

BEATS Study

Built Environment and
Active Transport to School

www.otago.ac.nz/beats



Complexities of Active Travel to Secondary Schools in Dunedin

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on behalf of the BEATS Research Team

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2 Walk & Cycle Conference | March 2021



BEATS Research Programme

Built Environment and Active Transport to School



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

- **BEATS is examining individual, social, environmental and policy influences on adolescents' active transport to school.**



Research programme overview



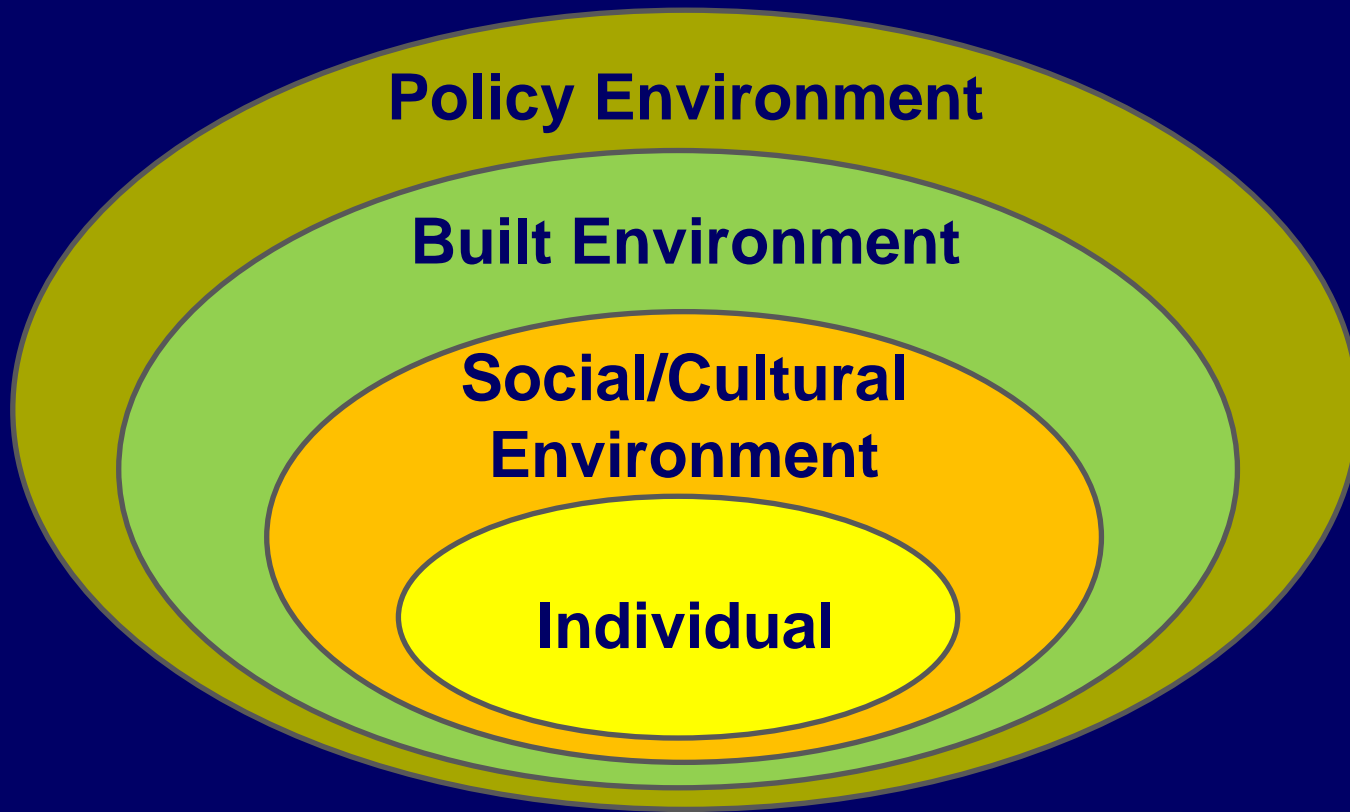
BEATS-2 Study: Information for schools



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BEATS Study Framework: Ecological Model for Active Transport



Adapted from
Sallis JF et al.
Circulation.
2012;125:729-
737

Mandic S et al.
BMJ Open.
2016;
6:e011196



**Exercise
Science**



Health



Transportation



**Built
Environment**



Education

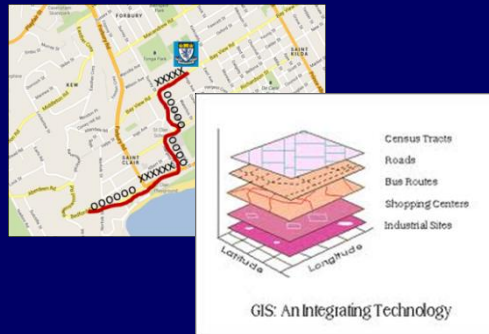
BEATS Research Methodology

Adolescents & Parents

Survey



Maps; GIS Analysis



Anthropometry



Physical Activity



School bag weight Adolescents



Focus groups Adolescents, Parents, Teachers



Interviews

School Principals

BEATS Research Programme (2013-2023)

URBAN

RURAL

BEATS Study

(2014-2017)
(Dunedin)

12 Schools
1780 Adolescents
355 Parents
14 Teachers
12 Principals

BEATS Natural Experiment

(2019-2023)
(Dunedin)



BEATS Rural Study

(2018-2019)
(Rural Otago)

11 Schools
1014 Adolescents
78 Parents
2 Principals

BEATS Cultural Study
(2018-2019)

Urban versus rural

Disciplines & impact areas:

Exercise Science

Public Health

Transport

Built Environment

Education

Partnerships:

Academia

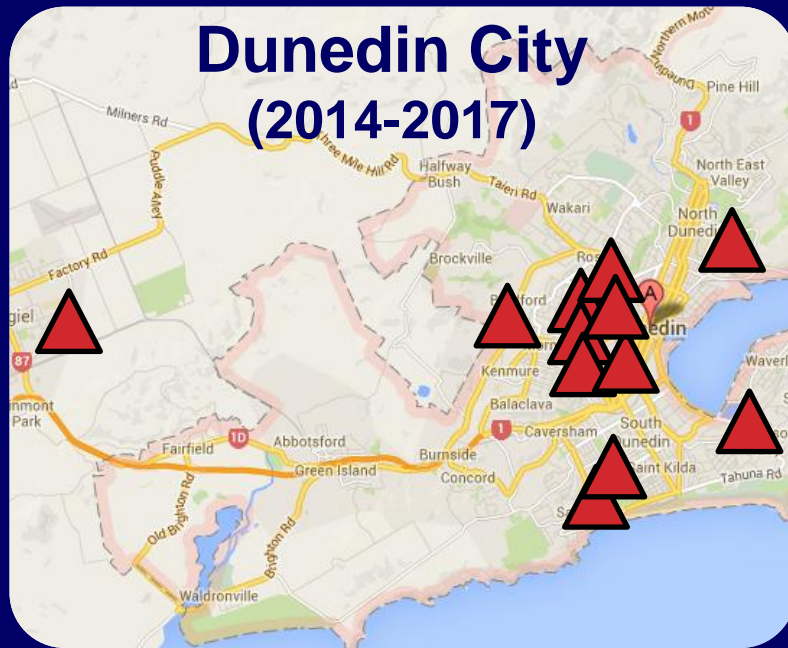
City Council

Schools

Community

BEATS Research Programme (2014-2018)

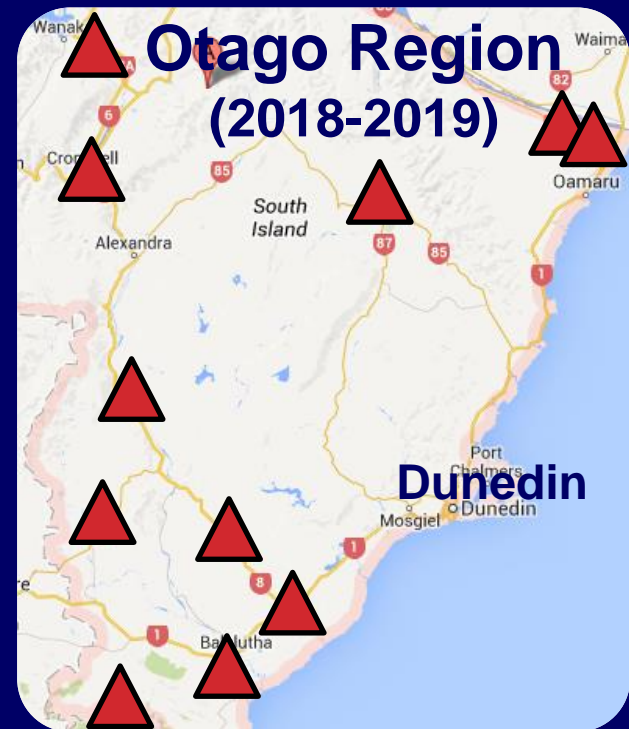
BEATS Study



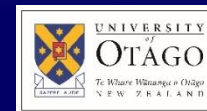
12 Secondary schools
(100% school recruitment rate)



BEATS Rural Study



11 Secondary schools
(73% school recruitment rate)



Otago Secondary Schools Supporting BEATS

(23 out of 27 schools; 85%)

Dunedin (2014/15)
(12 out of 12 schools)



Rural Otago (2018)
(11 out of 15 schools)



Total sample of adolescents (n=2,656)

BEATS Research Programme 2013-2020: Overview

Disciplines & impact areas:

Exercise Science

Public Health

Transport

Built Environment

Education

Partnerships:

Academia

City Council

Schools

Community

Transport sector

Research team:

Members:

- Investigators
- Advisory Board members
- Research staff
- Research students
- Collaborators

Team's expertise:

- 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 funding)

Research data collection:

- Survey
- Anthropometry
- Accelerometers
- Focus group/interview
- Mapping

Adolescents

✓

Parents

✓

Teachers /
Principals

✓

- Built environment analysis (Geographic Information Science)
- Environmental scan of school neighbourhoods

Spin-off projects:

- 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):

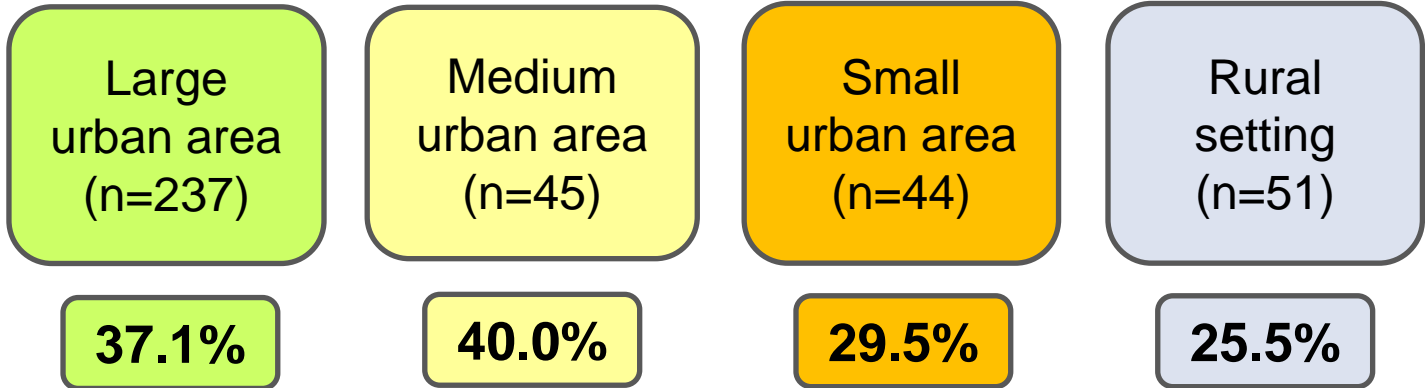
27 Journal articles	34 Seminar presentations for academic audiences
1 Book chapter	26 Seminar presentations for stakeholders, policy makers, health promoters
131 Conference abstracts	
39 Technical reports	



Brittany
White, MSc

Otago Adolescents' Physical Activity Levels

**Met physical
activity
guidelines**



p=0.312



Higher levels of physical activity observed in:

- Adolescent boys
- School sport participants
- **Users of active transport to school**
- On weekdays versus weekend days

Some differences observed by urbanisation settings:

Adolescents from large urban areas accumulated more moderate-to-vigorous physical activity during the school commute time.

Transport to School and Adolescents' Physical Activity



Chiew Ching
Kek, MSc

Dunedin,
NZ

Active
Transport
(n=73)

Active and
Motorized
Transport
(n=56)

Motorized
Transport
(n=185)

Met physical
activity guidelines

47.9%

46.4%

33.5%

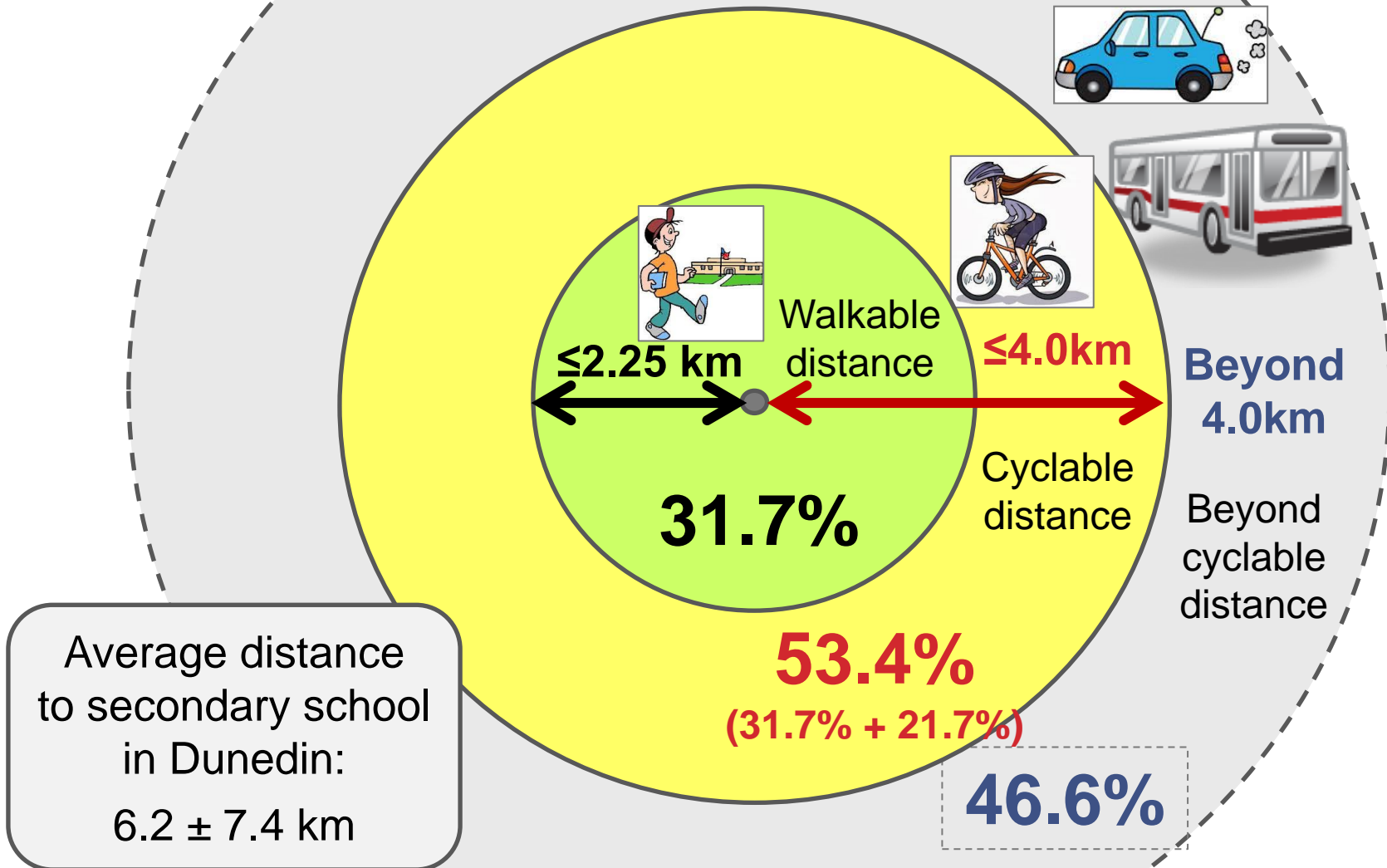
PA differences by transport mode were observed:

- *In girls but not boys*
- *On school days but not weekend days*
- *Only during school commute time*



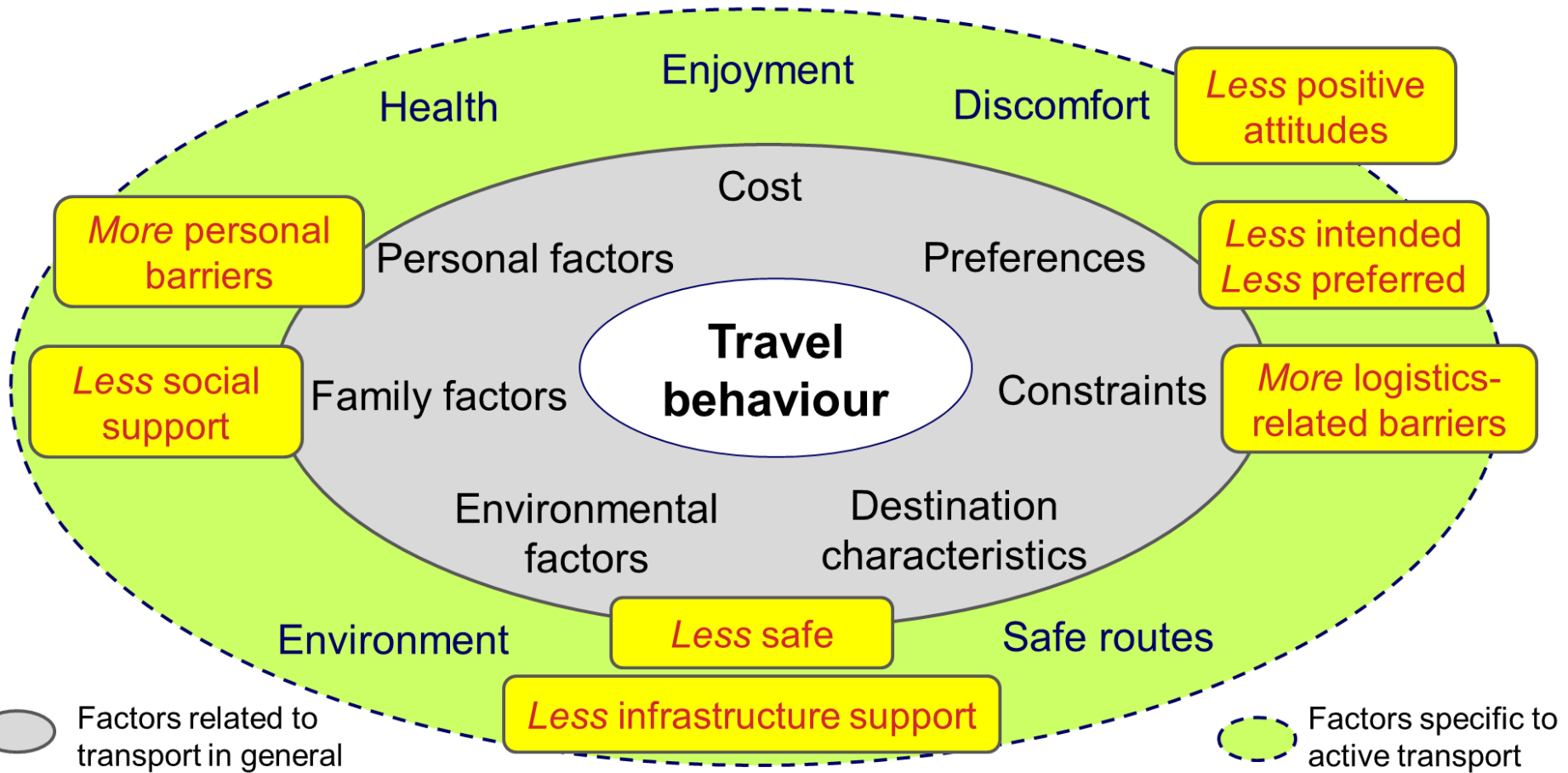
Both **active transport** and **combined active and motorized transport to/from school** are potential avenues to **increase daily physical activity in adolescents**, particularly in adolescent girls.

Walkable and Cyclable Distance to Secondary School in Dunedin



Adolescents and Parental Perceptions

Cycling versus Walking to School



BEATS Student Survey (n=764)

Mandic S et al. Journal of Transport and Health. 2017; 4:294-304.

BEATS Parental Survey (n=341)

Mandic S et al. Transportation Research Part F: Traffic Psychology and Behaviour. 2020; 71:238-249.

Parental Perceptions of Walking to School Differ by Distance

Home-to-school distance  Walkable (≤ 2.25 km) Cyclable ($>2.25-4$ km) Beyond (>4 km)

Social support

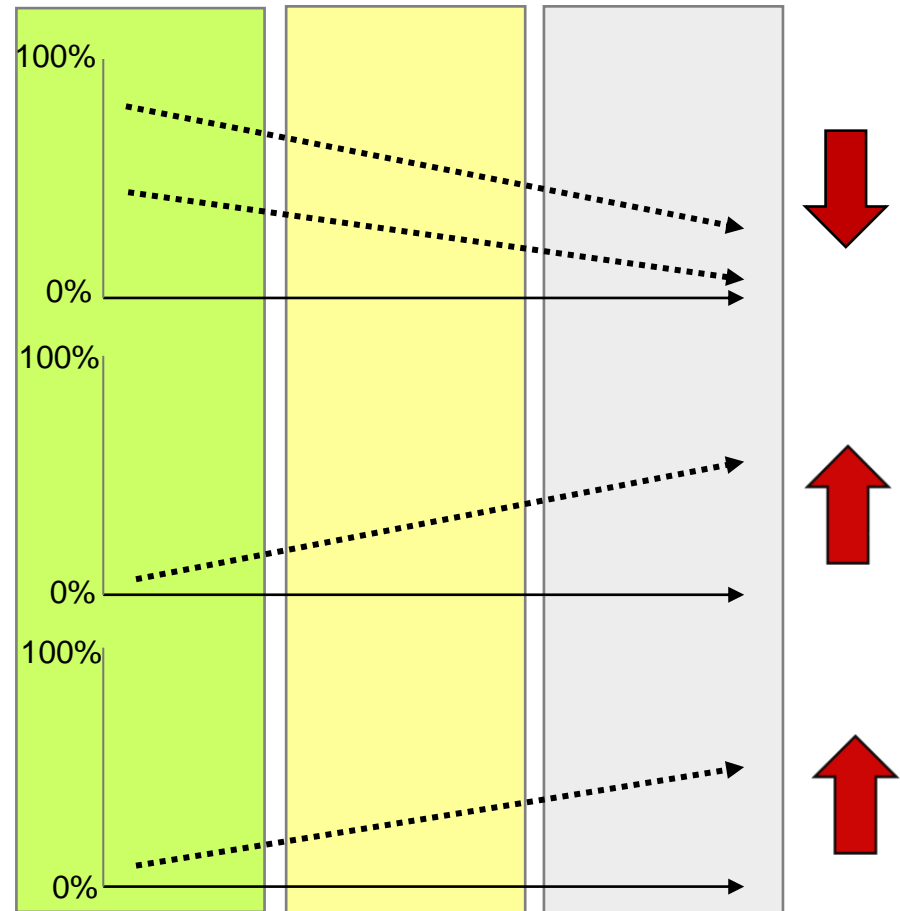
Parents 46.2%

Child's friends 20.6%

Environmental barriers

Lack of appropriate infrastructure 35.0%

Safety concerns 35.0%

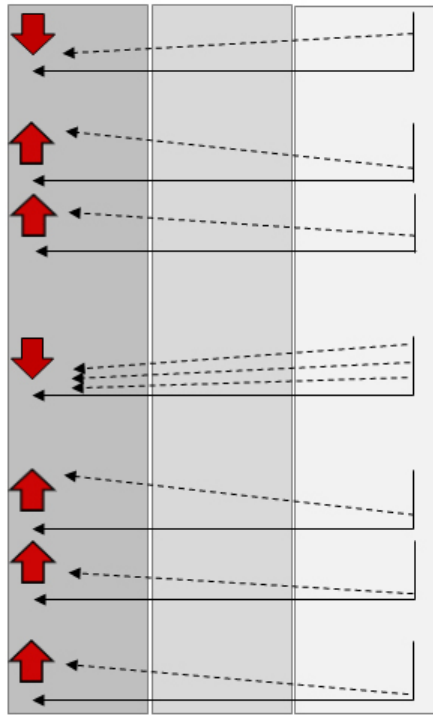


Parental Perceptions

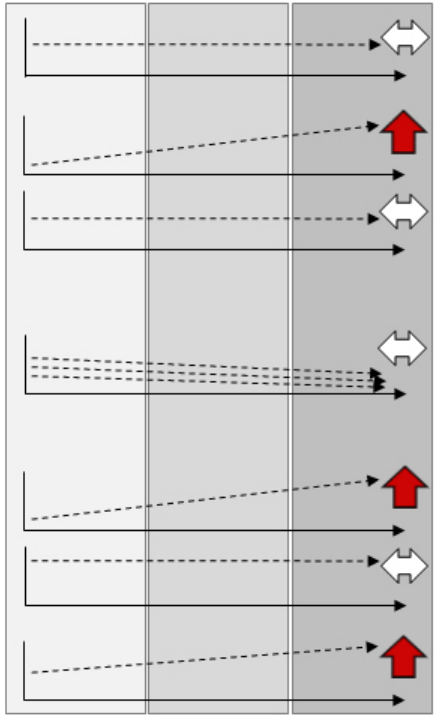
Parental perceptions of walking and cycling to school

Walking to school

Cycling to school



Barrier	Walking to school (%)	Cycling to school (%)
Importance	87.5%	62.5%
Personal barriers		
Takes too much time	60.2%	44.5%
My child does not want to/like to	51.5%	68.1%
Social support		
Parents	46.2%	17.1%
Child's friends	20.6%	4.8%
School	25.4%	12.4%
Environmental barriers		
Distance too far	63.0%	51.3%
Lack of appropriate infrastructure	35.0%	73.5%
Safety concerns	35.0%	64.6%



Beyond (>4 km) Cyclable (>2.25-4 km) Walkable (≤2.25 km)

← Home-to-school distance →

Walkable (≤2.25 km) Cyclable (>2.25-4 km) Beyond (>4 km)

Importance of distance-specific approaches to addressing barriers to active transport to school

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

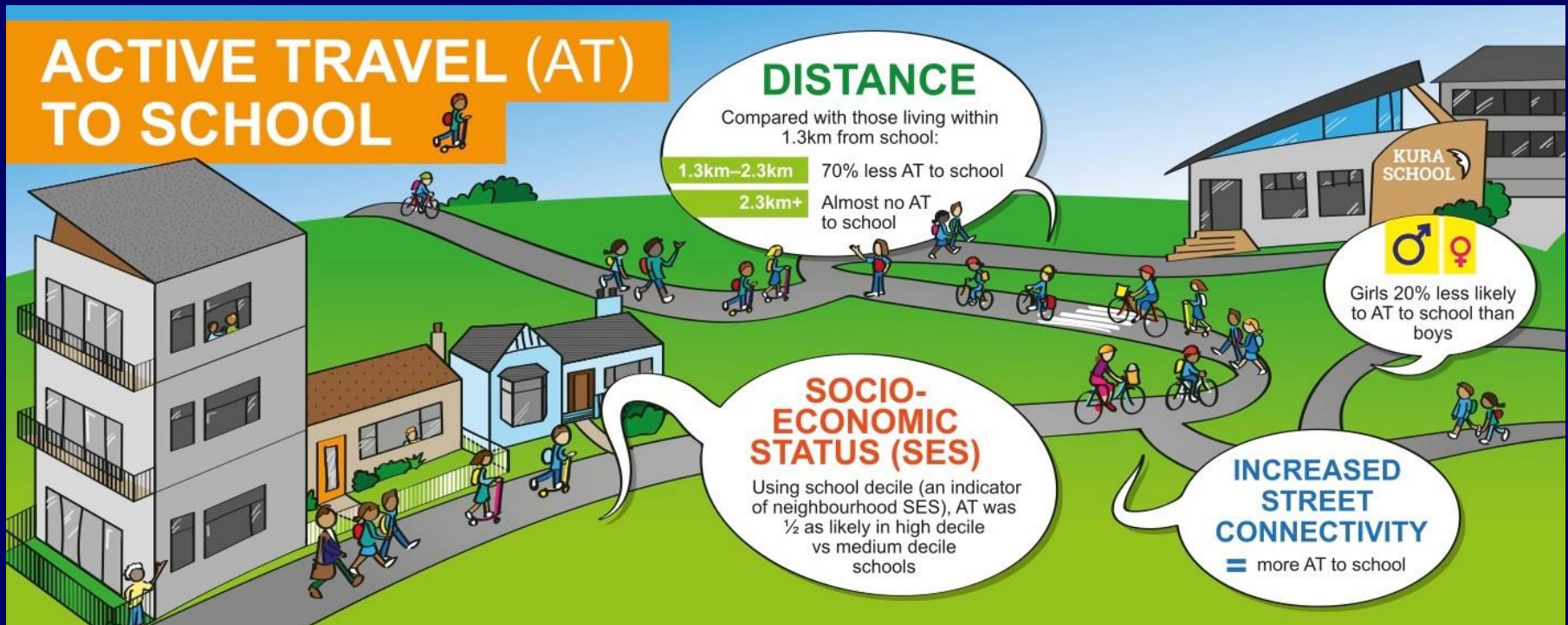


A/Prof Debbie
Hopkins
(Oxford)

- 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



Correlates of Active Transport To School



Ikeda E et al. J Transp Health. 2018;9:117-131

Social capital

Porskamp T et al. (2019)
Health & Place. 60:102216



22%

Molina-García et al. (2018)
J Transp Health. 11, 64-72



School bag weight:
5.6 kg
(± 2.1 kg)

Mandic S et al. (2018)
Children. 5:129



Travelling to School by Car



Increased likelihood
of private vehicle
transport to school
in adolescents

Greater
distance to
school

Medium
school-level
deprivation

Low home
neighbourhood
intersection
density

Dunedin adolescents
(n=1,240)

Driver's licencing status:

- 20.8% had licence;
- 77.0% intended to get it;
- 2.2% no intention to learn to drive



A/Prof Debbie Hopkins (Oxford)

Adolescents' Aspirations for Car-Based Travel

Multivariate correlates of importance attached to driving a car

Positive

Negative

Family factors

Number of vehicles at home

Travel behaviours

Driving a car as main mode of transport

Driven by others as main mode of transport

Walking as main mode of transport

Attitudes, norms and perceived behavioural control

Friends think I should learn to drive

Need driving license to visit friends

Nervous about driving/ learning to drive

I can go wherever I want to go (freedom)

Driving makes people more independent

Cars are bad for the environment

My parents enjoy driving

Intentions

I want to get driver's licence

Sample: 1240 adolescents (13-18 years of age) from Dunedin, NZ (36% over driving age in NZ)



Barriers to Using Public Buses for Transport to School in Dunedin



Prof Jenny Mindell (UCL)

Public buses

Services:

- Non-existent or infrequent
- Takes too long
- Cost

Infrastructure:

- No bus shelters
- No bike racks on bus

Information:

- Difficulties accessing / understanding timetables
- No real-time information

Social environment

- Chaffering children
- Trip chaining

- Extracurricular activities
- No-one to travel with
- Prefer to walk or cycle

- School uniform
- School bags
- Punctuality

Built environment

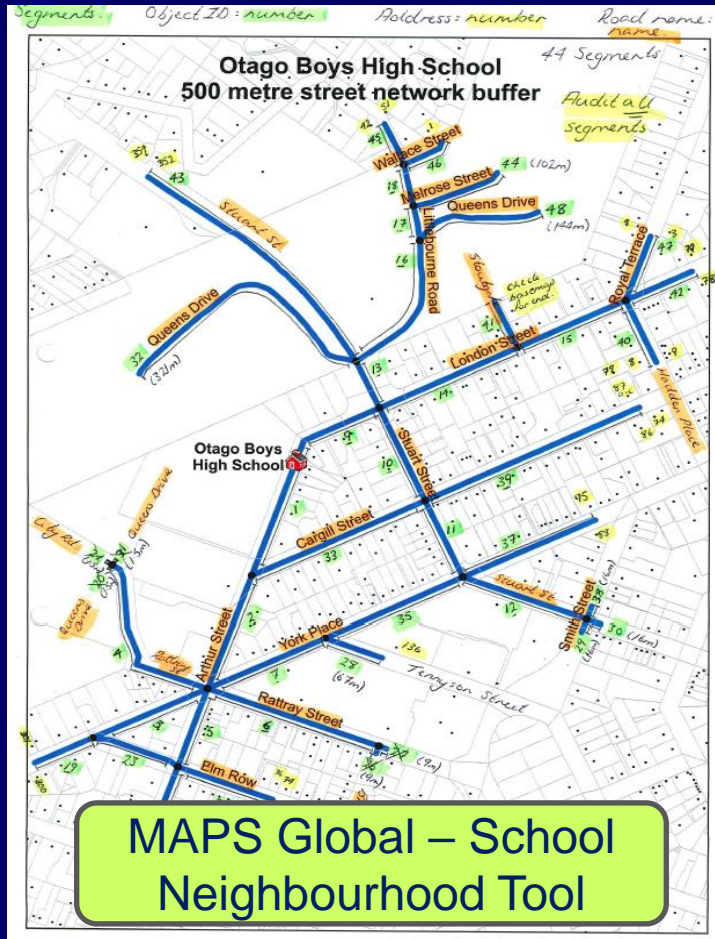
Distance

- Living too close to school
- Too far to bus stop

Natural environment

- Hilly terrain
- Inclement weather

School Neighbourhoods



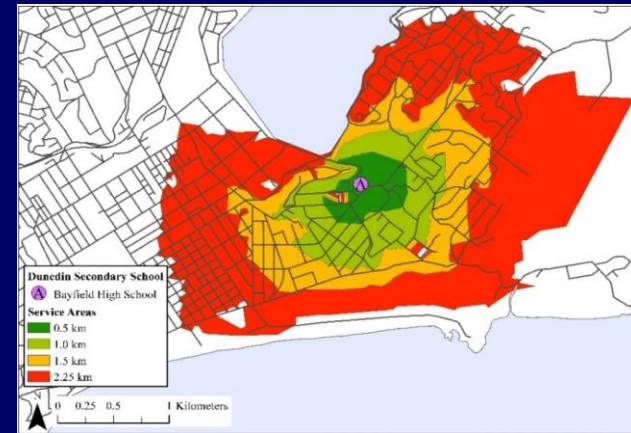
Pocock T et al. Journal of Environmental Research and Public Health. 2020; 17:2194

Environmental audits:

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



Tessa Pocock, MSc



The strongest predictor of adolescents' active transport to school?

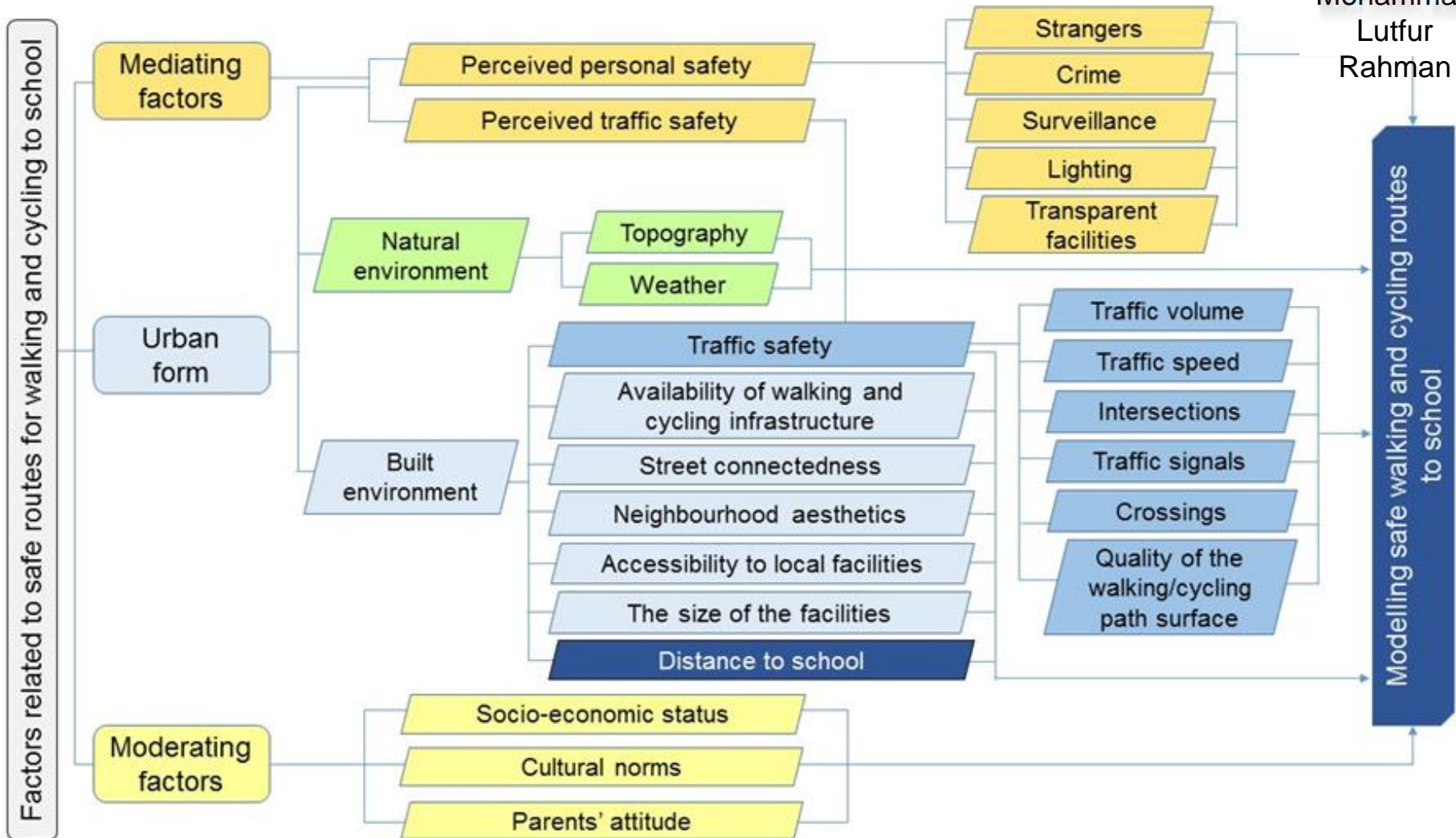
Adolescents' perceptions of safety of walking to school

Pocock T et al. Health & Place. 2019;55:1-8

Modelling Safe Walking and Cycling Routes to School: Framework



Mohammad Lutfur Rahman



School Choice and Transport to School

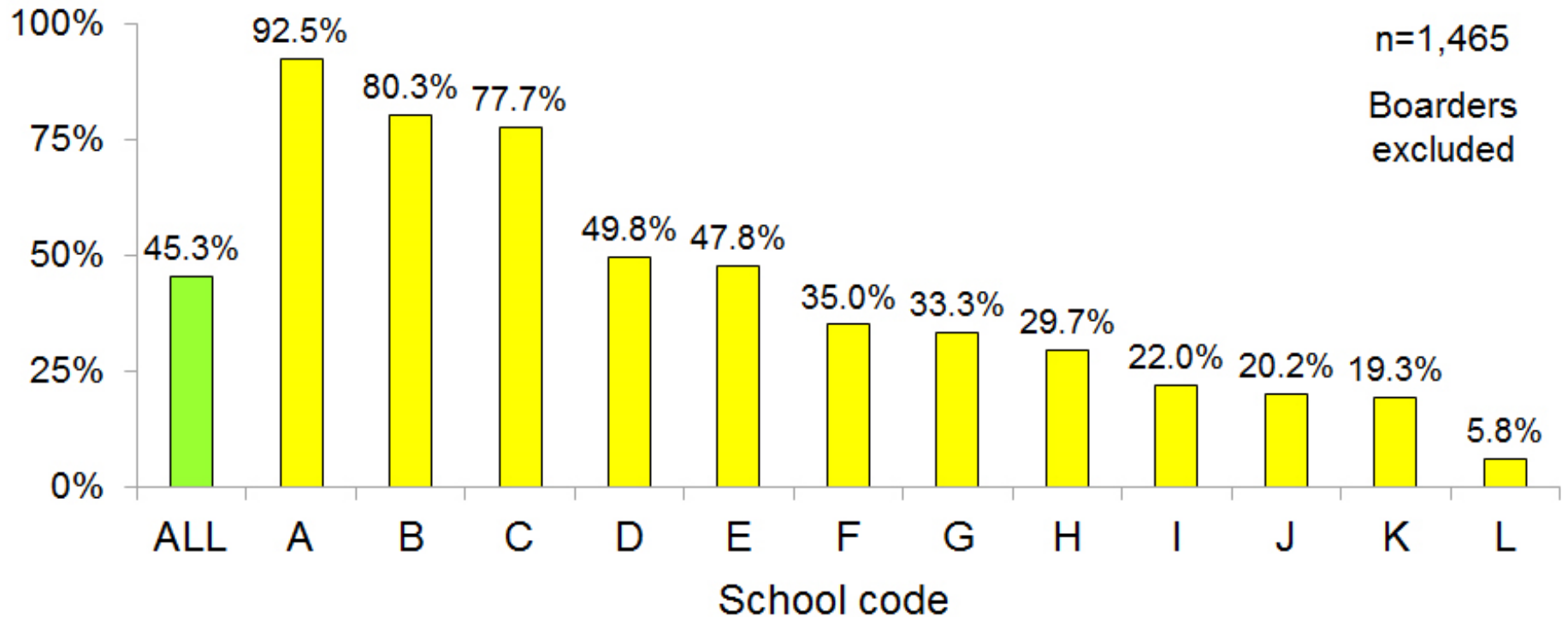


Mr Gordon Wilson (DSSP)



A/Prof Susan Sandretto (Otago)

When you enrolled, was this the secondary school closest to your home?



Implications of School Choice Decisions on Active Transport to School



Without school zoning,
51.3% of adolescents
 enrolled in the closest school.

Distance

Importance of school
 proximity to home

Co-educational school status

Peer feedback



46.5%



8.8%

40.3%



68.8%

School choice has implications for
 education, health, transport and
 environment

Adolescents (n=797)

(Special character (integrated) schools and schools with zoning excluded)

(Students from 6 out of 12 Dunedin secondary schools (50%) included in the analysis)

Mandic et al. Journal of
 Transport and Health.

2017; 6:347-357

School Choice, Adolescents' Physical Activity and Car Travel in Dunedin



A/Prof Michael Keall (Otago)

Dunedin, New Zealand



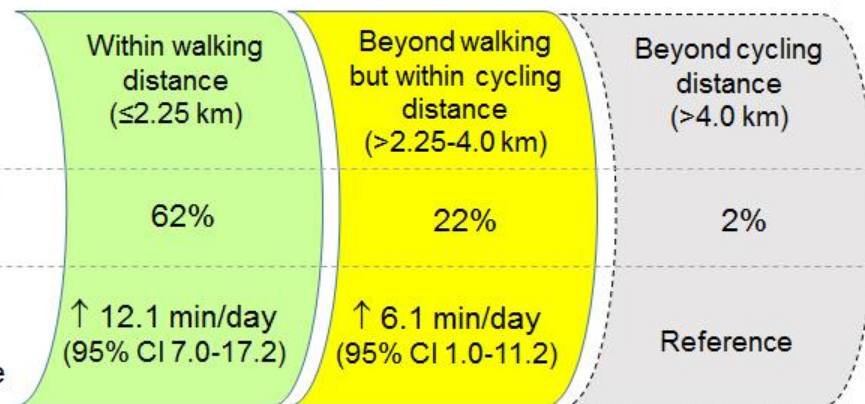
Homes

During the school commute time (8-9 am and 3-4 pm)
11.5% of private car trips (95% CI: 7.8%-16.8%) and
12.5% of car distance driven (95% CI: 8.8%-17.7%)
 were related to secondary school travel



School

Home-to-school distance



MVPA during school commute: \uparrow by additional 3.4 min/day

School-related private car trips: \downarrow by 7% city-wide



\uparrow by additional 3.4 min/day



\downarrow by 7% city-wide

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



A/Prof Susan Sandretto
(Otago)

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



Turning the Tide - from Cars to Active Transport

Authors: Sandra Mandic, Andrew Jackson, John Lieswyn, Jennifer S Mindell, Enrique García Bengoechea, John C Spence, Ben Wooliscroft, Celia Wade-Brown, Kirsten Coppell, Erica Hinckson



Summary of Key Policy Recommendations for Increasing Active Transport in NZ

A Evaluation, Governance and Funding

- A1. Set and monitor shared targets for the proportion of trips by active modes and public transport
- A2. Ensure that the value of active transport is recognised in policies and investment decisions to allocate the necessary funding for this task
- A3. Continually update the information available on health and economic impacts of specific active transport interventions

B Education and Encouragement/Promotion

- B1. Promote active transport to and from schools
- B2. Promote active transport to and from workplaces
- B3. Make public transport more affordable and accessible
- B4. Improve motorist education

C Engineering (Infrastructure, Built environment)

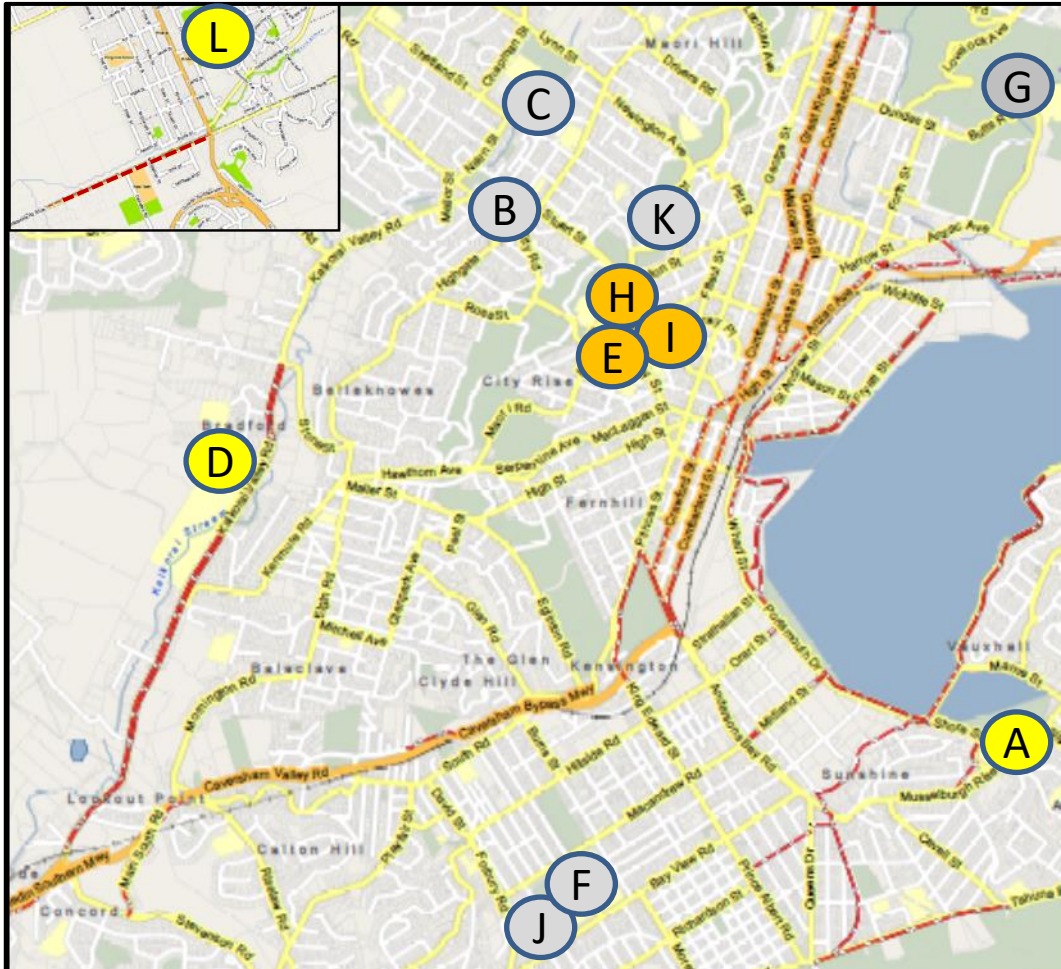
- C1. Require and fund a universal, interconnected active transport network
- C2. Design and transform towns and cities for people to ensure positive health and environmental outcomes

D Enforcement and Regulation

- D1. Change the decision making framework/planning results (that affect transport options) to enable good health and wellbeing at a population level
- D2. Change regulations to improve road safety for active transport
- D3. Regulate for healthy transport options to and from schools
- D4. Improve and enforce regulations for better air quality

(13 recommendations and 39 suggested actions grouped across four broad categories)

BEATS-2 Study (BEATS Natural Experiment) (2019-2023)

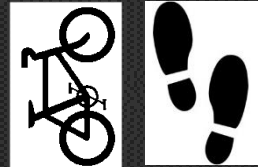


- - - Cycling infrastructure constructed since 2014
- 'Exposure' schools: Cycling infrastructure
- 'Exposure' schools: Pedestrian infrastructure
- 'Control' schools

Follow-up data (2020-2022)
(≥10 schools)

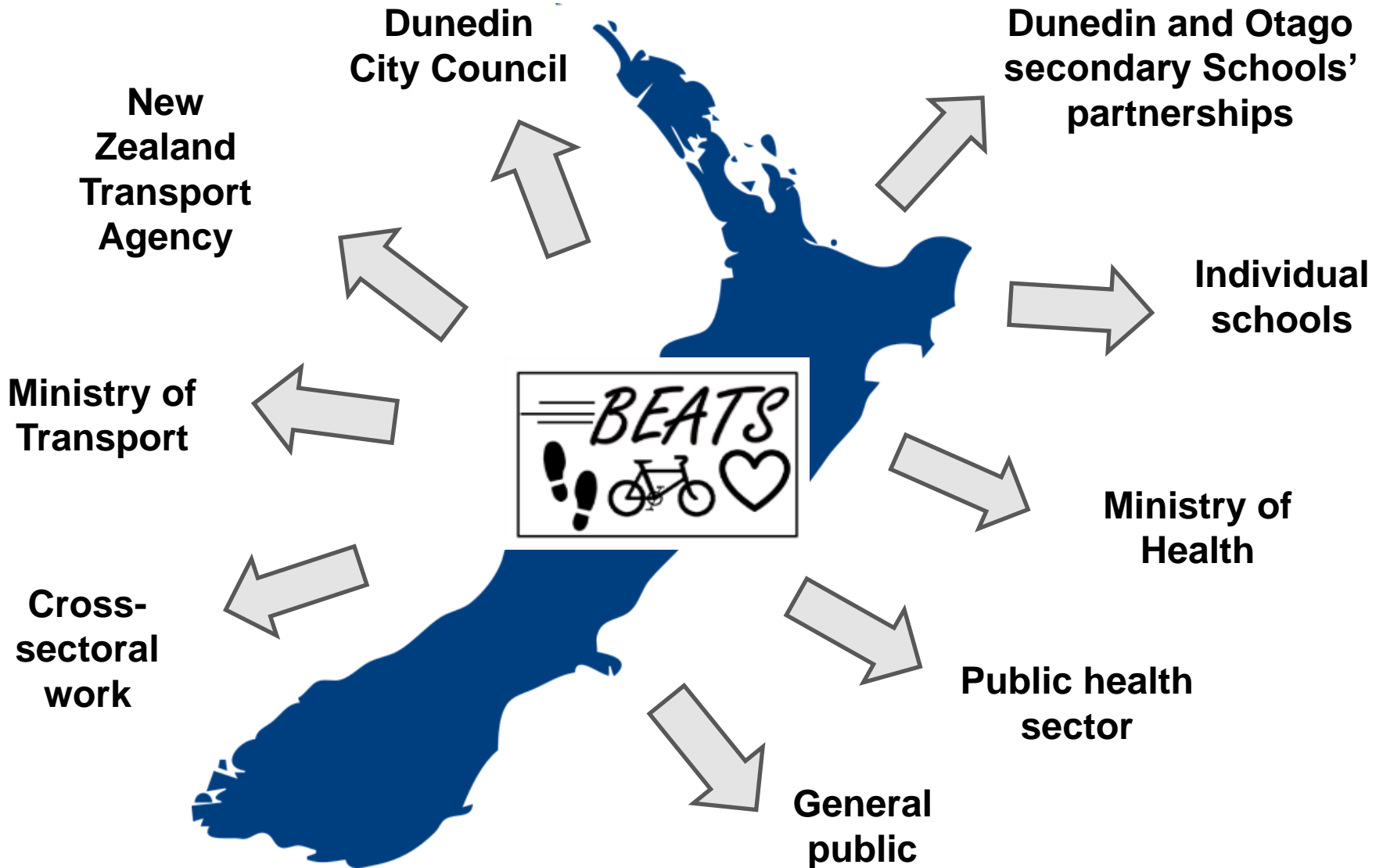
Exposure areas:
Cycling and pedestrian infrastructure construction (since 2014)
(6 'exposure' schools)

Control areas:
No change (no new infrastructure construction)
(6 'control' schools)



Baseline data (BEATS) ✓
(2014/2015) (12 schools)

BEATS Research Dissemination and Impact in NZ





BEATS Research Programme Report 2013-2020

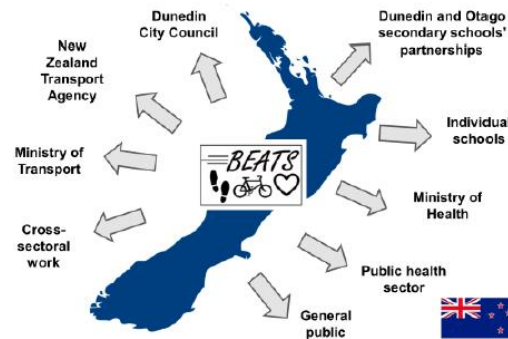


Overview

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



To be released in April 2021

Thank you!

www.otago.ac.nz/beats

Email: sandy.mandic@aut.ac.nz

