Public Transit use: an unlikely panacea to solve the physical inactivity crisis in older adults?

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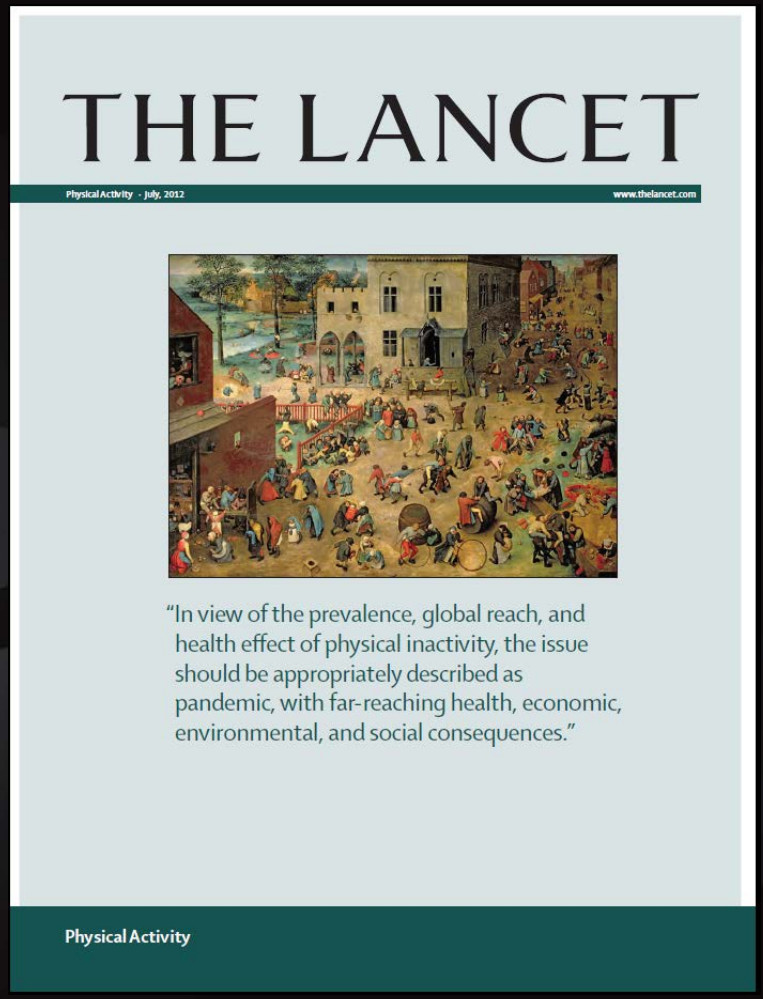
The physical activity pandemic



Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy

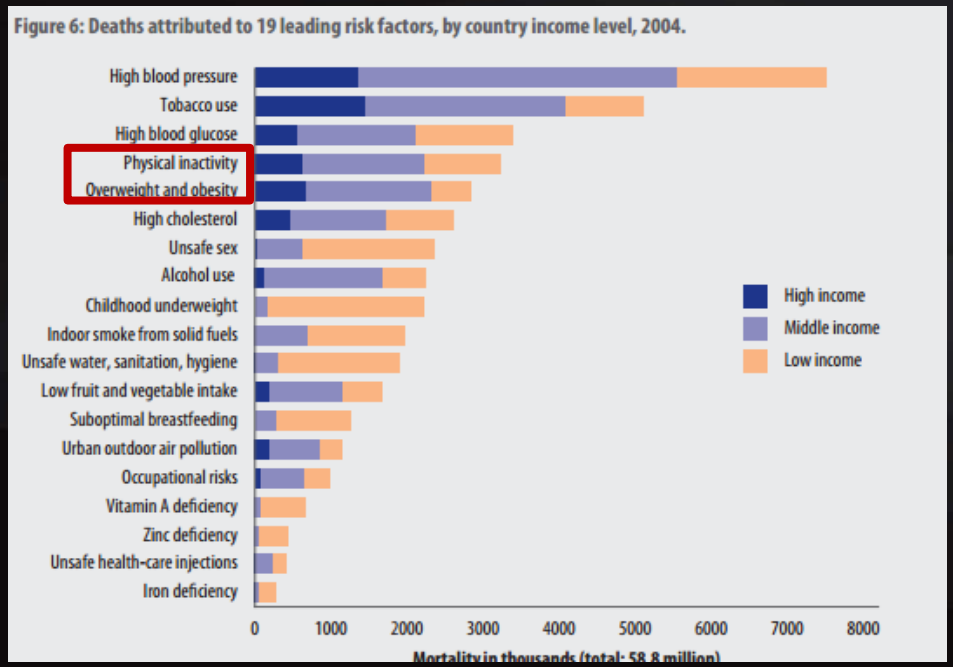
I-Min Lee, Eric J Shiroma, Felipe Lobelo, Pekka Puska, Steven N Blair, Peter T Katzmarzyk, for the Lancet Physical Activity Series Working Group*

Summary

Background Strong evidence shows that physical inactivity increases the risk of many adverse health conditions, including major non-communicable diseases such as coronary heart disease, type 2 diabetes, and breast and colon cancers, and shortens life expectancy. Because much of the world's population is inactive, this link presents a major public health issue. We aimed to quantify the effect of physical inactivity on these major non-communicable diseases by estimating how much disease could be averted if inactive people were to become active and to estimate gain in life expectancy at the population level.

Methods For our analysis of burden of disease, we calculated population attributable fractions (PAFs) associated with physical inactivity using conservative assumptions for each of the major non-communicable diseases, by country, to estimate how much disease could be averted if physical inactivity were eliminated. We used life-table analysis to estimate gains in life expectancy of the population.

Findings Worldwide, we estimate that physical inactivity causes 6% (ranging from 3·2% in southeast Asia to 7·8% in the eastern Mediterranean region) of the burden of disease from coronary heart disease, 7% (3·9–9·6) of type 2 diabetes, 10% (5·6–14·1) of breast cancer, and 10% (5·7–13·8) of colon cancer. Inactivity causes 9% (range 5·1–12·5) of premature mortality, or more than 5·3 million of the 57 million deaths that occurred worldwide in 2008. If inactivity were not eliminated, but decreased instead by 10% or 25%, more than 533 000 and more than 1·3 million deaths, respectively, could be averted every year. We estimated that elimination of physical inactivity would increase the life expectancy of the world's population by 0·68 (range 0·41–0·95) years.



Lee et al., 2012. *The Lancet*, 380(9838), 219-229
World Health Organization. *Global health risks: mortality and burden of disease attributable to selected major risks*. 2009.

CORONARY HEART-DISEASE AND PHYSICAL ACTIVITY OF WORK

J. N. MORRIS M.A. Glasg., M.R.C.P., D.P.H.
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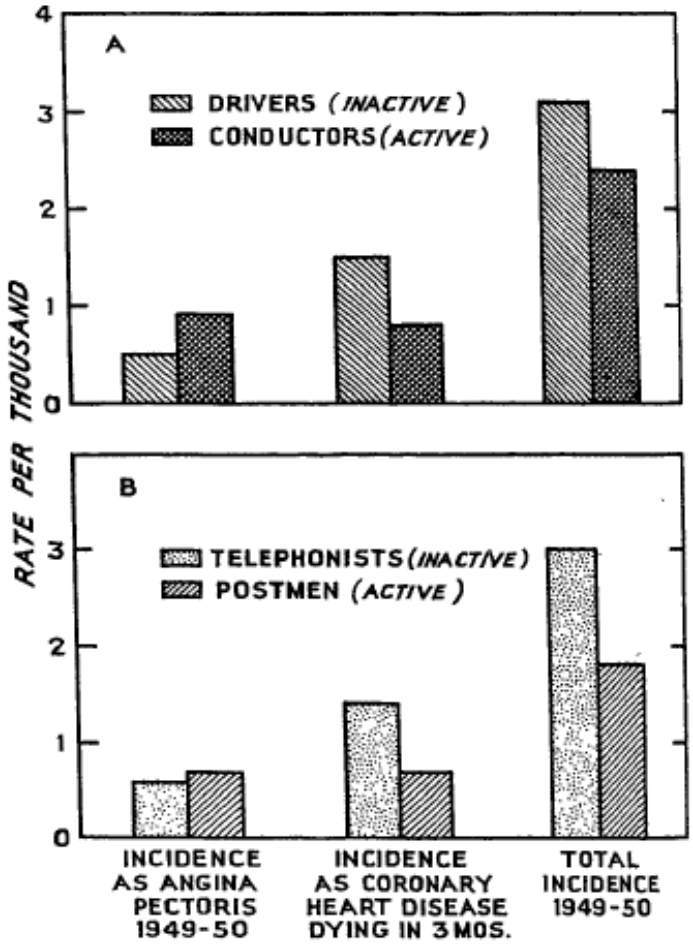
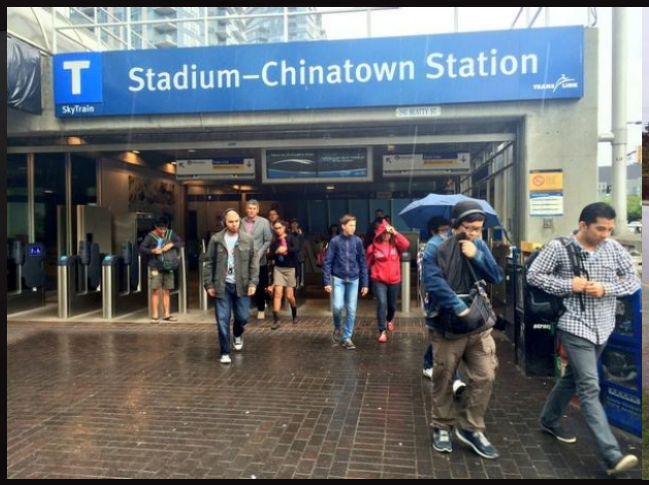


Fig. 2.—First clinical episodes of coronary heart-disease in 1949–52: A, drivers and male conductors, aged 35–64, of Central London Buses; B, G.P.O. male telephonists and postmen, aged 35–59.

Morris et al. 1953. *The Lancet* 265:: 053–1057;contd. & 1111–1120;concl.

Public transit use and physical activity

Publication	Key Finding
Rissel C *et al*. *Int J Environ Res Public Health.* 2012;9:2454-2478.	Review article: studies found 8-33 additional minutes of walking from transit use.
Chaix B *et al*. *Int J Behav Nutr Phys Act.* 2014;11:124.	~33% of daily moderate-to-vigorous physical activity attributable to transport (incl. transit)
Wener RE *et al*. *Environment and Behavior.* 2007;39:62-74.	Train commuters walked an average 30% more steps/day compared with car commuters
Lachapelle U *et al*. *J Phys Act Health.* 2011;8 Suppl 1:S72-82.	Transit users accumulated 5-10mins more physical activity than non-users
Saelens BE *et al*. *Am J Public Health.* 2014;104:854-859.	14.6 minutes of daily physical activity directly attributable to public transit use – and ONLY on transit days!



Local contexts? What about older adults?

Our research: The Walk the Talk study

A cross-sectional study evaluating the association between the built environment and the mobility and health of low-income older adults (≥65 years) in Metro Vancouver.

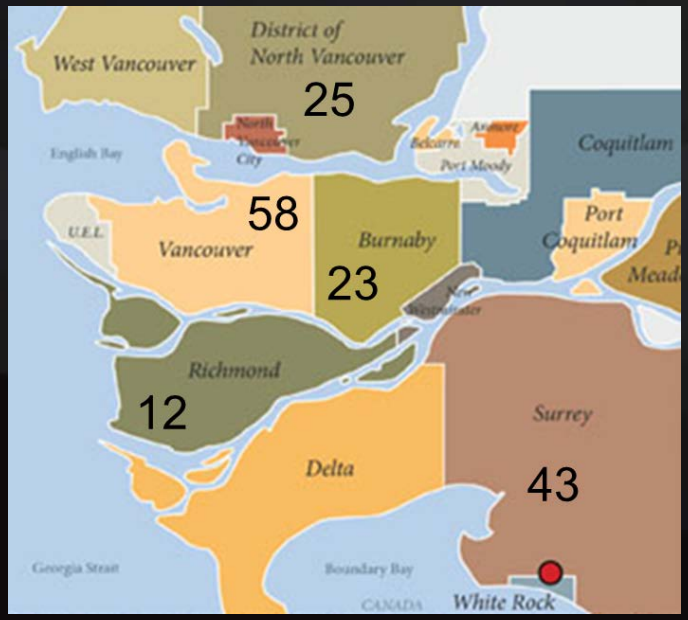
Sampling frame:

- Identified Shelter Aid for Elderly Renters (SAFER) recipients aged ≥ 65y residing within eight municipalities in Metro Vancouver (n=5871)
- Stratified into deciles of walkability (WalkScore®); randomly sampled 200 individuals from each decile of walkability

Recruitment:

- 1995 letters of invitation mailed to households
- Up to 3 follow-up phone calls
- Eligibility: English speaking | Cognitively intact | Leaves home at least 1 day per week | Able to walk > 10m | Able to participate in a mobility assessment (asked to walk 4m)

Recruitment rate: 8.1%



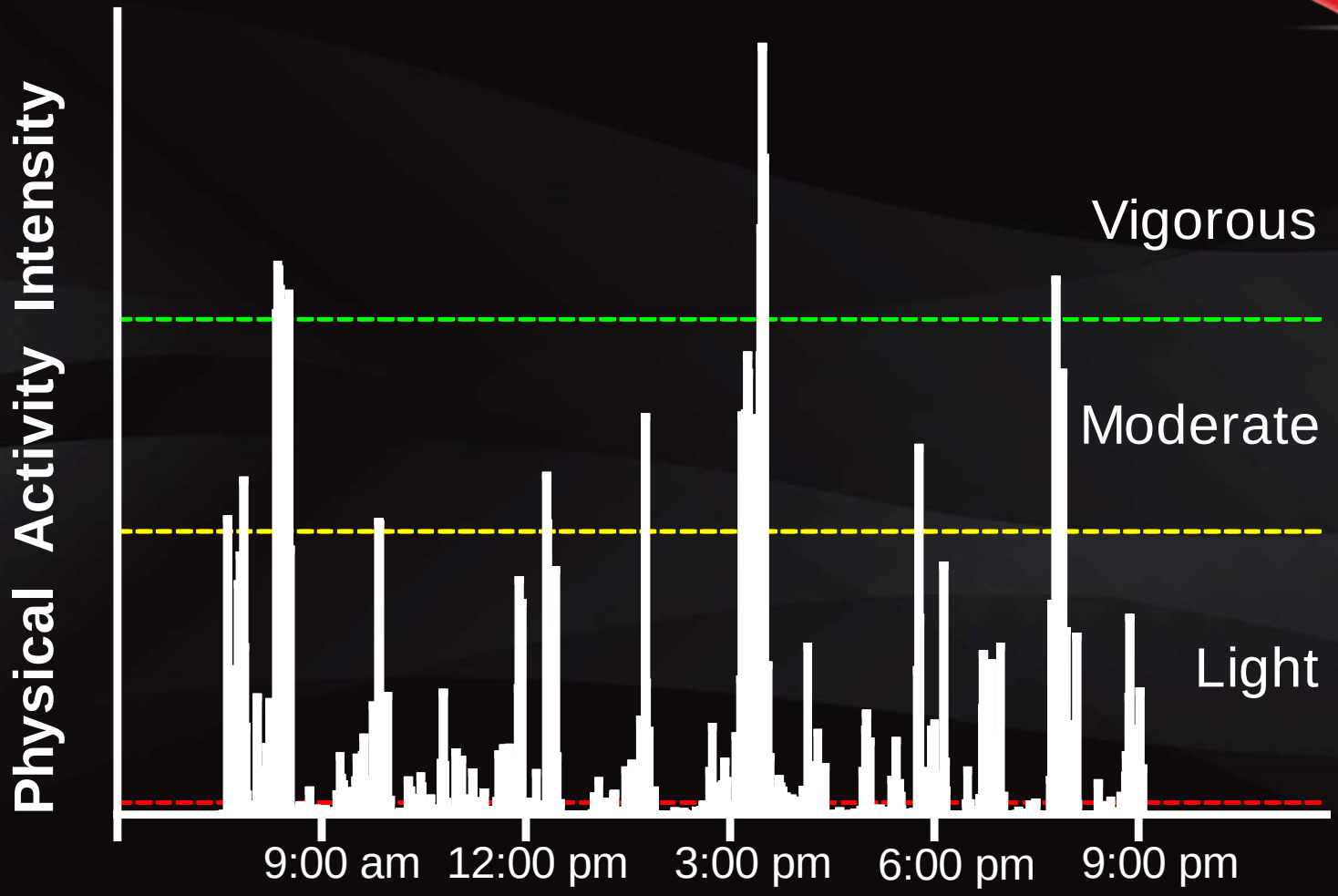
Walk the Talk: Analytical sample

	All	Non-user	Transit-user	*p*
N (% female)	86 (67%)	49 (61%)	37 (73%)	0.157
Age (yrs)	73.5 (5.5) *(range: 66-88)*	73.9 (5.7)	73.0 (5.4)	0.422
BMI ($kg \cdot m^{-2}$)*	27.6 (5.8)	28.2 (5.7)	26.8 (6.0)	0.271
% normal / overweight / obese	35% / 42% / 23%	27% / 49% / 24%	46% / 32% / 22%	0.155
% using walk aid (*n*)	19% (16)	(11)	(5)	0.292
% access to car (*n*)	60% (51)	**(38)**	**(13)**	**<0.001**
% living alone (*n*)	83% (71)	(40)	(31)	0.795
% some university education (*n*)	34% (29)	(16)	(13)	0.810

Date are mean (SD) of % (n)

Methods: Accelerometry (physical activity)

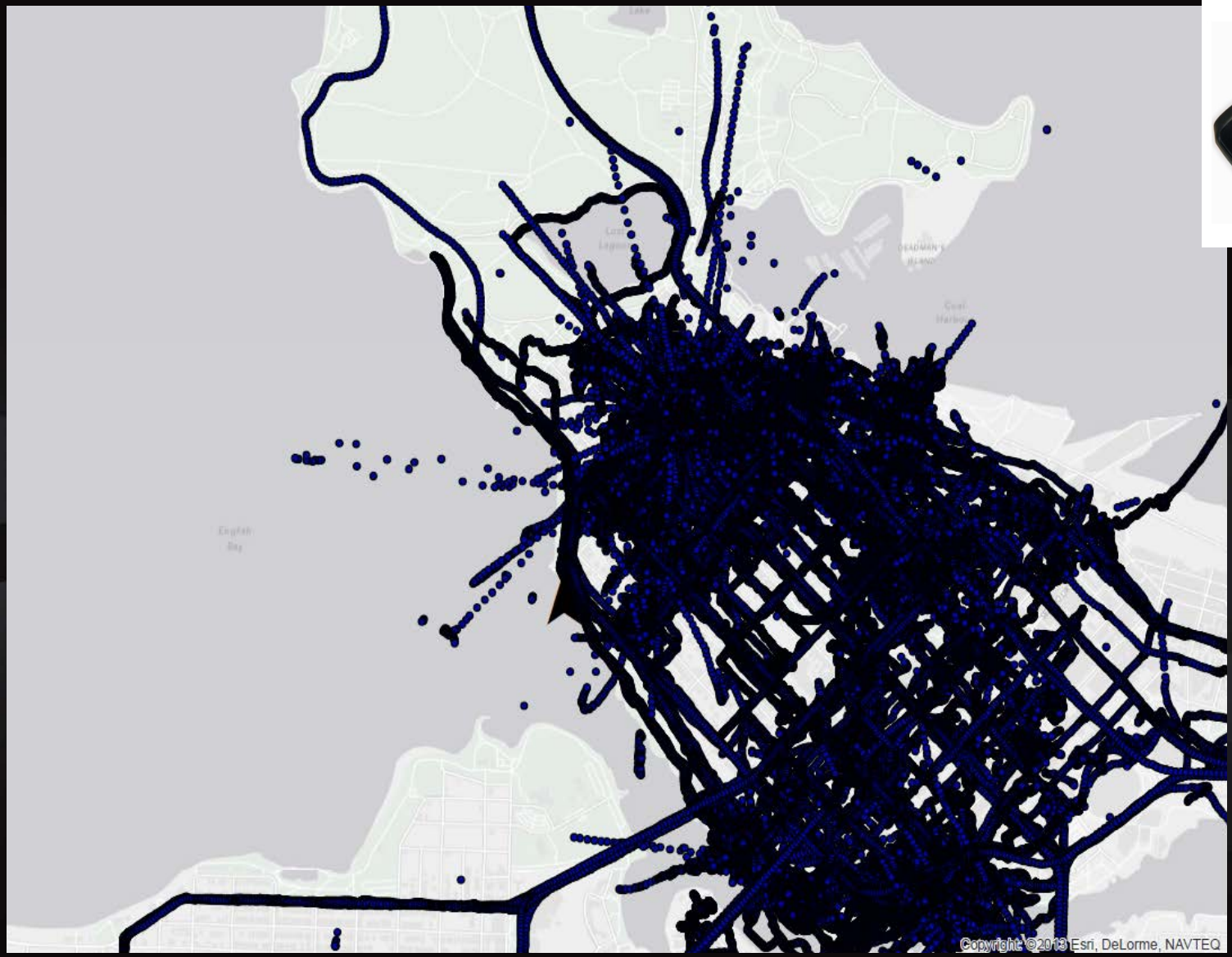
- Worn on right hip, 7 days during waking hours (March-May 2012)
- ActiGraph GT3X+ (reintegrated to 1s epoch)
- Freedson cut-points (MVPA ≥1952 CPM)[a]



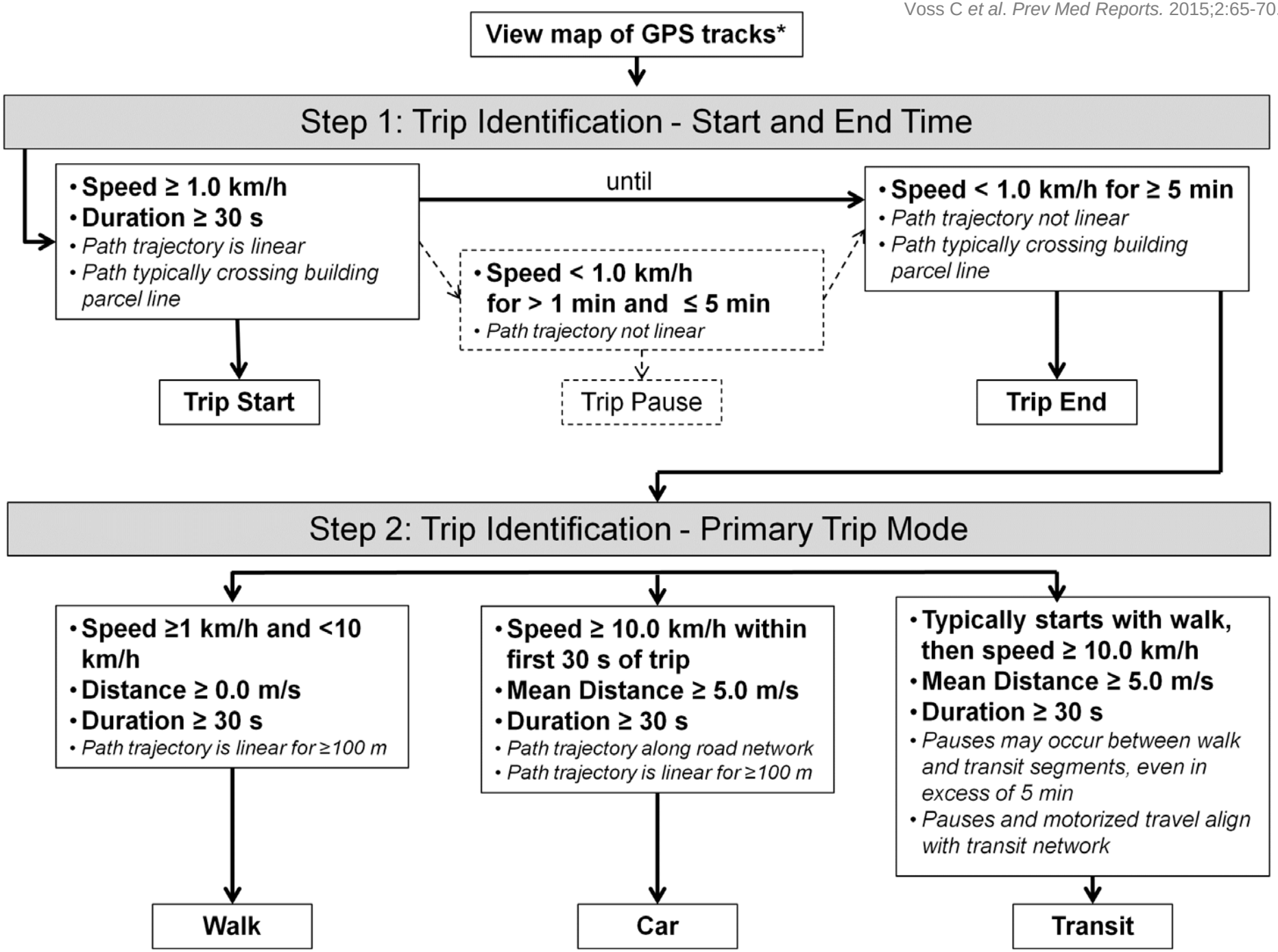
MVPA – moderate-to-vigorous physical activity

[a]Freedson PS *et al*. *Med Sci Sports Exerc.* 1998;30:777-781.

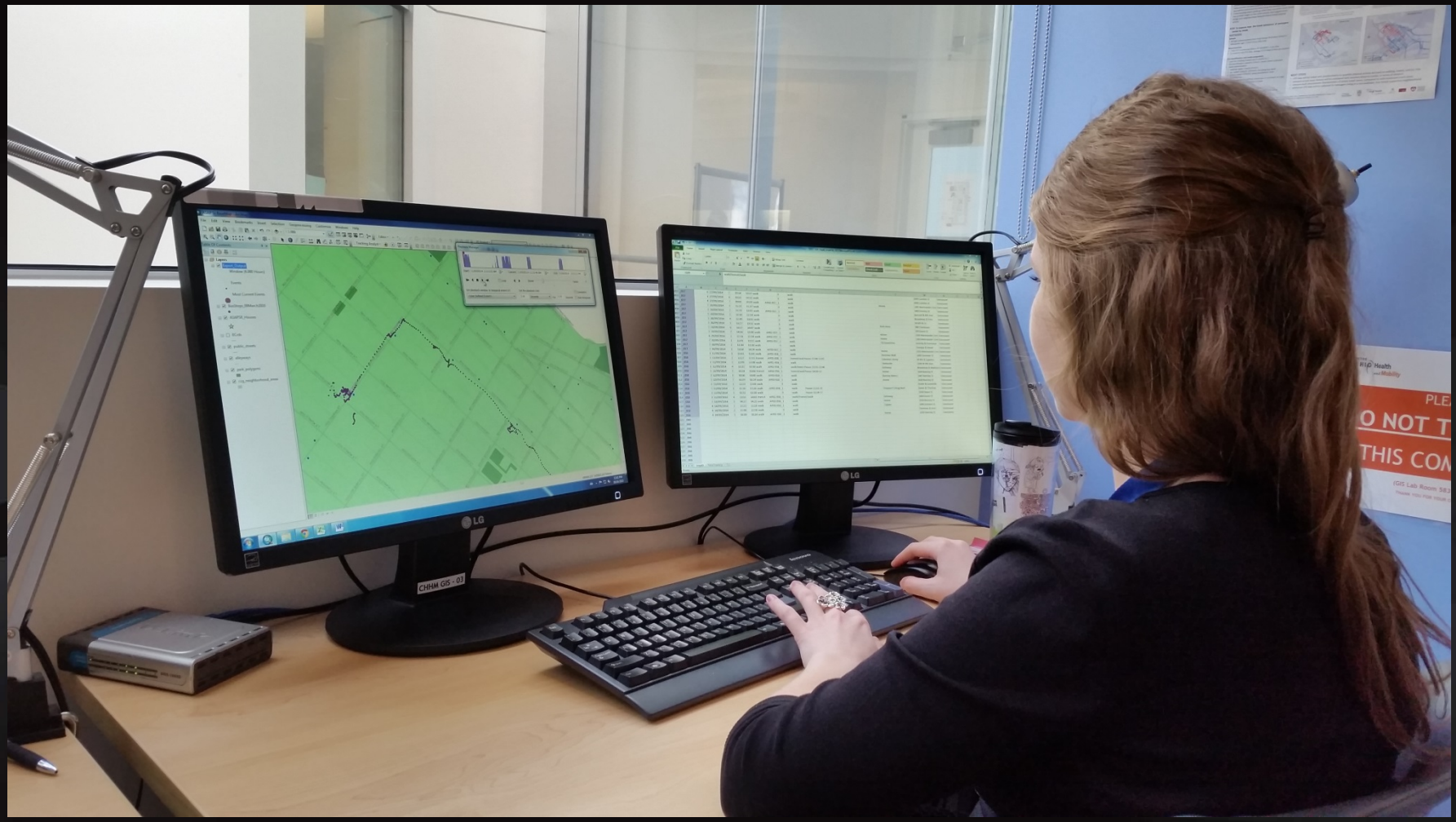
Methods: Global Positioning Systems (transport)



Voss C *et al. Prev Med Reports.* 2015;2:65-70.

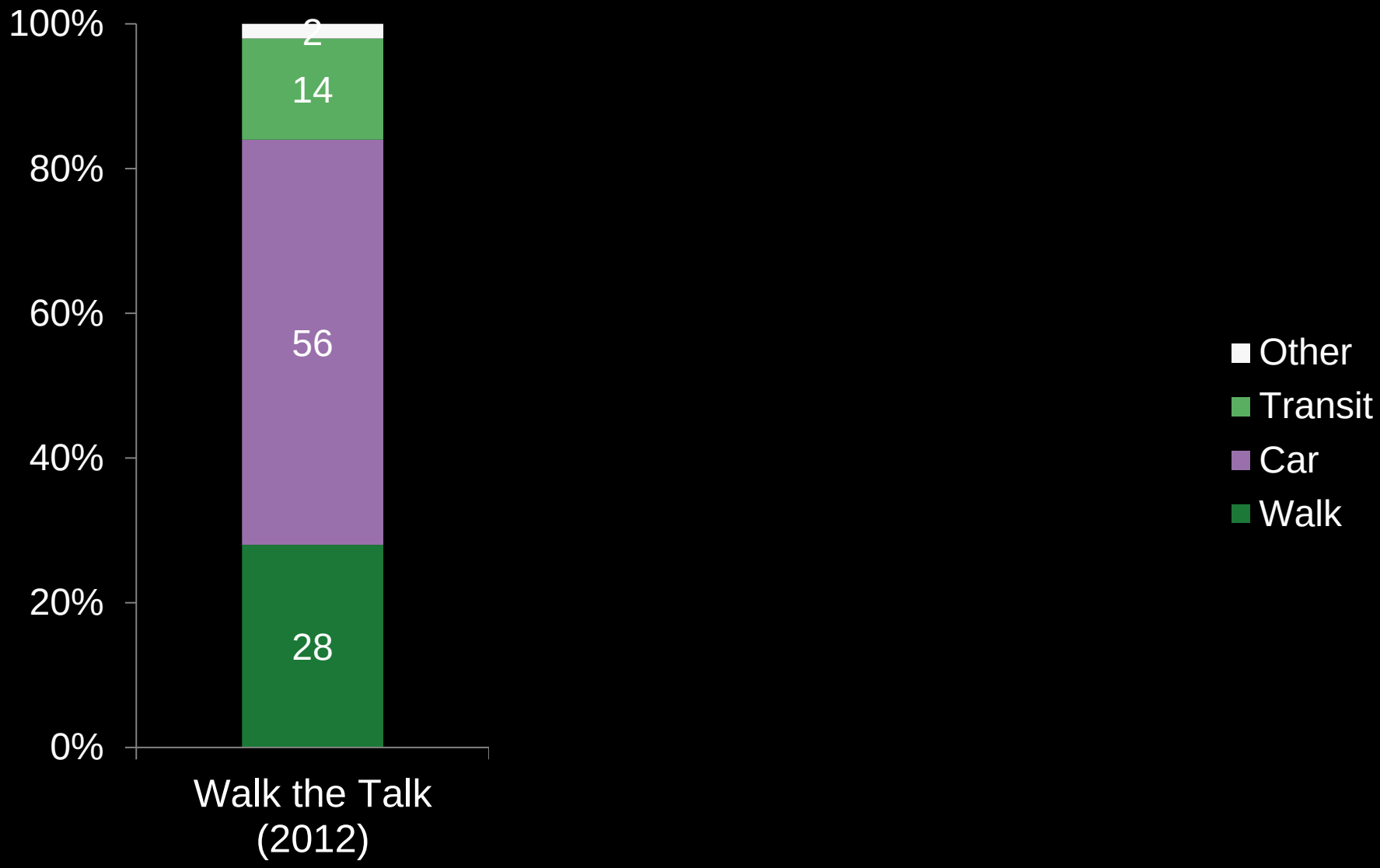


Trip Identification



Trip identification:
Public transit trip

Results: Mode share - older adults



*TransLink. 2011 Metro Vancouver Regional Trip Diary Survey: Analysis Report. 2013

**Voss C *et al*. *[in preparation].* 2015

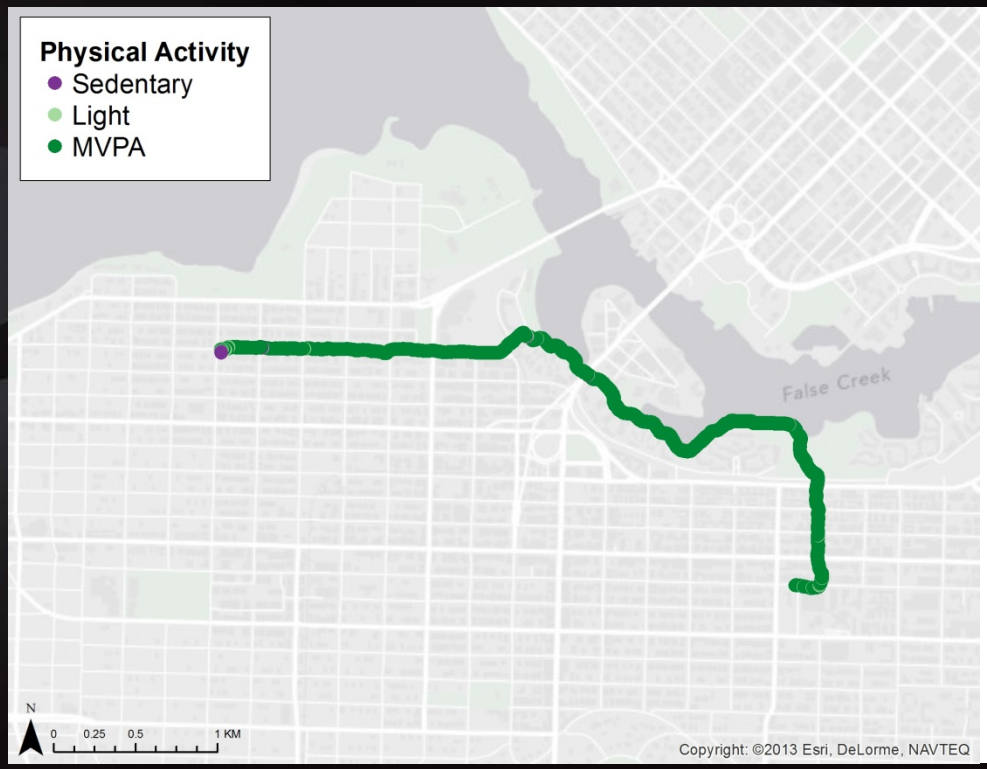
Trip-based physical activity
Walk trip

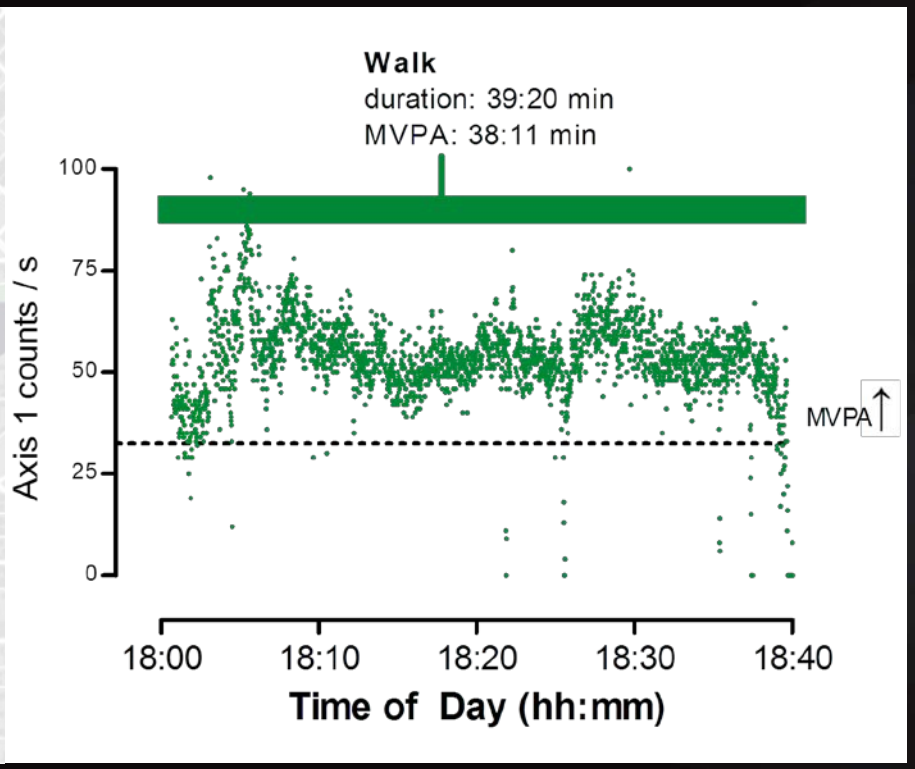
GPS

- Duration: 39:20 minutes
- Distance: 3.5 km
- Average Speed: 4.6 km/h

Accelerometry

- MVPA: 38.11 minutes





Voss C *et al*. *[in preparation]*. 2015

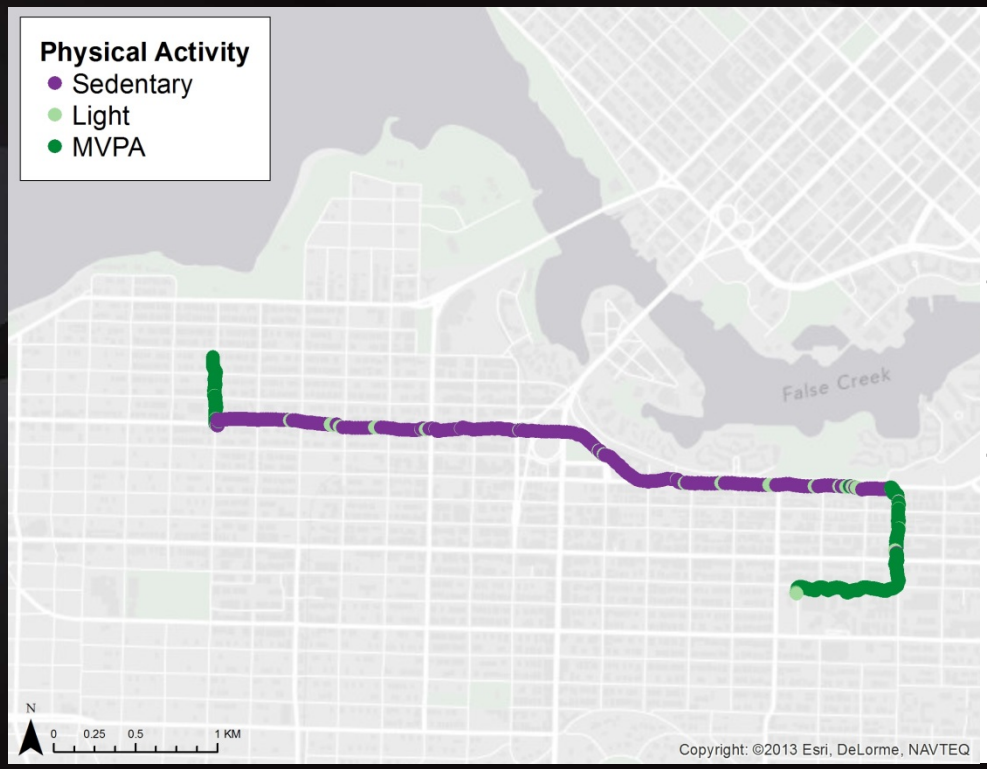
Trip-based physical activity
Transit trip

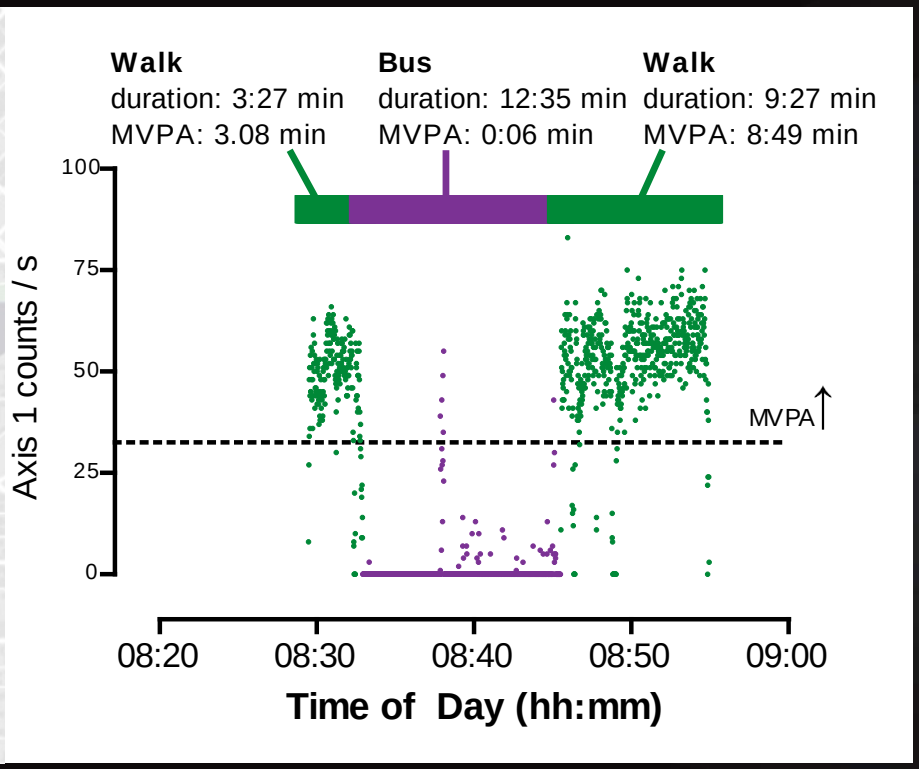
GPS

- Duration: 25:28 minutes
- Distance: 3.9 km
- Average Speed: 9.7 km/h

Accelerometry

- MVPA: 11.63 minutes





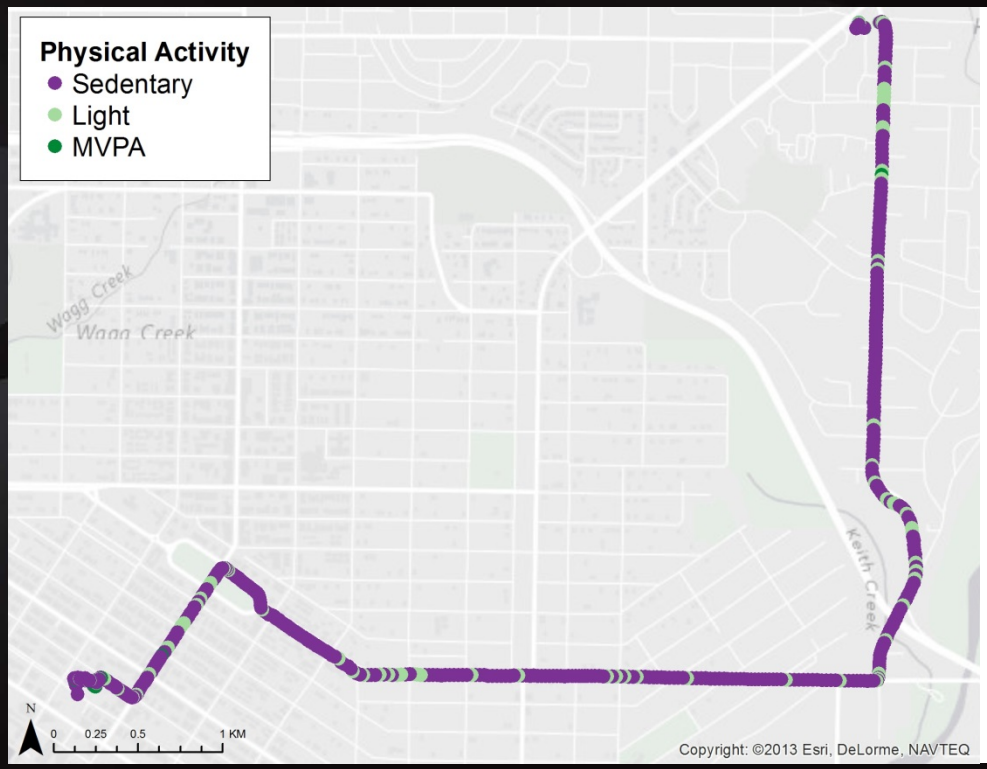
MVPA = moderate-to-vigorous physical activity

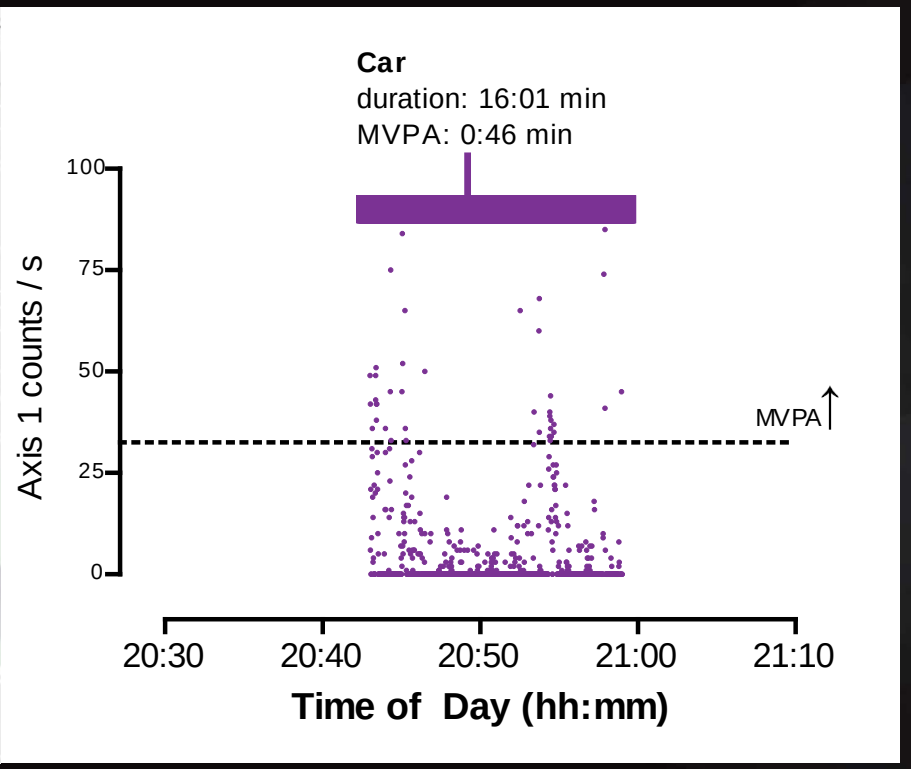
Voss C *et al. [in preparation]*. 2015

Trip-based physical activity
Car trip

GPS
- Duration: 16:01 minutes
- Distance: 6.5 km
- Average Speed: 28.3 km/h

Accelerometry
- MVPA: 0.46 minutes





MVPA = moderate-to-vigorous physical activity

Voss C *et al*. *[in preparation]*. 2015

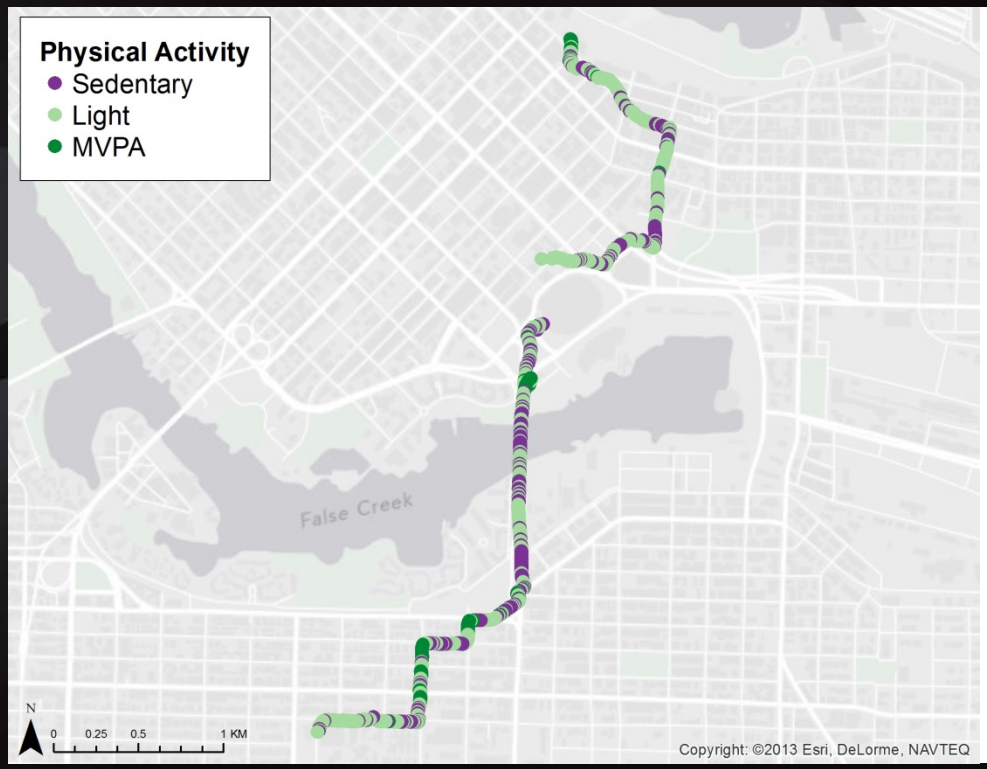
Trip-based physical activity
Bicycle trip

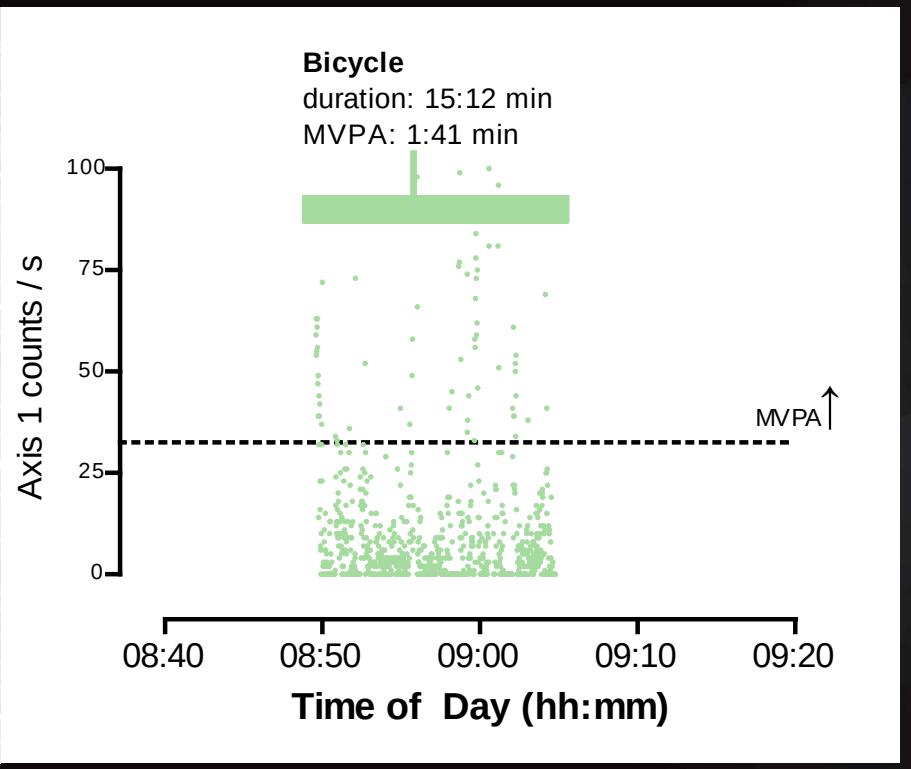
GPS

- Duration: 15:12 minutes
- Distance: 4.5 km
- Average Speed: 14.8 km/h

Accelerometry

- MVPA:1.41 minutes





MVPA – moderate-to-vigorous physical activity

Voss C *et al*. *[in preparation]*. 2015

Trip-based physical activity
Summary

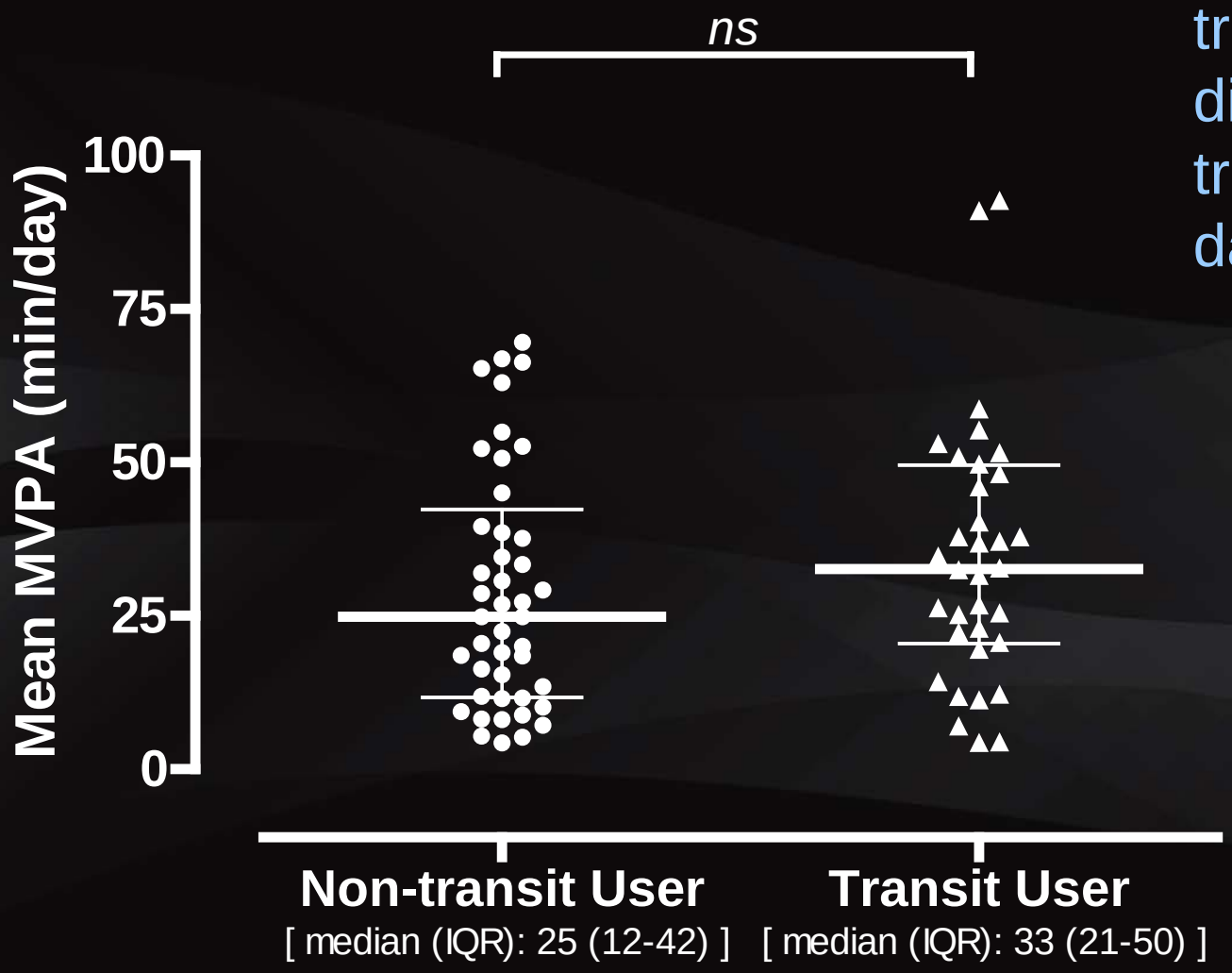
	n	GPS Trip Duration (minutes)	Moderate-to-vigorous physical activity (minutes/trip)
All Trips	*1,223*	*13.2 (7.2, 23.7)*	*0.9 (0.3, 3.8)*
Car	701	12.9 (7.8, 20.3)	0.5 (0.2, 1.0)*
Transit	169	28.9 (20.9, 49.1)**	**5.0 (1.5, 10.6)***
Walk◊	353	9.8 (5.2, 17.5)	**3.8 (1.2, 9.9)**

Date are median (p25, p75). ◊Referent: Walk (multi-level analysis); **p*<0.05; ***p*<0.001 significant different from referent; excluded: n=16 bike, n=12 handy dart, n=5 other; Based on *n*=86 participants.

Winters M *et al*. *[in preparation].* 2015

Non-transit users versus transit users: Physical activity

But public transit users did not use transit every day…

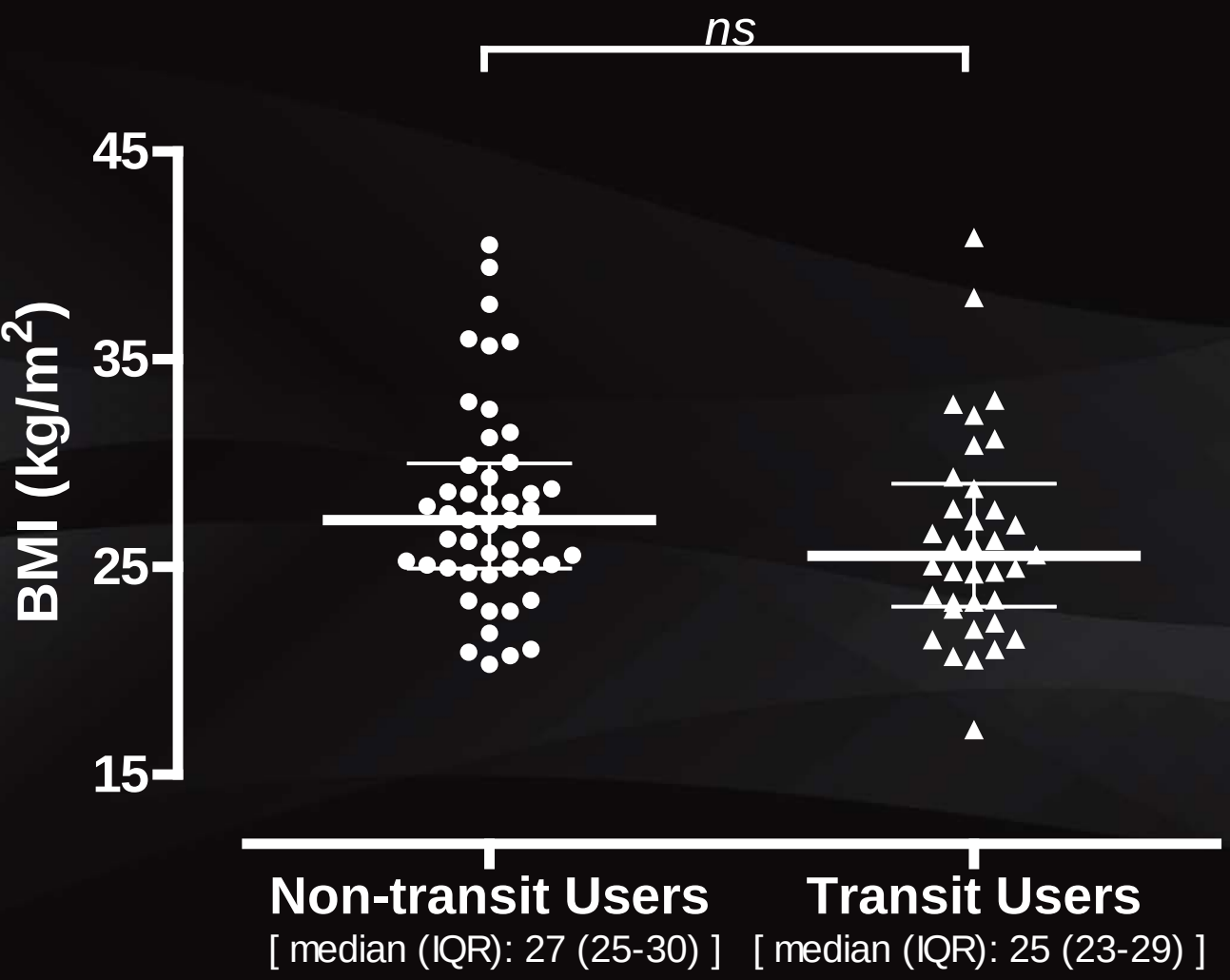


Based on *n*=80 individuals (≥3 days valid accelerometry required to calculate mean daily MVPA)

Daily physical activity levels: Transit-days versus non-transit days

* $p<0.05$ for overall MVPA; $p<0.01$ for transport-MVPA (referent: 'transit-user, not today')
Based on $n=281$ person-days by $n=86$ individuals

Non-transit users versus transit users: Body Mass Index



Based on *n*=86 individuals

Walking interviews

- **I have a bus pass** because I'm on limited income. And I use it. I use it a lot. [74 yrs, female]

- I don't need the car anymore because I can literally walk everywhere I want to go. And everywhere else, I either take Skytrain or the bus. So I got rid of the car. Moved here. Haven't regretted it, you know. [71 yrs, male]

- The Skytrain could be closer, but you can't do much about that. And besides, it's good, it's 10 blocks in either direction. So if weren't inclined to walk, **I'd be having to walk** anyway which is good. [74-yrs, female]

- When I stand at the bus stop and watch these, some of these crazy people, I just do have a heart attack and I say, no, I know why I'm not driving. There's too many crazies. **I don't know if I'd be alert enough** for all these crazies these days. I mean, not all. Some people are excellent drivers. [73 yrs, female]

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