



BEATS Research Programme Report 2013-2020

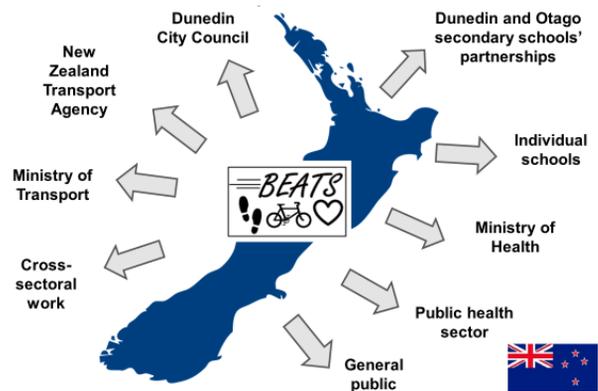


Overview

The Built Environment and Active Transport to School (BEATS) Research Programme is based on contemporary ecological models for active transport (walking or cycling) that identify individual, social, environmental and policy influences on behaviour. This research has been designed to advance scientific knowledge and provide service to the government, local community and schools.

www.otago.ac.nz/beats

BEATS Research Dissemination and Impact



BEATS Research Programme 2013-2020: Overview

Disciplines & impact areas:	Exercise Science	Public Health	Transport	Built Environment	Education
Partnerships:	Academia	Schools	City Council	Community	Transport Sector
Research team:	Members: <ul style="list-style-type: none"> Investigators Advisory board members Research staff Research students Collaborators 		Team's expertise: <ul style="list-style-type: none"> Exercise sciences Public health Physical activity promotion Behavioural medicine Biostatistics Māori Health Geographies of transport Children geographies Geographic Information Science Education 		
Projects:	BEATS Study (Dunedin; 2014-2017) 12 Schools 1780 Adolescents 355 Parents 14 Teachers ✓ 12 Principals ✓	BEATS Rural Study (Rural Otago; 2018-2019) 11 Schools 1014 Adolescents ✓ 78 Parents ✓ 2 Principals ✓	BEATS Cultural Study (Dunedin & Bay of Plenty; 2018-2019) Data collection completed ✓	BEATS Natural Experiment (Dunedin; 2019-2023) In progress ✓	The Catalyst Project (Subject to future funding)
Research data collection:	<ul style="list-style-type: none"> Survey Anthropometry Accelerometers Focus group/interview Mapping 	Adolescents ✓ ✓ ✓ ✓ ✓	Parents ✓ ✓ ✓ ✓	Teachers / Principals ✓	<ul style="list-style-type: none"> Built environment analysis (Geographic Information Science) Environmental scan of school neighbourhoods
Spin-off projects:	<ul style="list-style-type: none"> Evaluation of cycle skills training programme (2015-2017) Examining cycle skills training content and delivery (2017-2018) BEATS Study Symposium (2014; 2016; 2018; 2020) The Active Living and Environment Symposium (2017; 2019) 				
Research outputs (as of February 2021):	27 Journal articles 1 Book chapter 131 Conference abstracts 39 Technical reports 34 Seminar presentations for academic audiences 26 Seminar presentations for stakeholders, policy makers, health promoters				

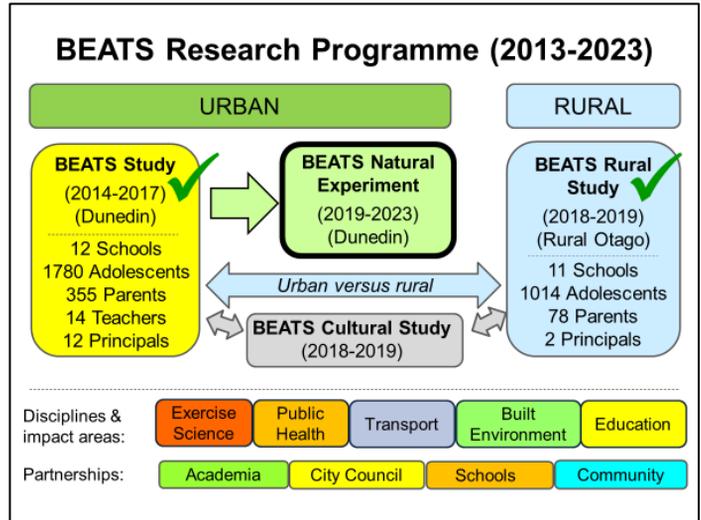
BEATS Research Programme: Led by the Heart, Informed by Science and Implemented by the Community

BEATS is an interdisciplinary and multi-sector research programme founded as a partnership between academia, schools, local government and the wider community.

The programme spans the fields of exercise science, health, transport, environment and education.

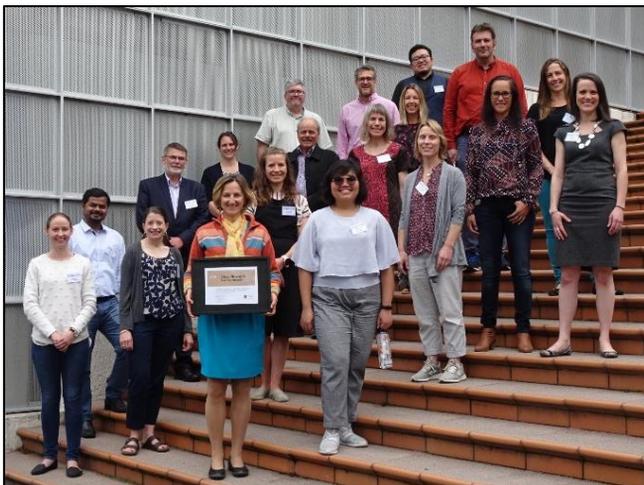
The BEATS Research Programme is a collaboration between Dunedin Secondary Schools' Partnership, Dunedin City Council, University of Otago and Auckland University of Technology.

The programme has been designed and implemented using a community-based participatory approach with the sustained involvement of key stakeholders. This approach has enabled the BEATS team to generate end-user relevant data, and facilitate knowledge translation into evidence-based policy and planning. BEATS research results are helping inform future interventions for built environment change, education campaigns, school policy development and city policy development.



The BEATS **Research Team** involves investigators from multiple disciplines and countries, advisory board members from the local community, an increasing number of research students and research assistants, and national and international collaborators. For details, refer to the BEATS website: <https://www.otago.ac.nz/beats/staff/index.html>

The BEATS **publications** and **spin-off projects** are summarised in this report and are also available on the BEATS website: www.otago.ac.nz/beats/publications.



In 2019, the BEATS Research Team won the University of Otago Research Group Award.

The findings from the BEATS Research are:

- Providing valuable information for schools, city councils, transport agencies and land planners;
- Suggesting potential ways to encourage students' active transport to school and increase physical activity levels in adolescents; and
- Helping inform future interventions for built environment change, education campaigns, school policy development and city/regional policy development.

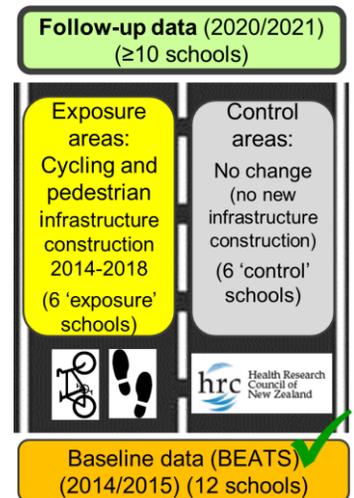


Current Project: BEATS Natural Experiment (BEATS-2 Study)

Several Dunedin neighbourhoods have been undergoing on-road and off-road cycling infrastructure construction since 2014 and pedestrian-related infrastructure changes in 2018, affecting six out of twelve Dunedin secondary schools.

The BEATS Natural Experiment (also known as the BEATS-2 Study) examines the effects of these built environment changes on active transport to school and physical activity levels in Dunedin adolescents, as well as adolescents' perceptions of the school neighbourhood built environment. Data will be collected in schools using published research methods. Analysis will include 2014/2015 BEATS Study data and contemporary ecological models for active transport that account for individual, social, environmental and policy factors. Findings will inform planning of future built environment and active transport interventions.

Funding: Health Research Council Project Grant (#19/173) (\$1,197,487).
Study protocol article: <https://doi.org/10.1136/bmjopen-2019-034899>



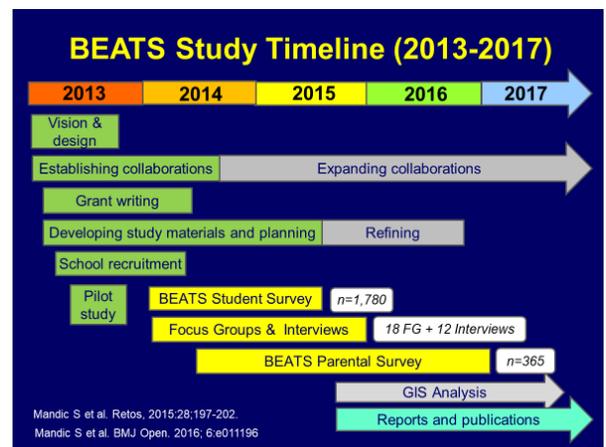
Completed BEATS Projects

BEATS Study (2014-2017)

The original BEATS Study examined individual, social, environmental and policy factors influencing active transport to school in adolescents living in Dunedin, New Zealand. The study has generated timely, unique and valuable data to inform future interventions for built environment change, educational campaigns and policy development in urban areas.

BEATS Study protocol article:
<https://doi.org/10.1136/bmjopen-2016-011196>

BEATS Study implementation article:
<http://recyt.fecyt.es/index.php/retos/article/view/34955/19222>



Funding: Health Research Council of New Zealand Emerging Researcher First Grant [14/565], National Heart Foundation of New Zealand [1602 and 1615], Lottery Health Research Grant [Applic 341129], University of Otago Research Grant [UORG 2014], Dunedin City Council and internal grants from the School of Physical Education, Sport and Exercise Sciences, University of Otago.

BEATS Rural Study (2018-2019)

This study examined individual, social, environmental and policy factors influencing active transport to school in adolescents living in rural areas of the Otago region of New Zealand. The study used the published BEATS Study methodology and conceptual framework. This study has generated valuable rural-specific data to inform future interventions for built environment change, educational campaigns and policy development in rural areas.

Funding: University of Otago Research Grant and Otago Energy Centre Research Seed Project grant.

BEATS Cultural Study (2018-2019)

This study examines what Māori and Pacific adolescents think about their transport to school. Data were collected in Dunedin and the wider Bay of Plenty in 2018. Understanding the impact of cultural factors in the local context is essential for identifying and designing effective interventions to promote active transport to school. This research continues as part of the BEATS Natural Experiment study.

For more information, visit our website: www.otago.ac.nz/beats

BEATS Research Programme Spin-Off Projects (2013-2020)

• The Active Living and Environment Symposium (TALES) (2017, 2019):

These symposia were designed to facilitate and grow an international, multidisciplinary and multi-sector dialogue related to Active Living and Environment. The symposia brought together researchers, policy makers, health promoters, urban designers, transport experts and interested members of the public to network and exchange ideas.



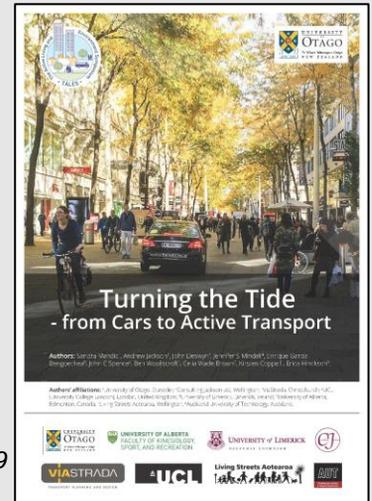
- Symposium website 2019: www.otago.ac.nz/active-living-2019
- Symposium proceedings 2017: <https://www.otago.ac.nz/active-living-2019/otago694082.pdf>

• “Turning the Tide – from Cars to Active Transport” Report with Key Policy Recommendations for Increasing Active Transport in New Zealand

This report considered the health and environmental benefits of walking and cycling and defined a clear set of actions to get us out of our cars and living healthier lives. The development of this report and policy recommendations was a multidisciplinary and cross-sector endeavour and one of the outcomes of The Active Living and Environment Symposium (TALES) 2019.

- Full report: <https://www.otago.ac.nz/active-living/otago710135.pdf>
- Brief report: <https://www.otago.ac.nz/active-living/otago710121.pdf>
- Scientific journal article describing methods and recommendations:

Sandra Mandic, Andrew Jackson, John Lieswyn, Jenny Mindell, Enrique García Bengoechea, John Spence, Ben Wooliscroft, Celia Wade-Brown, Kirsten Coppell, Erica Hinckson. Development of Key Policy Recommendations for Active Transport in New Zealand: Multi-Sector and Multidisciplinary Endeavour. Journal of Transport & Health. 2020; 18:100859 DOI: <https://doi.org/10.1016/j.jth.2020.100859>



• Cycle Skills Training Research Projects (2015-2018)

South Dunedin Cycling Project provided a cycle skills training programme, a series of activities and events, as well as access to bikes, helmets and safety equipment in Dunedin, New Zealand. The research conducted in 2015-2017 examined and compared the effects of cycle skills training with or without on-road training on cycling-related knowledge, confidence and behaviours in children and youth.

Two articles were published reporting results from this project (see page 7 for details): <https://doi.org/10.1016/j.jth.2017.12.010> and <https://doi.org/10.1016/j.jth.2018.01.015>

In 2017-2018, research was conducted to examine cycling skills training content and delivery in primary and intermediate schools in Dunedin. Data collection included focus groups, photos, videos and children building 3D models of their ideal cycle skills training course. Children's work was displayed at their school.



• BEATS Study Symposia (2014, 2016, 2018, 2020):

BEATS Symposia have been used as one of many avenues to communicate the BEATS Research findings to the wider community and to engage with our stakeholders. Findings shared at these symposia were relevant to academia, government, public health, urban design, the transportation and environment sectors.

- Symposium proceedings 2020: <https://www.otago.ac.nz/beats/otago732418.pdf>
- Symposium proceedings 2018: <https://www.otago.ac.nz/beats/otago699865.pdf>
- Symposium proceedings 2016: <https://www.otago.ac.nz/active-living/otago618157.pdf>
- Symposium proceedings 2014: <https://www.otago.ac.nz/active-living/otago618159.pdf>

• Active Living Laboratory Newsletter (since 2016):

We publish a quarterly newsletter to provide regular updates about our work and the BEATS Research publications. Previous issues are available online: www.otago.ac.nz/active-living/research/publications

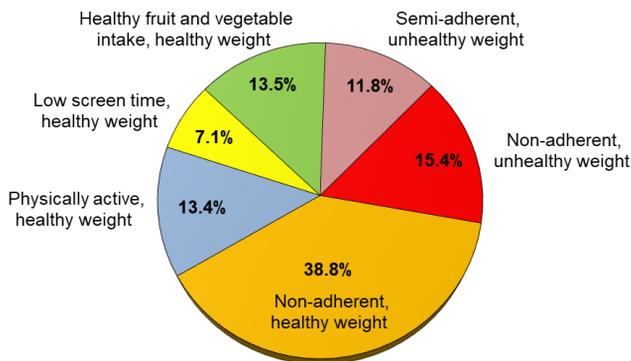
Summary of BEATS Research Findings Published to Date

Adolescents' Health and Physical Activity Levels



Clustering of (Un)Healthy Behaviours in Adolescents from Dunedin, New Zealand

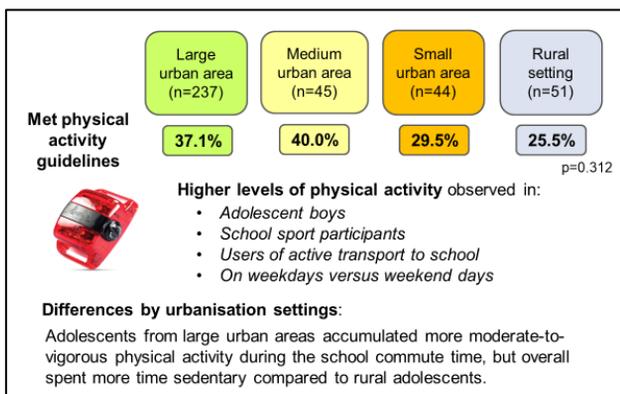
The findings from the BEATS Study show that few Dunedin adolescents met recommended health behaviour guidelines, yet two-thirds had a healthy weight. This study identified six clusters based on health behaviours and weight status. Clusters had distinct sociodemographic and lifestyle characteristics. These findings suggest that future public health strategies for adolescents should be comprehensive and consider socioeconomic structural factors.



Six clusters identified based on meeting guidelines for physical activity, screen time, fruit and vegetable intake and healthy weight

Sandra Mandic, Enrique García Bengoechea, Kirsten J Coppell, John C Spence. Clustering of (un)healthy behaviors in adolescents from Dunedin, New Zealand. *American Journal of Health Behavior*. 2017;41(3):266-275 DOI: <https://doi.org/10.5993/AJHB.41.3.6>

Comparison of Physical Activity Patterns across Large, Medium, and Small Urban Areas and Rural Settings in the Otago Region, New Zealand

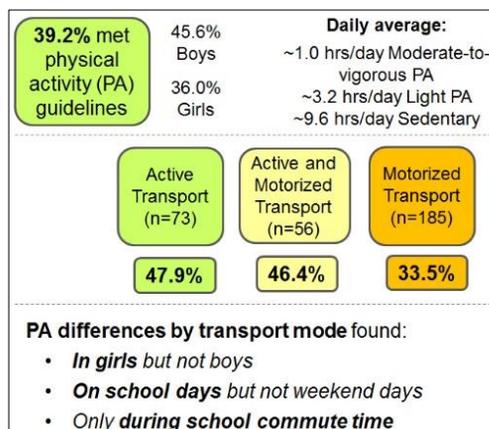


Analysis of BEATS Study and BEATS Rural Study data showed that less than half of Otago adolescents meet physical activity guidelines. Higher proportion of males, those participating in school sports and using active transport to school met physical activity guidelines compared to their counterparts. Overall, adolescents are less physically active on weekends compared to school days. Adolescents from large urban areas spent more time being stationary compared to their rural peers. Continuous encouragement of physical activity is needed for adolescents across urban and rural settings.

Brittany White, Enrique García Bengoechea, John Spence, Kirsten Coppell, Sandra Mandic. Comparison of physical activity patterns across large, medium, and small urban areas and rural settings in the Otago Region, New Zealand. *New Zealand Medical Journal*. [In press] (Accepted on 01 Feb 2021)

Transport to School Habits and Objectively Measured Physical Activity in Adolescents

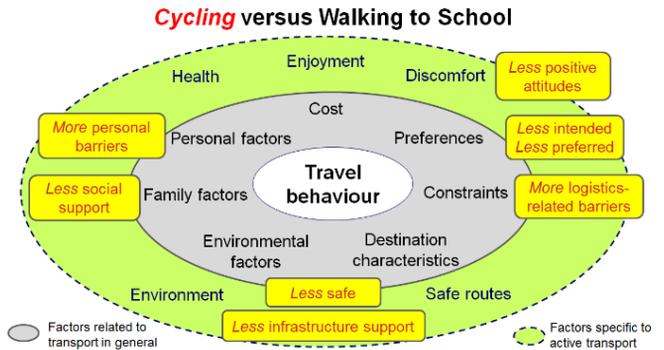
Nearly half of adolescents using active transport to school (alone or in combination with motorised modes) met physical activity recommendations compared to only one third of motorised transport users. Physical activity differences by transport modes were observed in girls, on school days and during school commute times. Therefore, combined active and motorised transport to school is also a plausible way to increase adolescent girls' physical activity when active transport only is not feasible.



Chiew Ching Kek, Enrique García Bengoechea, John Spence, Sandra Mandic. The relationship between transport-to-school habits and physical activity in a sample of New Zealand adolescents. *Journal of Sport and Health Science*. 2019; 8(5):463-470. DOI: <https://doi.org/10.1016/j.jshs.2019.02.006>

Adolescents Perceptions of Walking versus Cycling to School

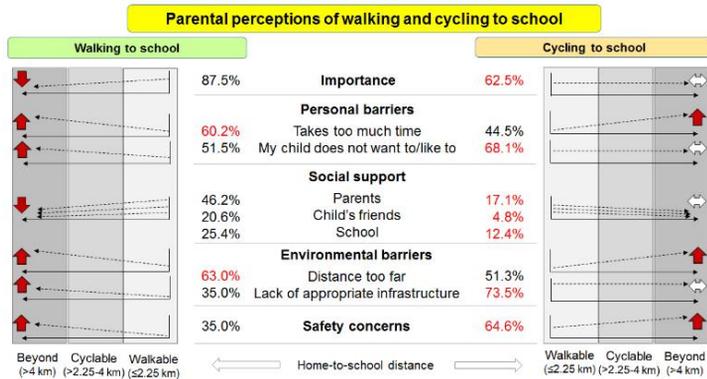
The BEATS Study findings show that low rates of cycling to school in New Zealand adolescents may be context-specific. This article shows that compared to walking, cycling to school among Dunedin adolescents was less common and perceived as less safe. Cycling also received less social and infrastructure support. Therefore, more supportive physical and social environments are required for promoting cycling to school among Dunedin adolescents.



Reprinted from Mandic S et al. J Transp Health, 2017; 4:294-304 (with permission from Elsevier).

Sandra Mandic, Debbie Hopkins, Enrique García Bengoechea, Charlotte Flaherty, John Williams, Leiana Sloane, Antoni Moore, John C Spence. Adolescents' perceptions of cycling versus walking to school: Understanding the New Zealand context. *Journal of Transportation and Health*. 2017;4:294-304 DOI: <https://doi.org/10.1016/j.jth.2016.10.007>

Differences in Parental Perceptions of Walking and Cycling to High School According to Distance



Reprinted from Mandic S et al. Transp Res Part F Traffic Psychol Behav. 2020; 71:238-249

This article showed that parents of adolescents favoured walking compared to cycling as a mode of transport to school for their child. With increasing distance to school, social support for active transport decreased whereas personal, environmental and safety barriers became more pronounced. Two-thirds of parents expected to participate in adolescents' school travel decision making. The findings highlight that active transport to school initiatives should minimise parental concerns, consider the specificity of walking and cycling and take into account distance to school.

Sandra Mandic, Debbie Hopkins, Enrique García Bengoechea, Charlotte Flaherty, Kirsten Coppell, Antoni Moore, John Williams, John Spence. Differences in parental perceptions of walking and cycling to high school according to distance. *Transportation Research Part F: Traffic Psychology and Behaviour*. 2020; 71:238-249; DOI: <https://doi.org/10.1016/j.trf.2020.04.013> (Open access)

A Tale of Two New Zealand Cities: Cycling to School among Adolescents in Christchurch and Dunedin

This article examined intrapersonal factors related to adolescents' cycling to school in Dunedin versus Christchurch. Despite higher rates of cycling to school in Christchurch, attitudes towards cycling to school were similar in both cities. Norms, capability, autonomy and intention to cycle were lower in Dunedin. Norms were the dominant influence for cycling to school in Christchurch and attitude was dominant in Dunedin. Therefore, norms, social needs and capability are relevant for adolescents' cycling initiatives.



Frater et al. Transp Res Part F: Traff Psych Behav. 2017;49:205-214

Jillian Frater, John Williams, Debbie Hopkins, Charlotte Flaherty, Antoni Moore, Simon Kingham, Roeline Kuijjer, Sandra Mandic. A tale of two New Zealand cities: Cycling to school among adolescents in Christchurch and Dunedin. *Transportation Research Part F: Traffic Psychology and Behaviour*. 2017;49:205-214. DOI: <https://doi.org/10.1016/j.trf.2017.06.018>

Perceptions of Cycling among High School Students and Their Parents

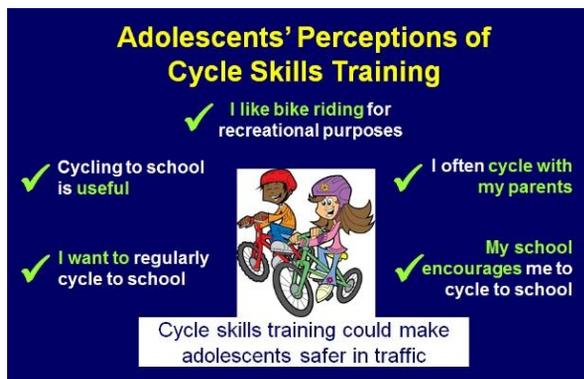
This article presents findings from BEATS Study focus groups with adolescents and parents. Key findings relate to perceived safety, implicit messages and social norms. A complex range of factors contributed to perceived safety of cycling, including features and perceptions of the built environment, traffic safety, previous cycling experiences and adolescents' cycling skills. Overcoming concerns through behavioural and cultural interventions coupled with up-skilling and infrastructure changes may present a pathway to increasing rates of cycling.

Perceptions of Cycling to School (From Student and Parental Focus Groups)

- **Perceived safety:**
 - A complex range of factors including:
 - Features and perceptions of the built environment
 - Traffic safety (including behaviours of other road users)
 - Previous cycling experiences (including accidents)
 - Adolescents' cycling skills and on-road experiences
- **Implicit messages**
- **Social norms**

Debbie Hopkins, Sandra Mandic. *Perceptions of cycling among high school students and their parents. International Journal of Sustainable Transportation.* 2017;11(5):342-356 DOI: <https://doi.org/10.1080/15568318.2016.1253803>

Attitudes Towards Cycle Skills Training in New Zealand Adolescents



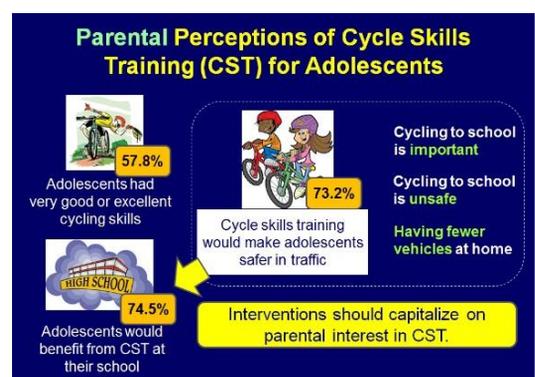
Little is known about adolescents' attitudes towards cycle skills training. In this study, over one third of adolescents perceived that cycle skills training could make them safer in traffic. Enjoyment, usefulness and desire to cycle were associated with a positive attitude towards the training. Parental cycling behaviour and school's encouragement were also important. Schools may be an appropriate setting for provision of cycle skills training for adolescents.

Sandra Mandic, Charlotte Flaherty, Tessa Pocock, Alex Mintoft-Jones, Jillian Frater, Palma Chillón, Enrique García Bengoechea. *Attitudes towards cycling skills training in New Zealand adolescents. Transportation Research Part F: Traffic Psychology and Behaviour.* 2016;42:217-226 DOI: <https://doi.org/10.1016/j.trf.2016.08.002>

Parental Perceptions of Cycle Skills Training for Adolescents

This article presents findings from the BEATS Parental Survey. Parents perceived cycle skills training would make adolescents safer in traffic. Having fewer vehicles at home and parental perceptions that cycling to school is important but unsafe were also associated with favourable perceptions of cycling skills training. Parents thought adolescents would benefit from such training at their school. Therefore, interventions should capitalize on parental interest in cycle skills training.

Sandra Mandic, Charlotte Flaherty, Tessa Pocock, Chiew Ching Kek, Palma Chillón, Christina Ergler, Enrique García Bengoechea. *Parental perceptions of cycle skills training for adolescents. Journal of Transport & Health.* 2017;6:411-419. DOI: <https://doi.org/10.1016/j.jth.2017.03.009>



Publications from the BEATS Spin-Off Project: Evaluation of Cycle Skills Training (2015-2017):

Sandra Mandic, Charlotte Flaherty, Tessa Pocock, Chiew Ching Kek, Siobhan McArthur, Christina Ergler, Palma Chillón, Enrique García Bengoechea. *Effects of cycle skills training on children's cycling-related knowledge, confidence and behaviours. Journal of Transport and Health.* 2018; 8:271-282 DOI: <https://doi.org/10.1016/j.jth.2017.12.010>

Sandra Mandic, Charlotte Flaherty, Christina Ergler, Chiew Ching Kek, Tessa Pocock, Dana Lawrie, Palma Chillón, Enrique García Bengoechea. *Effects of cycle skills training on cycling-related knowledge, confidence and behaviour in adolescent girls. Journal of Transport and Health.* 2018;9:253-263 DOI: <https://doi.org/10.1016/j.jth.2018.01.015>

Built Environment Associates of Active School Travel in New Zealand Children and Youth: A Systematic Meta-Analysis using Individual Participant Data

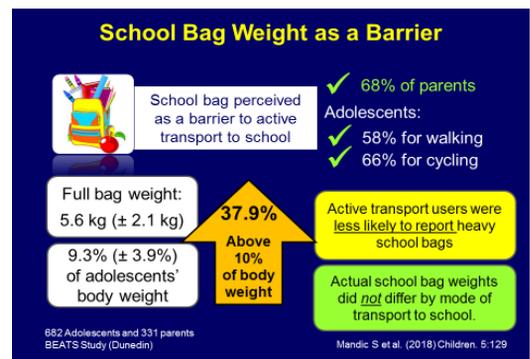
This article analysed data from five New Zealand-based studies (including the BEATS Study) with a total sample of 2844 children and youth aged 6-19 years. The results show that distance to school was the strongest predictor of active travel to school. Increased street connectivity around schools was related to active travel to school. Dwelling density and school socioeconomic status were negatively associated with active travel to school. Distance to school is a key consideration for school zoning and catchment policies.

Erika Ikeda, Tom Stewart, Nicholas Garrett, Victoria Egli, Sandra Mandic, Jamie Hosking, Karen Witten, Greer Hawley, El Shadan Tautolo, Judy Rodda, Antoni Moore, Melody Smith. *Built environment associates of active school travel in New Zealand children and youth: A systematic meta-analysis using individual participant data. Journal of Transport and Health. 2018;9:117-131 DOI: <https://doi.org/10.1016/j.jth.2018.04.007>*

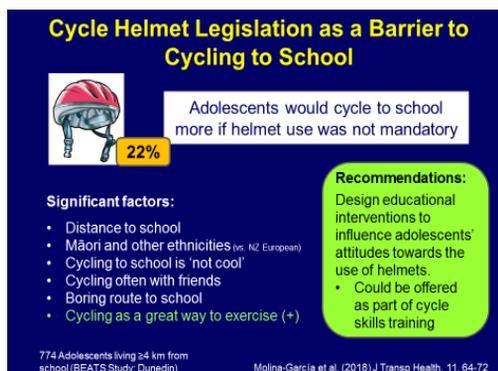
School Bag Weight as a Barrier to Active Transport to School

This article shows that school bag weight was perceived by both adolescents and their parents as a barrier for active transport to school. Heavy school bags were seen as a greater barrier for cycling versus walking. Active transport users were less likely to perceive their school bag as too heavy. On average, adolescents' school bags weighed 5.6 kg. Actual school bag weights did not differ by mode of transport to school. School bag weights should be considered in future active transport to school interventions.

Sandra Mandic, Roman Keller, Enrique García Bengoechea, Antoni Moore, Kirsten Coppell. *School bag weight as a barrier to active transport to school among New Zealand adolescents. Children. 2018, 5, 129; DOI: <https://doi.org/10.3390/children5100129>*



Would New Zealand Adolescents Cycle to School More if Allowed to Cycle without a Helmet?



This article shows that 22% of Dunedin youth stated they would cycle to school more often if helmet use was not mandatory. Greater distance to school and school route being perceived as boring were identified as significant factors. Ethnicity, social norms and cycling often with friends also emerged as significant factors. These findings can be used to design educational interventions among adolescents to raise awareness that wearing a bicycle helmet provides protection from head injuries.

Javier Molina-García, Ana Queralt, Enrique García Bengoechea, Antoni Moore, Sandra Mandic. *Would New Zealand adolescents cycle to school more if allowed to cycle without a helmet? Journal of Transport and Health. 2018;11:64-72 DOI: <https://doi.org/10.1016/j.jth.2018.10.001>*

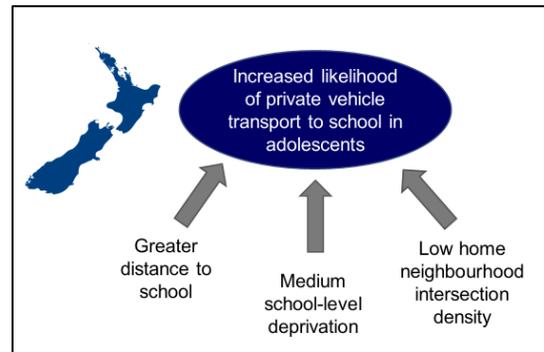
The Importance of Social Capital for Young People's Active Transport and Independent Mobility in Rural Otago, New Zealand

This article shows the importance of social capital in adolescents' licenses, habits and levels of independent mobility and active transport in rural areas. Two main factors related to adolescents' active transport and independent mobility in rural areas were perceptions of stranger and traffic danger, both due to a lack of social trust. The perception of social capital decline observed was similar to a previously reported decline in urban areas, going against the perceived notion of social ties and communities being strong in rural areas. Therefore, health policies targeted at increasing adolescents' physical activity in rural areas should consider social capital.

Tessa Porskamp, Christina Egler, Eva Pilot, Preeti Sushama, Sandra Mandic. *The Importance of social capital for young people's active transport and independent mobility in rural Otago, New Zealand. Health & Place. 2019; 60:102216 DOI: <https://doi.org/10.1016/j.healthplace.2019.102216>*

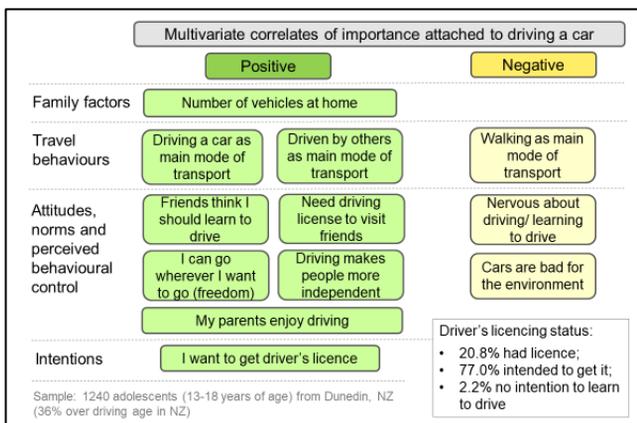
Sociodemographic and Built Environment Associates of Travel to School by Car among New Zealand Adolescents

Using data from four New Zealand studies (including the BEATS Study), this article shows that distance to school, school level deprivation and low home neighbourhood intersection density are associated with higher likelihood of car travel to school compared with active transport among New Zealand adolescents. Comprehensive interventions focusing on both social and built environment factors are needed to reduce car travel to school.



Sandra Mandic, Erika Ikeda, Tom Stewart, Nicholas Garrett, Debbie Hopkins, Jennifer Mindell, El Shadan Tautolo, Melody Smith. Sociodemographic and built environment associates of travel to school by car among New Zealand adolescents: Meta-analysis. *International Journal of Environmental Research and Public Health*. 2020; 17:9138; DOI: <https://doi.org/10.3390/ijerph17239138> (Open access)

Adolescents and Their Aspirations for Private Car-Based Transport

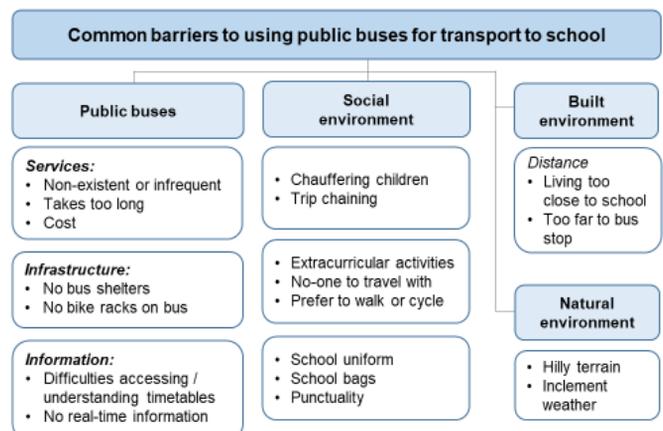


Recent reports showed declining preference for car-transport by younger generations ('Millennials'), particularly in cities. Dunedin adolescents' show sustained interest in car-based travel. The research shows the importance of socialisation processes; the travel practices that adolescents are exposed to at home and amongst their social groups impacts upon their future intentions and aspirations. Designing interventions to decrease car use and increase uptake of active and public modes need to focus on everyday travel practices. What caregivers, friends and peers say and do is an important component and needs to be factored into interventions.

Debbie Hopkins, Enrique García Bengoechea, Sandra Mandic. Adolescents and their aspirations for private car-based transport. *Transportation*. 2019. (E-pub: 21 Aug 2019) DOI: <https://doi.org/10.1007/s11116-019-10044-4>

Taking the Bus? Barriers and Facilitators for Adolescent Use of Public Buses to School

This article used multiple sources of data to understand the barriers to and facilitators of public transport use by adolescents for school travel in Dunedin. Major barriers were distance to school, cost, parental trip chaining, built environment features, the weather, convenience, and safety perceptions. This article outlines recommendations that could increase use of public buses for school travel. Future actions would require government authorities, schools, parents and adolescents to work together to encourage adolescents use of public buses to school.

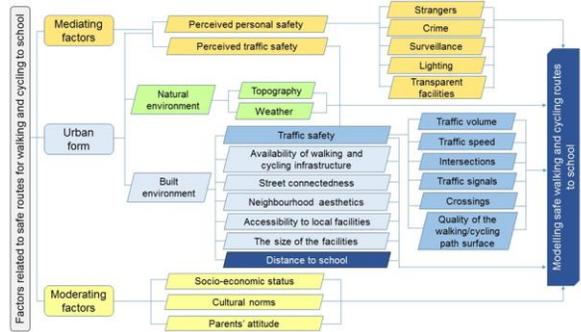


Adapted from Mindell JS et al. *Travel Behaviour and Society*. 2021;22:48-58

Jennifer S Mindell, Christina Ergler, Debbie Hopkins, Sandra Mandic. Taking the bus? Barriers and facilitators for adolescent use of public buses to school. *Travel Behaviour and Society*. 2021;22:48-58; DOI: <https://doi.org/10.1016/j.tbs.2020.08.006> (Open access)

A Conceptual Framework for Modelling Safe Walking and Cycling Routes to High Schools

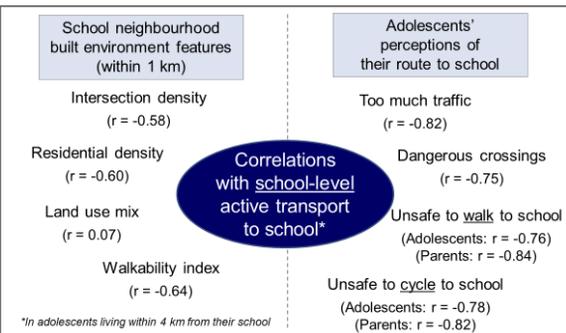
This framework was based on several existing relevant frameworks including ecological models, the Five E's framework of transport planning and a travel mode choice framework for school travel. The framework identifies built environment features and traffic safety factors to be considered when modelling safe walking/cycling routes to high schools. To be effective, the modelling and creation of safe routes to high schools should be complemented by other interventions, including education, enforcement and encouragement.



Reprinted from Rahman et al. *Int J Env Res Pub Health*. 2020, 17, 3318.

Mohammad Lutfur Rahman, Antoni Moore, Melody Smith, John Lieswyn, Sandra Mandic. A Conceptual framework for modelling safe walking and cycling routes to high schools. *International Journal of Environmental Research and Public Health*. 2020, 17, 3318; DOI: <https://doi.org/10.3390/ijerph17093318> (Open access)

Active Transport to School and School Neighbourhood Built Environment across Urbanisation Settings in Otago, New Zealand



This article showed findings from BEATS and BEATS Rural Studies. In the Otago region of New Zealand, school neighbourhood environments and active transport to school rates vary across diverse urbanisation settings. Built environment features of school neighbourhoods and adolescents' perceptions of the school route are associated with the adolescents' use of active transport to school. Future initiatives should focus on ensuring built environment features around schools support active modes for school travel.

Mohammad Lutfur Rahman, Tessa Pocock, Antoni Moore, Sandra Mandic. Active transport to school and school neighbourhood built environment across urbanisation settings in Otago, New Zealand. *International Journal of Environmental Research and Public Health*. 2020; 17:9013; DOI: <https://doi.org/10.3390/ijerph17239013> (Open access)

Assessment of School Neighbourhood Built Environments for Active Transport to School

An optimal distance for walking to school in Dunedin adolescents is ≤ 2.25 km. Adolescents' perceived walking safety was the strongest correlate of active transport to school, whereas the near-school built environment was not correlated with active transport to school. Therefore, adolescents' perceptions of walking safety should be considered as part of comprehensive efforts to encourage active transport.

Tessa Pocock, Antoni Moore, Michael Keall, Sandra Mandic. Physical and spatial assessment of school neighbourhood built environments for active transport to school in adolescents from Dunedin (New Zealand). *Health & Place*. 2019;55:1-8. DOI: <https://doi.org/10.1016/j.healthplace.2018.10.003>

School Neighbourhoods and Active Transport

Environmental audits:

- All 12 Dunedin high schools
- 934 segments audited (106 km in total; (2.7-14 km/school))
- 767 crossings

- Environmental scan of school neighbourhoods
- GIS analysis of school neighbourhood built environment
- Adolescents' perceptions of the route to school

The strongest predictor of active transport to school?

Adolescents' perceptions of safety for walking to school

Modified Tool for Assessment of School Neighbourhoods: MAPS-Global SN

This study evaluated the use of a modified audit tool and protocol - Microscale Audit of Pedestrian Streetscapes (MAPS) Global – School Neighbourhood in Dunedin. The results show that this modified tool is a feasible alternative to school neighbourhood audits and complement built environment measures obtained through Geographic Information Systems analysis. This article includes recommendations and considerations for future use of the modified tool.

Tessa Pocock, Antoni Moore, Javier Molina-García, Ana Queralt, Sandra Mandic. School neighbourhood built environment assessment for adolescents' active transport to school: Modification of an environmental audit tool (MAPS Global). *International Journal of Environmental Research and Public Health*. 2020; 17:2194. DOI: <https://doi.org/10.3390/ijerph17072194> (Open access)

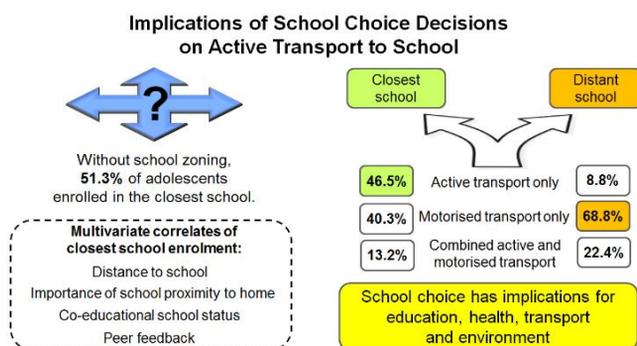
Adolescents' Perspectives on School Choice

The most common reasons for school choice in Dunedin included: preference for a co-educational school, school's facilities, positive comments from parents/students and friends' enrolment. Reasons for school choice differed by who was making the decision (student, parent, or student and parent together). These findings suggest that social factors and school programmes/facilities rather than proximity to home influence school choice decisions in Dunedin.

Sandra Mandic, Susan Sandretto, Debbie Hopkins, Gordon Wilson, Antoni Moore, Enrique García Bengoechea. "I wanted to go here": Adolescents' perspectives on school choice. *Journal of School Choice: International Research and Reform*. 2018;12(1):98-122. DOI: <http://dx.doi.org/10.1080/15582159.2017.1381543>

Comments from students and parents	Positive feedback about school: - 51.9% Students; 51.3% Parents	1,465 adolescents (boarders excluded)
	Negative feedback from people at closest school: - 8.0% Students; 8.4% Parents	
Social connections	50.7% Friends enrolled	
	35.1% Sibling(s) went or enrolled	
	27.0% Parents attended	
Co-ed status	68.6% Preferred co-ed school	
	25.3% Preferred single-sex school	
Programmes and facilities	52.3% Facilities	
	46.3% Sports programmes	
	33.0% Cultural programmes	
Proximity	36.5% Closest school to home	
Other	7.3% Other reasons	

Implications of School Choice Decisions on Active Transport to School



Reprinted from Mandic S et al. *J Transp Health*, 2017;6:347-357 (with permission from Elsevier).

Rodda, Gordon Wilson. Enrolling in the closest school or not? Implications of school choice decisions for active transport to school. *Journal of Transport & Health*. 2017;6:347-357. DOI: <https://doi.org/10.1016/j.jth.2017.05.006>

Without school zoning, half of Dunedin adolescents enrolled in the closest school. Distance to school and importance of school's proximity influenced school choice. Co-educational school status and peer feedback were also important. Adolescents attending their closest school had five times higher rates of active transport. These findings suggest that school choice has implications for education, health, transport and environment.

Sandra Mandic, Susan Sandretto, Enrique García Bengoechea, Debbie Hopkins, Antoni Moore, Judy

Competing Tensions: Active Transport to School, School Choice and Policy Making

School choice policies increase distance to school and reduce active travel rates. Findings from this article showed that school leaders were aware of main barriers to active transport to and from school. Many school leaders viewed school travel as a family decision and choice. Active school travel policies have not been in the school leaders' 'field of view'. Future efforts to encourage active school travel should involve students and their parents and consider comprehensive approaches that span in and out-of-school initiatives.

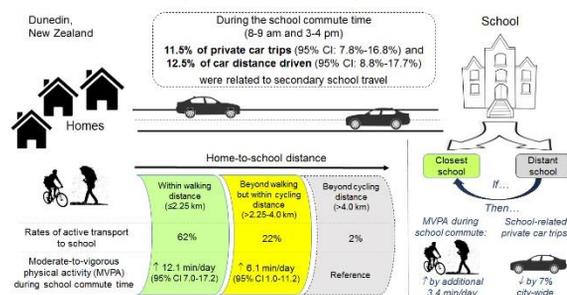
Key themes with quotes
School choice and distance travelled "Our students now come from all over the city, not just our local area"
School choice and barriers to active transport "It's absolute bedlam out there"
Transportation as family/parental choice "Parents don't want to be told how to run their lives by the school"
Prioritising competing tensions "It hasn't been in our field of view"
Initiating change "Just open[ing] up the dialogue's... going to be good"

Reprinted from Sandretto et al. *J Transp Health*, 2020; 18:100908 (with permission from Elsevier).

Susan Sandretto, Debbie Hopkins, Gordon Wilson, Sandra Mandic. *Competing tensions: Active transport to school, school choice and policy making*. *Journal of Transport & Health*. 2020; 18:100908; DOI: <https://doi.org/10.1016/j.jth.2020.100908>

Implications of Attending the Closest School on Adolescents' Physical Activity and Car Travel in Dunedin

Attending the closest school may benefit adolescents' physical activity and reduce car travel. This article estimated such benefits based on data from Dunedin. Around half of private motor vehicle trips to and from school were chained with other trips. In Dunedin, modest reductions in private vehicle traffic, particularly around schools, and increases in adolescents' physical activity during the school commute period would be expected if all adolescents attended the closest school.

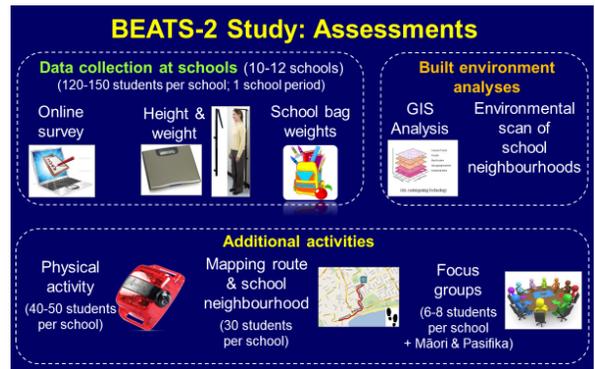


Reprinted from Keall et al. *J Transp Health*, 2020; 18:100900 (with permission from Elsevier).

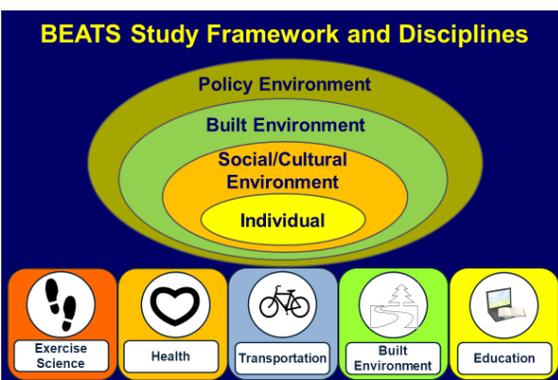
Michael Keall, Debbie Hopkins, Kirsten Coppell, Susan Sandretto, Enrique García Bengoechea, John Spence, Gordon Wilson, Sandra Mandic. *Implications of attending the closest school on adolescents' physical activity and car travel in Dunedin*. *Journal of Transport & Health*. 2020; 18:100900; DOI: <https://doi.org/10.1016/j.jth.2020.100900>

BEATS Natural Experiment Study Protocol

Natural experiments are considered a priority for examining causal associations between the built environment and physical activity because the randomised controlled trial design is rarely feasible. This article describes research methodology for the BEATS Natural Experiment (BEATS-2) Study designed to evaluate the effects of cycling and pedestrian infrastructure changes in Dunedin on adolescents' transport to school behaviours.



Sandra Mandic, Debbie Hopkins, Enrique García Bengoechea, Antoni Moore, Susan Sandretto, Kirsten Coppell, Christina Ergler, Michael Keall, Anna Rolleston, Gavin Kidd, Gordon Wilson, John C. Spence. Built environment changes and active transport to school among adolescents: BEATS Natural Experiment study protocol. *BMJ Open*. 2020; 10:e034899. DOI: <https://doi.org/10.1136/bmjopen-2019-034899> (Open access)



BEATS Study Protocol Article

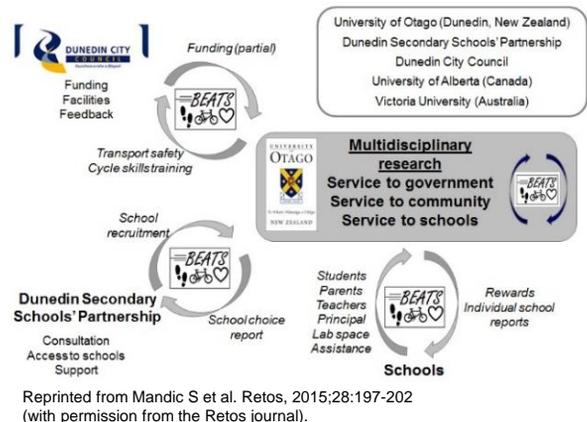
This article describes rationale, framework, research questions and research methodology for the BEATS Study conducted in Dunedin 2014-2017.

Sandra Mandic, John Williams, Antoni Moore, Debbie Hopkins, Charlotte Flaherty, Gordon Wilson, Enrique García Bengoechea, John C Spence. Built Environment and Active Transport to School (BEATS) Study: Protocol for a cross-sectional study. *BMJ Open*. 2016;6:e011196. DOI: <https://doi.org/10.1136/bmjopen-2016-011196>

BEATS Study Planning and Implementation

This article provides “a look behind the scenes” from vision to implementation of the BEATS Study: study design, building research and community collaborations, planning and preparation for data collection, study implementation and knowledge dissemination.

Sandra Mandic, Ashley Mountfort, Debbie Hopkins, Charlotte Flaherty, John Williams, Emily Brook, Gordon Wilson, Antoni Moore. Built Environment and Active Transport to School (BEATS) Study: Multidisciplinary and multi-sector collaboration for physical activity promotion. *Retos*, 2015. 28: p. 197-202. DOI: <http://recyt.fecyt.es/index.php/retos/article/view/34955/19222>



Acknowledgments

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We look forward to continuing to work together in the upcoming years, advancing the scientific knowledge, and leading the way in interdisciplinary and cross-sector collaborations.
The BEATS research journey of 2,900+ days to date continues...