

School Neighbourhood Built Environment and Active Transport to School in Adolescents

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School Neighbourhood Built Environment

Built environment refers to the entirety of human designed and built places and facilities

In relation to active transport to school (ATS):

- + • Provision/maintenance of supportive environmental infrastructure
- + • Neighbourhood aesthetics (absence of litter; maintained green spaces)
- + • Home neighbourhood intersection density
- • Distance to school
- • Personal and traffic safety concerns

Associations between ATS and school neighbourhood built environment are context-specific due to differences in built environment design, cultural and social norms, and neighbourhood safety.



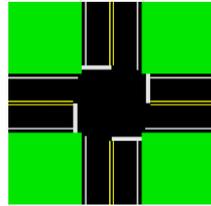
School Neighbourhood Built Environment

Micro-scale features



- Environmental details that directly influence activity experiences
- Easier/cheaper to modify

Macro-scale features



- Overall community design and structure
- General environmental supportiveness for activity

Perceived features

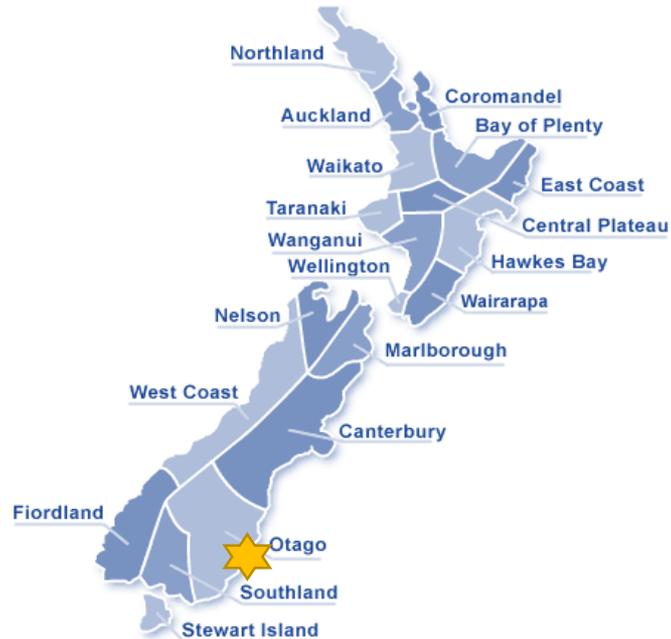


- Perceptions correlate with ATS behaviour
- BUT may not accurately reflect the availability of features



Study Purpose

To examine associations between the school neighbourhood built environment, active transport to school and adolescents' perceptions of the school route across all twelve Dunedin secondary schools



Built environment assessment

- Perceived environment
- Micro-scale (observed)
- Macro-scale (objective)



Perceived Built Environment

BEATS Study
Built Environment and Active
Transport to School

Among adolescents living ≤ 2.25 km from school:

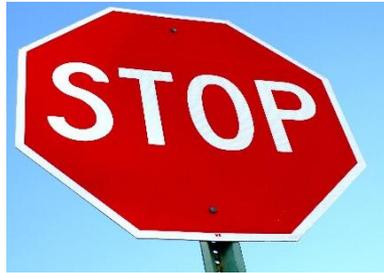
- Transport to school habits
- Adolescents' perceptions of the route to school

Total sample (n=471)	
Age (years)	15.2 \pm 1.4
Gender: Female	56.3%
Ethnicity	
NZ European	71.1%
Māori	11.5%

Traffic Volume



Dangerous Crossings



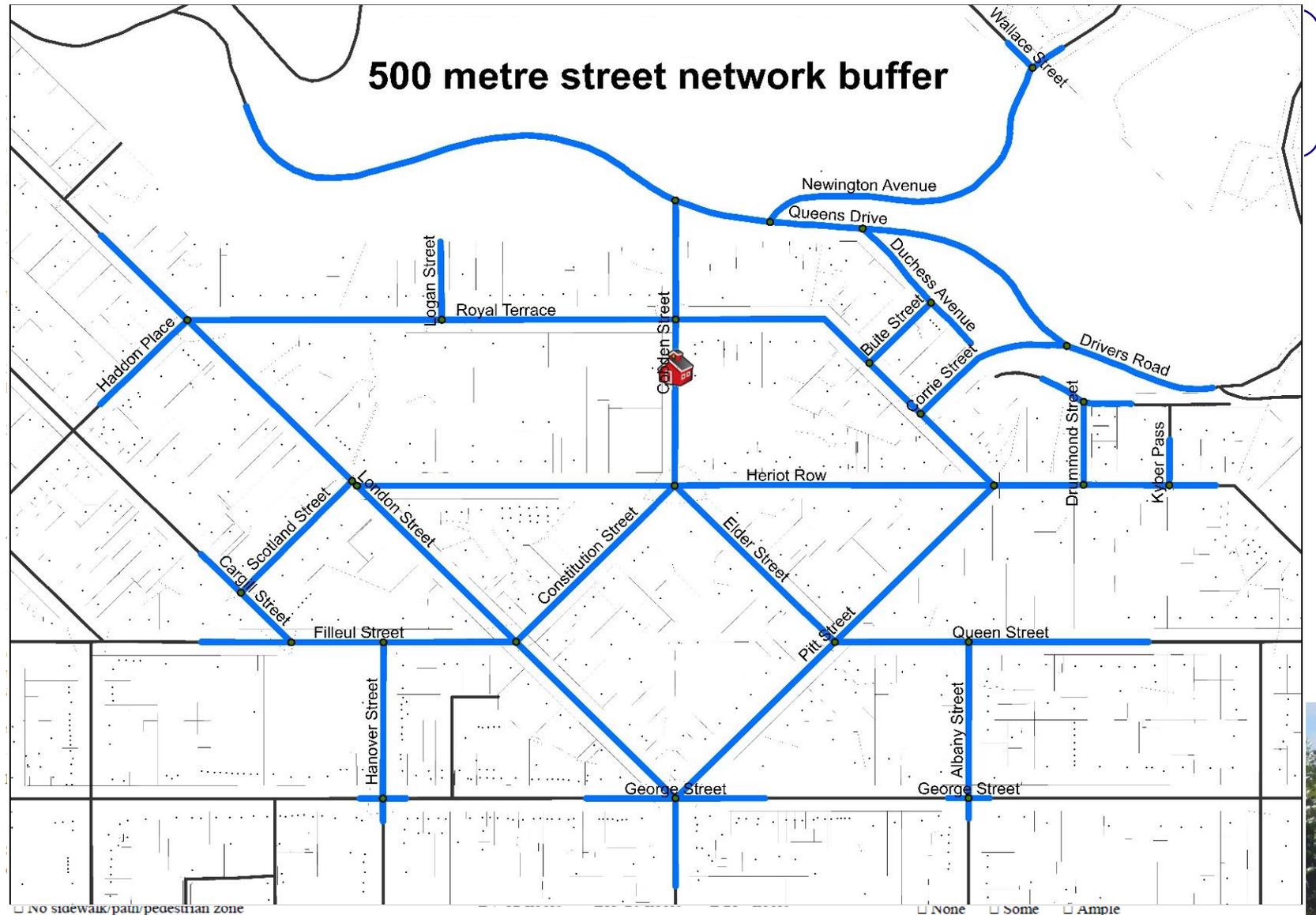
Safety of route for walking and cycling



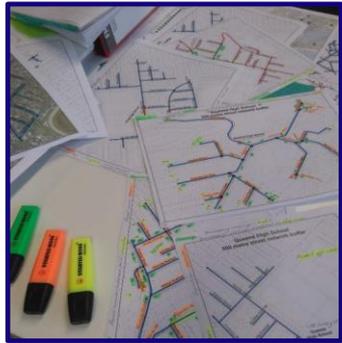
Absence of footpaths and cycle lanes



Micro-Scale Built Environment (Observed)



MAPS Global Auditing

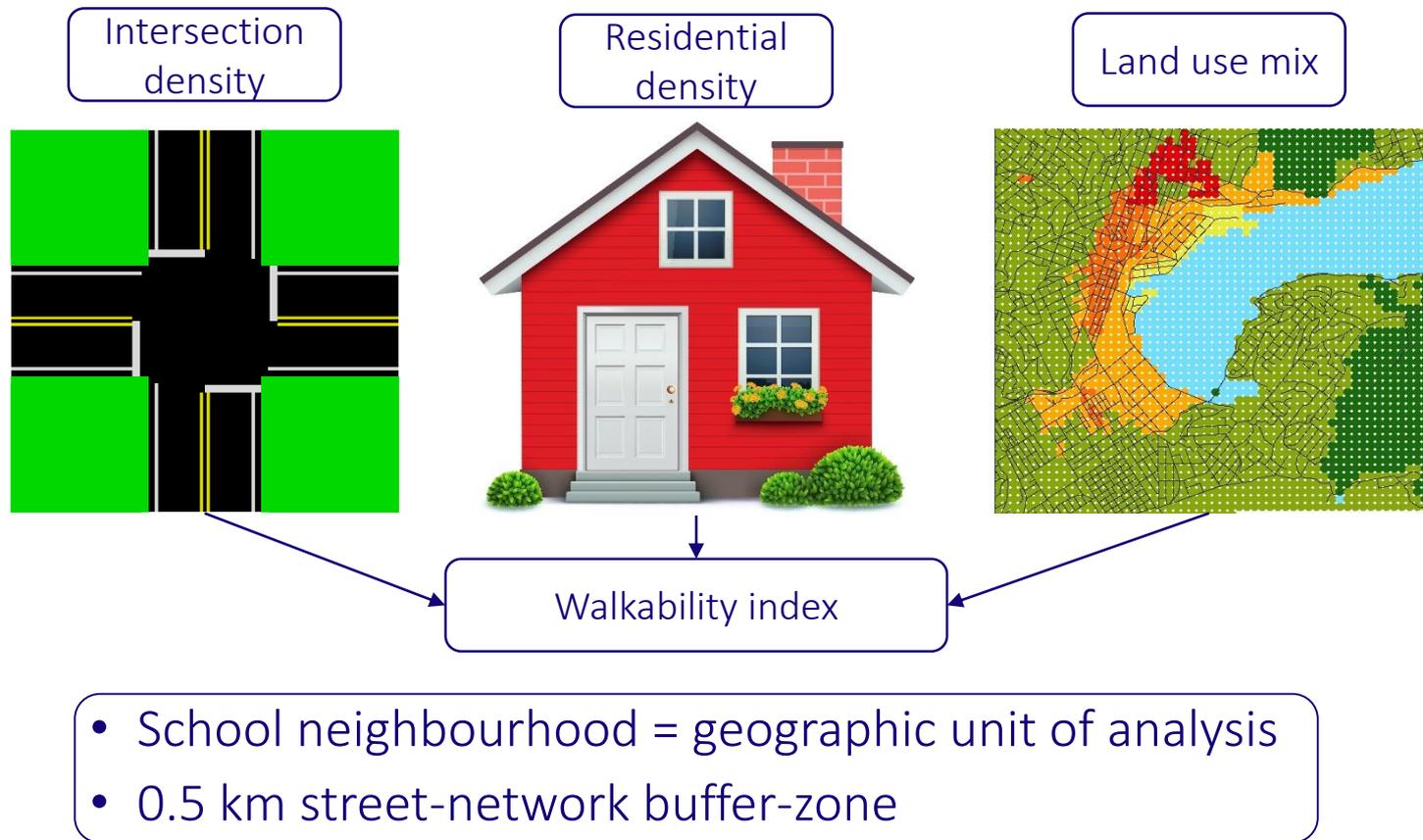


MAPS Global sections	Total number assessed	Range between schools
Route	934	10-160
Segment	934	10-160
Crossing	767	3-118
Cul-de-sac	14	0-6

Total sum of street segment lengths:
106.6 km!



Macro-Scale Built Environment (Objective)

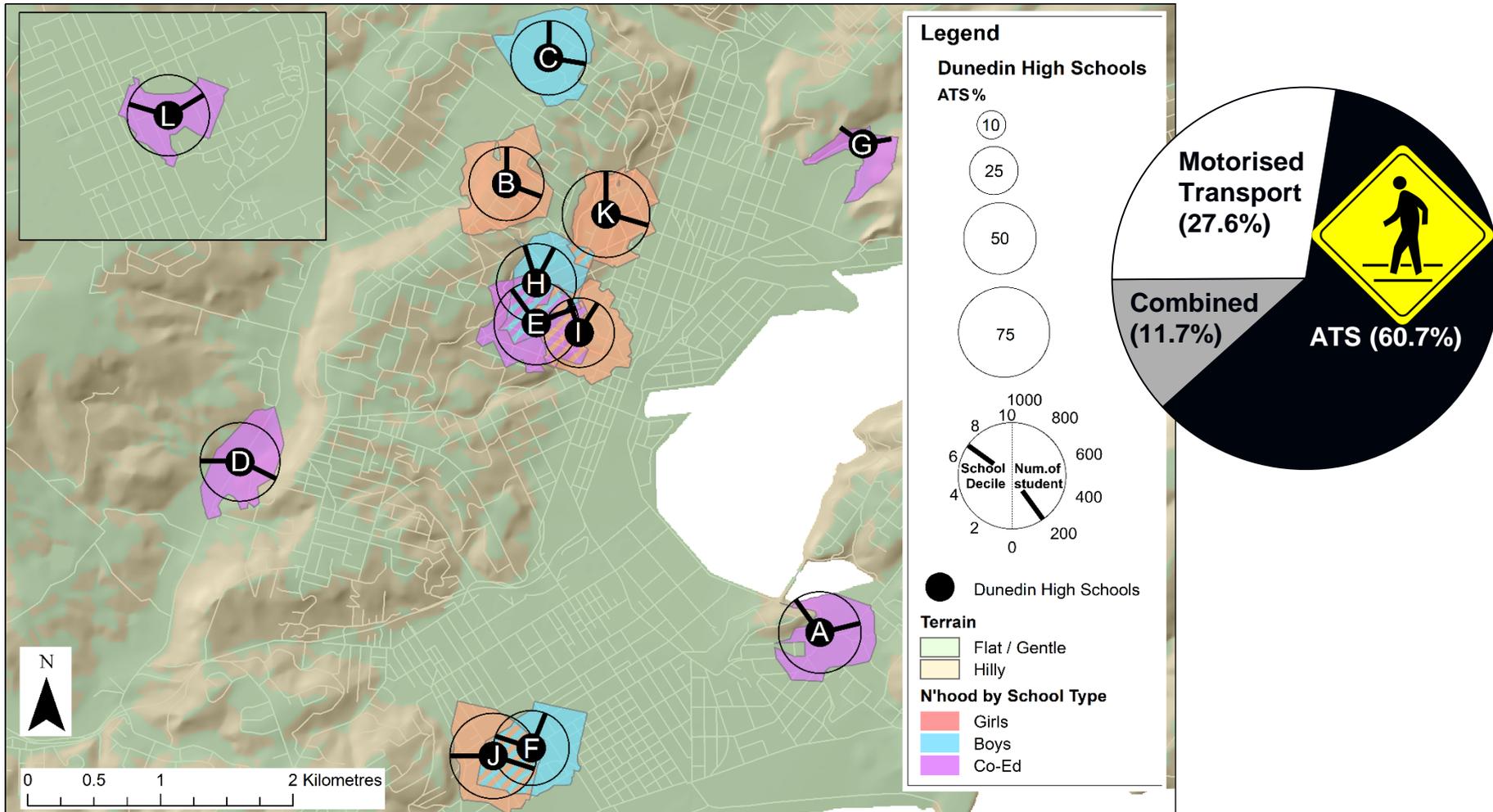


Results



Results: School Characteristics

Large across-school variability in ATS rates for adolescents living ≤ 2.25 km from their school (range: 47.8% - 70.0%)



Results: Bivariate Analysis

School neighbourhood built environment characteristics

ATS

Micro-scale environment

MAPS Global Survey 3.2, 2016

Date: _____ Auditor ID# _____

Route # _____ Start Time: _____ End Time: _____

Route: *Circle back side of the street*

Section: **Land use/destinations**

1. How is route information collected?

- Feet walked route
- Auto (above route)
- Both walked & above route
- Other (Specify): _____

2. What type of residential use?

Check all that apply:

- Single family house
- Multi-unit houses (duplex, 4-plex, row house)
- Apartment or condominium
- Apartment above street level
- None of the above

3. How many of the following types of non-residential destinations are present?

a. Fast food restaurant (national or local chain, primarily fast burgers, chicken, pizza etc.)

0 1 2 3 4 5+

b. Full-service restaurant or bar (all ages)

0 1 2 3 4 5+

c. Cheaper restaurant

0 1 2 3 4 5+

d. Convenience store (e.g. 7-11, Rona, etc.)

0 1 2 3 4 5+

e. Cafe or coffee or tea shop

0 1 2 3 4 5+

f. Bakery

0 1 2 3 4 5+

g. Age-restricted bar/nightclub

0 1 2 3 4 5+

h. Liquor or alcohol store

0 1 2 3 4 5+

i. Bank credit union ATM

0 1 2 3 4 5+

j. Dogpoo placement

0 1 2 3 4 5+

k. Health-related professional (e.g., chiropractor, Dr. office, private health care facilities)

0 1 2 3 4 5+

1. Entertainment (e.g., movie theatre, arcade)

0 1 2 3 4 5+

m. Other recreation (e.g., park, amusement, dry canyon)

0 1 2 3 4 5+

n. Other recreation (e.g., tennis, cycling, swimming)

0 1 2 3 4 5+

o. Place of worship (e.g., church, mosque, synagogue, cultural temple)

0 1 2 3 4 5+

p. School

0 1 2 3 4 5+

q. Private indoor recreation (e.g., commercial gym, above table)

0 1 2 3 4 5+

r. Public indoor recreation (e.g., community centre)

0 1 2 3 4 5+

4. What other street characteristics are present? (specify # of each type)

- Traffic lights (signals, circles, speed tables, speed bumps, curb extensions)
- Lane-reversals (if vehicle segment = 1)
- Street of the day
- Presence of street easements
- Check all that apply:
 - Trash bins (public)
 - Benches/other places to sit
 - Bicycle racks
 - Public bicycle access lockers or repair shops
 - Kiosks or information boards
 - Handrails/sloped curbs
 - None of the above

Section: **Aesthetics and Social**

1. Do you observe planned landscape features, such as fountains, sculpture, or art (public or private)?

Yes No

2. Do you observe any natural bodies of water?

Yes No

3. Do you observe softscape features such as gardens or landscaping (e.g., shrubs, lawn, flowers, retaining walls, rock gardens)?

Yes No

4. Are the buildings well-maintained?

0% 1-40% 50-80% 100%

5. Is landscaping well-maintained?

0% 1-40% 50-80% 100%

6. Is graffiti tagging (not murals) present?

Yes No

7. Is noticeable graffiti litter present?

Yes No

8. Is noticeable graffiti dog or human feeding present?

Yes No

9. How the sense of graffiti, litter and feeding?

None A little (present) A lot (overwhelming)

10. Presence of anyone walking?

Yes No

11. Do there is higher walk rate (lower which is 40mph+)?

Yes No

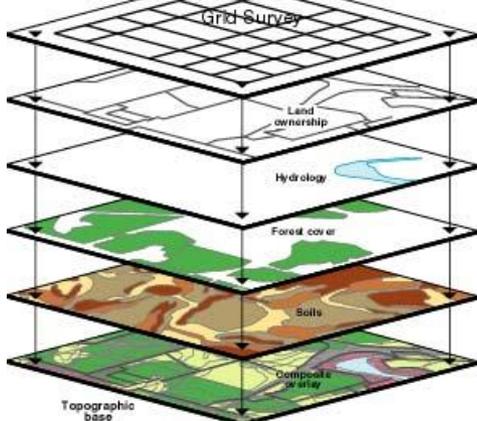
Sub-scales/Scores

Homogeneity of MAPS Global scores around all schools

Overall grand score

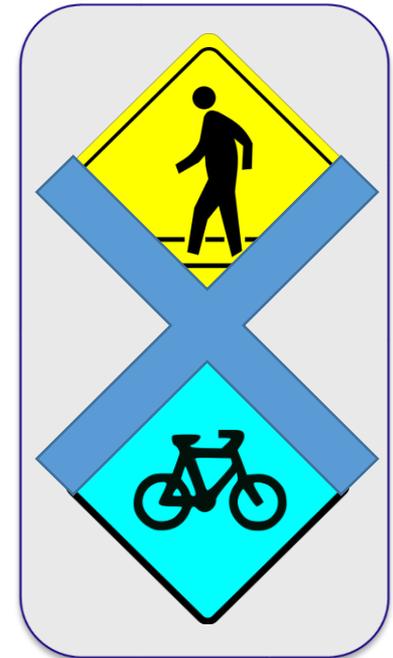
- Pedestrian infrastructure
- Pedestrian design
- Bicycle facilities

Macro-scale environment



GIS measures

- Intersection density
- Residential density
- Land use mix
- Walkability index



Results: Bivariate Analysis

Significant, but weak correlations

School neighbourhood built environment characteristics

Micro-scale environment

MAPS Global Survey 3.2, 2016

Date: _____ Auditor ID# _____

Route # _____ Start Time: _____ End Time: _____

Route: *Check both sides of the street*

Section: Land use destinations

1. How is route information collected?

Foot-canted route
 Auto (above street)
 Both (land & above street)
 Other (StreetView)

2. What type of residential use?

One-unit (detached)
 Single family townhouse
 Medium-rise (apartment, 4-plus, row house)
 Apartment or condominium
 Apartment above street level
 None of the above

3. How many of the following types of non-residential destinations are present?

a. Fast food restaurant (national or local chain, primarily fast burger, chicken, pizza etc.)
 0 1 2 3 4 5+

b. Full-service restaurant or bar (all ages)
 0 1 2 3 4 5+

c. Chinese restaurant
 0 1 2 3 4 5+

d. Convenience store (e.g. 7-11, Rite Aid, Walgreens)
 0 1 2 3 4 5+

e. Cafe or coffee or tea shop
 0 1 2 3 4 5+

f. Bakery
 0 1 2 3 4 5+

g. Age-oriented bar/nightclub
 0 1 2 3 4 5+

h. Liquor or alcohol store
 0 1 2 3 4 5+

i. Bank credit union ATM
 0 1 2 3 4 5+

j. Drugstore pharmacy
 0 1 2 3 4 5+

k. Health-related professional (e.g. chiropractor, Dr. office, private health care provider)
 0 1 2 3 4 5+

1. Restaurant (e.g. pizza, burger, sandwich)
 0 1 2 3 4 5+

m. Other service (e.g. bank, grocery, dry cleaner)
 0 1 2 3 4 5+

n. Office service (e.g. bank, clothing, hardware)
 0 1 2 3 4 5+

o. Other service (e.g. bank, clothing, hardware)
 0 1 2 3 4 5+

a. Place of worship (e.g. church, mosque, synagogue, mosque)
 0 1 2 3 4 5+

p. School
 0 1 2 3 4 5+

q. Public school recreation (e.g. commercial gym, above street)
 0 1 2 3 4 5+

r. Public school recreation (e.g. community center)
 0 1 2 3 4 5+

s. Private outdoor recreation (e.g. private golf course)
 0 1 2 3 4 5+

t. Public outdoor recreation (e.g. park)
 0 1 2 3 4 5+

u. Public park
 0 1 2 3 4 5+

v. Trail
 0 1 2 3 4 5+

w. Pedestrian street scene
 0 1 2 3 4 5+

x. Bicycle lane
 0 1 2 3 4 5+

Section: Streetscape

1. Number of public transit stops (bus stop, stop on J, etc.)
 0 1 2 3 4 5+

2. What is available at the first transit stop? (check all that apply)
 Bus CBT Train Subway Tram Streetcar Street Covered busstop Transit Time

3. What other transport options do you see on the route? (check all that apply)
 Taxi/cab Public bike share Car share Taxi Private bike share Bicycle share

4. What other street characteristics are present? (specify # of each type)
 Traffic lights (signal, circular, speed table, speed bump, curb extension)
 Traffic circle
 Turnover curb
 Other curb
 None of the above (if white segment = 1)

5. Presence of street amenities
 Street lighting
 Trash bins (public)
 Benches
 Other places to sit
 Bicycle racks
 Public bicycle access lockers or repair stations
 Kiosks or information boards
 Water fountains
 None of the above

Section: Aesthetics and Social

1. Do you observe planned landscape features, such as fountains, sculptures, or art (public or private)?
 Yes No

2. Do you observe any natural features of water?
 Yes No

3. Do you observe softscape features such as gardens or landscaping (e.g. shrubbery, lawn, flowers, retaining walls, rock gardens)?
 Yes No

4. Are the buildings well-maintained?
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8. Is noticeable graffiti litter or human feeding present?
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9. How the sense of graffiti, litter and feeding
 None A little (present) Some (very noticeable) A lot (overwhelming)

10. Presence of anyone walking?
 Yes No

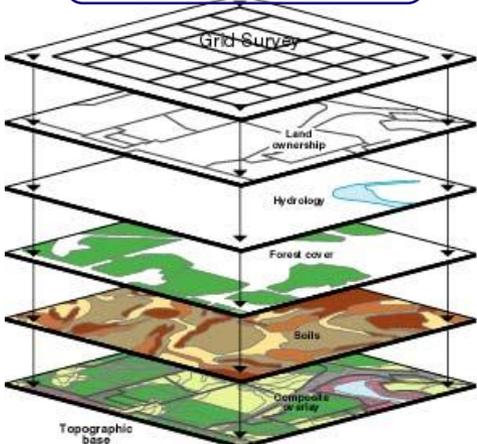
11. Do there is higher level road (over which is 4-lane or 5+ lanes, multi-lane) nearby?
 Yes No

Sub-scales/Scores

- Overall grand score
- Pedestrian infrastructure
- Pedestrian design
- Bicycle facilities

r=-0.18 to r=0.10; all p<0.05

Macro-scale environment



GIS measures

- Intersection density
- Residential density
- Land use mix
- Walkability index

r=0.09 to r=0.24; all p<0.05

Adolescents' perceptions

Traffic Volume



Dangerous crossings



Safety of route for walking and cycling



Absence of footpaths and cycle lanes



Results: Bivariate Analysis

Significant negative correlations

ATS

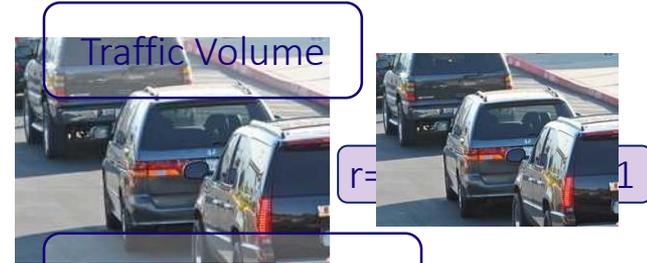


Concern over high traffic volume along the route

Concern over safety of walking to school

Concern over safety of cycling to school

Adolescents' perceptions

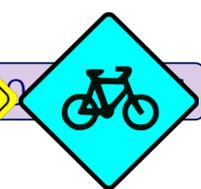
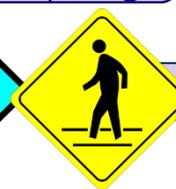


Dangerous crossings



r = -0.2

Safety of route for walking and cycling



Absence of footpaths and cycle lanes



Therefore, features of the school neighbourhood built environment influence adolescents' perceptions of the school route, including safety for walking and cycling.

Results: Multivariate Analysis

Adjusted for neighbourhood-level socioeconomic deprivation, gender and GIS-calculated walkability

ATS



Adolescents' perception of the safety of walking to school was the strongest correlate of ATS among adolescents living ≤ 2.25 km of school.

Consistently higher odds of ATS among adolescents with less safety concerns ($p=0.016$).



Brief Conclusions

- Although school neighbourhood built environment features were not significantly correlated with ATS among Dunedin adolescents, they are likely to mediate adolescents' perceptions of walking safety.
- To encourage uptake of ATS:
 - School neighbourhood should be considered as a part of efforts aimed at enhancing perceptions of safety among adolescents.
 - Interventions should aim to improve adolescents' perceptions of walking safety (such as providing appropriate pedestrian infrastructure and reducing traffic volume).



Thank you!

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Physical and spatial assessment of school neighbourhood built environments for active transport to school in adolescents from Dunedin (New Zealand)



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