

# Associations of Perceived Neighborhood Attributes with Self-Report and Objective Measures of Walking in Hong Kong Adults: Preliminary Findings

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## Background

Lowest household  
density (units/km<sup>2</sup>):



- Health and walking
- Environment and walking
- Most research conducted in low-density urbanized areas of Western countries (Australia; Canada; USA)
- Asian urban areas:
  - Higher density
  - Greater reliance on public transport
  - Socio-cultural differences
  - Differences in the built environment

## Background

Highest household density (units/km<sup>2</sup>):



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## Background

Average household density (units/km<sup>2</sup>):



- Health and walking
- Environment and walking
- Most research conducted in low-density urbanized areas of Western countries (Australia; Canada; USA)
- Asian urban areas:
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# What does a high density, walkable neighborhood look like?

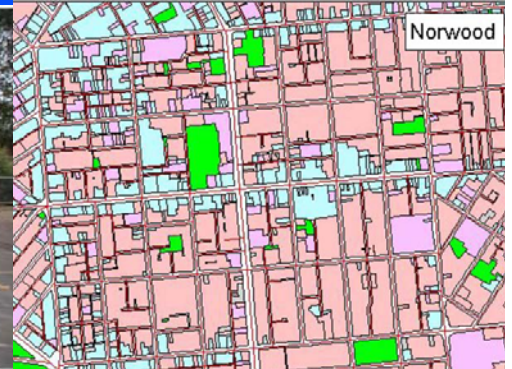
## Hong Kong

Average pop. density  
6295 persons/km<sup>2</sup>



## Adelaide, Australia

Average pop. density  
1687 persons/km<sup>2</sup>







## Aim

- Examine relationships of perceived neighborhood characteristics with self-report and objective measures of walking in Chinese-speaking adults of Hong Kong
  - Self-reported walking within (& outside) the neighborhood
  - Moderate-intensity minutes of physical activity (accelerometers)
  - Step counts (accelerometers)
- Provide data for the International Physical Activity and the Environment Network initiative (Hong Kong representing the upper end of urban density spectrum)



## Methods

- N = 195 (aged 20-65) – multi-stage stratified sampling strategy
- 32 small Tertiary Planning Unit groups in Hong Kong metropolitan area
  - High SES and high walkability
  - High SES and low walkability
  - Low SES and high walkability
  - Low SES and low walkability



Walkability (GIS) = dwelling density + street connectivity



Types of neighborhood



HWHSES: Tsan Yung Mansion



LWHSES: Discovery Bay  
Midvale Village



HWLSES: Tai Fung House



LWLSES: Wing On Terrace



# Methods



- Interviewer-administered questionnaire
  - Perceived attributes of local community
    - **Chinese Neighborhood Environment Walkability Scale – Abbreviate (NEWS-AC)**
      - Man-made barriers (car parked on sidewalks; hawkers; crowd)
      - Indoor places for walking
      - Non-direct access to services (through bridges; escalators)
      - Air pollution
    - Weekly minutes of walking for transport and recreation within and outside the neighborhood (NPAQ-C) (Giles-Corti et al., 2006)
    - Other (e.g., socio-demographics)
- Accelerometers (Actigraph GT1M); N = 106; 1 week; at least 4 valid days with 1 weekend day
  - Average daily moderate-intensity minutes of physical activity (Freedson's cut-off points)
  - Average daily step counts



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## Methods

- Generalized linear models
  - Gamma variance function
  - Identity or logarithmic link function
  - Robust standard errors (cluster effects)
  - Models adjusted for socio-demographic confounders
  - Models of objective measures of walking adjusted for total time of accelerometer wearing and number of weekend/holiday days
  - All continuous predictors centered around the mean
  - Separate models for each environmental attribute (small number of participants and clusters; preliminary findings)



# Results

87 min/wk difference

Outcome	Low walkable areas	High walkable areas
Walking for transport (min/wk)	202 (187)	289 (258)*
Walking for recreation (min/wk)	140 (225)	182 (235)
Moderate-intensity physical activity (Actigraph; min/day)	112 (187)	116 (202)
	59 (138)	20 (180)
	43 (26)	46 (24)
	41 (26)	42 (25)
Step counts (daily)	9753 (3783)	10324 (3579)
	9299 (3703)	10238 (4708)

M (SD)

Median (IQR)

\* p<0.01



... between-area differences in walking variables ...



## Results ... associations between perceived environment and measures of walking ...

Perceived neighborhood attribute	WT	WR	MPA	Steps
Household density (5 – 1275)	<b>1.001*</b>	<b>0.997*</b>	1.00	1.00
Street connectivity (1 – 4)	<b>1.41***</b>	0.93	1.12	1.03
Traffic safety (1 – 4)	<b>1.50**</b>	0.98	1.09	<b>1.14*</b>
Crime (1 – 4)	<b>1.17*</b>	<b>0.56*</b>	1.00	1.01
Green areas (1 – 4)	0.96	<b>1.80**</b>	1.05	1.01
Indoor places for walking (1 – 4)	<b>1.17*</b>	0.85	0.95	0.98
Building aesthetics (1 – 4)	1.21	<b>1.76*</b>	1.03	1.03
Social environment (1 – 4)	<b>1.09*</b>	1.13	<b>1.17*</b>	<b>1.09*</b>
Indirect access to services (1 – 4)	1.16	<b>1.90**</b>	1.09	<b>1.08*</b>

WT = walking for transport; WR = walking for recreation; MPA = moderate-intensity physical activity;  
 \*P < .05; \*\*P < .01; \*\*\*P < .001



**Walking for different purposes is associated with different environmental attributes**

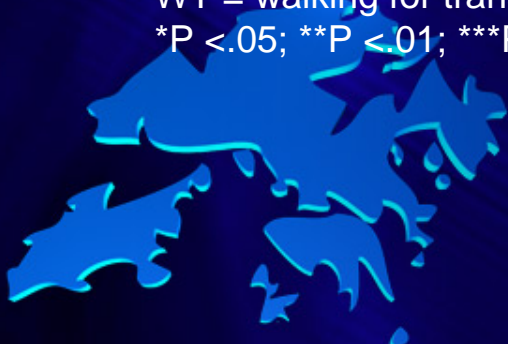
**Some attributes may facilitate one type but hinder another types of walking – effects cancel out**

## Results ... associations between perceived environment and measure of walking ...

Perceived neighborhood attribute	Setting	WT	WR	MPA	Steps
Land use mix – diversity (1 – 5)	Within	<b>1.22*</b>	<b>1.13*</b>	1.13	1.03
	Outside	<b>0.92*</b>	1.00		
Traffic hazards (1 – 4)	Within	1.25	0.95	<b>1.32***</b>	<b>1.13**</b>
	Outside	1.12	<b>1.28**</b>		
Fences separating traffic from pedestrians (1 – 4)	Within	1.00	0.97	<b>1.08*</b>	<b>1.07*</b>
	Outside	1.10	<b>1.12*</b>		
Building aesthetics (1 – 4)	Within	1.21	<b>1.76*</b>	1.03	1.03
	Outside	<b>0.81**</b>	1.00		

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**Negative aspects of the environment are sometimes offset by walking outside the neighborhood**



## Results ... associations between perceived environment and measure of walking ...

Perceived neighborhood attribute	WT	WR	MPA	Steps
Traffic safety (1 – 4)	<b>1.50**</b>	0.98	1.09	<b>1.14*</b>
Indirect access to services (1 – 4)	1.16	<b>1.90**</b>	1.06	<b>1.08*</b>

WT = walking for transport; WR = walking for recreation; MPA = moderate-intensity physical activity;  
\*P <.05; \*\*P <.01 slow speed differences btw steps and mpa

**Associations between environmental characteristics and objectively-measured walking varied by measure**

**Moderate-intensity minutes of PA as measured by accelerometry may not capture the substantial amount of low-intensity walking in Hong Kong residents**





# Main points ... discussion



- High level of walking ... some at low intensity
- Outcome dependent on measure of walking
- Importance of examining location of walking
- Walking for transport:
  - Destinations matter ... however ...
    - Poor access within the neighbourhood offset by good public transport
- Walking for recreation
  - Aesthetics; crime; traffic and destinations matter ...
  - Negative aspect of the neighbourhood environment offset by accessibility to other neighbouring areas

