawson R, Tilley N. 1997. *Realistic evaluation*. London: Sage.
- Pulotu-Endemann FK. 2009. Fonofale: model of health. <https://whanauoraresearch.co.nz/wpcontent/uploads/formidable/FonofalemodelExplanation1-Copy.pdf>.
- Sahlqvist S, Song Y, Ogilvie D. 2012. Is active travel associated with greater physical activity? The contribution of commuting and non-commuting active travel to total physical activity in adults. *Preventive Medicine*. 55(3):206–211. doi:10.1016/j.ypmed.2012.06.028.
- Salvo G, Lashewicz BM, Doyle-Baker PK, McCormack GR. 2018. Neighbourhood built environment influences on physical activity among adults: a systematized review of qualitative evidence. *International Journal of Environmental Research and Public Health*. 15(5):897. doi:10.3390/ijerph15050897.
- Sa'u Lilo L. 2021. Culturally healthy urban design among Pacific elders for good health outcomes: a brief literature review. Report prepared for the Ageing Well and Healthier Lives National Science Challenges.
- Savaya R, Waysman M. 2005. The logic model: a tool for incorporating theory in development and evaluation of programs. *Administration in Social Work*. 29(2):85–103. doi:10.1300/J147v29n02_06.
- Scrivano L, Tessari A, Marcora SM, Manners DN. 2023. Active mobility and mental health: A scoping review towards a healthier world. In: Baingana C, editor. *Cambridge Prisms: global mental health*. Cambridge: Cambridge University Press; p. 1–44.
- Shaw C, Keall M, Guiney H. 2017. What modes of transport are associated with higher levels of physical activity? Cross-sectional study of New Zealand adults. *Journal of Transport and Health*. 7:125–133. doi:10.1016/j.jth.2017.09.010.
- Shaw C, Tiatia-Seath J. 2022. Travel inequities experienced by Pacific peoples in Aotearoa/New Zealand. *Journal of Transport Geography*. 99:103305. doi:10.1016/j.jtrangeo.2022.103305.
- Smith M, Hosking J, Woodward A, Witten K, Macmillan A, Field A, Baas P, Mackie H. 2017. Systematic literature review of built environment effects on physical activity and active transport – an update and new findings on health equity. *International Journal of Behavioral Nutrition and Physical Activity*. 14:158. doi:10.1186/s12966-017-0613-9.
- Southwick M, Kenealy T, Ryan D. 2012. Primary care for Pacific people: a Pacific and health systems approach. *Pacific Perspectives*. <http://www.health.govt.nz/publication/primary-care-pacific-people-pacific-andhealth-systems-approach>.

- Stappers NE, Bekker MP, Jansen MW, et al. 2023. Effects of major urban redesign on sedentary behavior, physical activity, active transport and health-related quality of life in adults. *BMC Public Health*. 23:1157. doi:10.1186/s12889-023-16035-6.
- Statistics New Zealand. 2018. New Zealand 2018 Census of Populations and Dwellings. <https://www.stats.govt.nz/tools/2018-census-place-summaries/new-zealand#ethnicity-culture-and-identity>.
- Sun G, Lau CY. 2021. Go-along with older people to public transport in high-density cities: understanding the concerns and walking barriers through their lens. *Journal of Transport & Health*. 21:101072. doi:10.1016/j.jth.2021.101072.
- Tamasese TK, Loudeen TP, Waldegrave C. 2014. Pacific perspectives on ageing in New Zealand Pacific-focused qualitative research. Lower Hutt: The Family Centre, Anglican Social Services.
- Tautolo ES, Wrapson W, Paterson J, Wright-St Clair V, Neville S, Dewes O, Iusitini L. 2017. Healthy Pacific grandparents: A participatory action research project exploring ageing well among Pacific people in New Zealand. *Self & Society*. 45(2):134–148. doi:10.1080/03060497.2017.1334973.
- Tymbal A, Demetriou Y, Kelso A, et al. 2020. Effects of the built environment on physical activity: a systematic review of longitudinal studies taking sex/gender into account. *Environ Health Prev Med*. 25:75. doi:10.1186/s12199-020-00915-z.
- Teariki MA, Leau E. 2024. Understanding Pacific worldviews: principles and connections for research. *Kōtuitui: New Zealand Journal of Social Sciences Online*. 19(2):132–151. doi:10.1080/1177083X.2023.2292268.
- Thorne R. 2019. Walking and cycling in Māngere: Community experiences of Te Ara Mua – future Streets. [Thorne-2019-Community-experiences-of-Future-Streets.pdf \(futurestreets.org.nz\)](https://www.futurestreets.org.nz).
- Thorne R, Wild K, Woodward A, Mackie H. 2020. Cycling projects in low-income communities: exploring community perceptions of Te Ara Mua–future streets. *New Zealand Geographer*. 76(3):170–181. doi:10.1111/nzg.12276.
- Tunufa'i L. 2016. Pacific research: rethinking the talanoa 'methodology'. *New Zealand Sociology*. 31(7):227–239.
- Vaioleti TM. 2016. Talanoa research methodology: a developing position on pacific research. *Waikato Journal of Education*. 12:21–34.
- Vakalahi F, Hafoka-Kanuch O. 2019. Our Pacific elders as keepers and transmitters of culture. In: Maidment J, Muāgututi'a U, editors. *Pacific social work*. New York: Routledge; p. 150–160.
- Warin B, Exeter DJ, Zhao J, Kenealy T, Wells S. 2016. Geography matters: the prevalence of diabetes in the Auckland Region by age, gender and ethnicity. *The New Zealand Medical Journal*. 129(1436):25–37.
- Witten K, Blakely T, Bagheri N, Badland H, Ivory V, Pearce J, Mavoa S, Hinckson E, Schofield G. 2012. Neighbourhood built environment is associated with transport and leisure physical activity: New Zealand findings using objective exposure and outcome measures. *Environmental Health Perspectives*. 120(7):P971–P977. doi:10.1289/ehp.1104584.
- Witten K, Field A. 2020. Engaging children in neighborhood planning for active travel infrastructure. In: Waygood EOD, Friman M, Olsson LE, Mitra R, editors. *Transport and children's well-being*. Amsterdam: Elsevier; p. 199–216.
- Witten K, Macmillan A, Mackie H, van der Werf B, Smith M, Field A, Woodward A, Hosking J. 2022. Te Ara Mua–future streets: can a streetscape upgrade designed to increase active travel change residents' perceptions of neighbourhood safety? *Wellbeing, Space and Society*. 3. doi:10.1016/j.wss.2022.100079.
- Xia T, Zhang Y, Crabb S, Shah P. 2013. Co benefits of replacing car trips with alternative transportation: a review of evidence and methodological issues. *Journal of Environmental and Public Health*.
- Zhang Y, Koene M, Chen C, Wagenaar C, Reijneveld SA. 2024. Associations between the built environment and physical activity in children, adults and older people: a narrative review of reviews. *Preventive Medicine*. 180:107856. doi:10.1016/j.ypmed.2024.107856.