Transport related Physical Activity

Public health application of the Transport &
Population Data Center's
Household Travel Survey (HTS)

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Acknowledgements

- Transport and Population Data Centre Department of Infrastructure, Planning and Natural Resources (DIPNR)
    - Tim Raimond,
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    - Annette Hay

- Centre for Epidemiology and Research NSW Department of Health
    - Alan Willmore

The topics of this talk

- Why transport-related PA is now relevant?

- Limitations of current PA surveillance and Transportation reports for public health practice
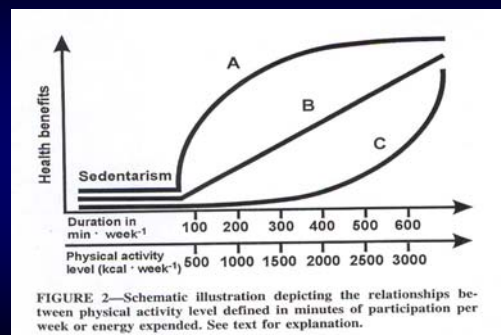
- Public health approach to travel data

- Implications

Why transport-related PA is now so relevant to public health?

Paradigm shift & epidemic of obesity

Development in scientific knowledge

- PA need not to be vigorous to improve health
    - Moderate-intensity PA can improve fitness and, is associated with a range of *physiological* and *psychological* health outcomes

- Health benefits is proportional to amount
    - Evidence for dose-response association
    - Fractionalization of daily amount

The dose response curves

FIGURE 2—Schematic illustration depicting the relationships between physical activity level defined in minutes of participation per week or energy expended. See text for explanation.
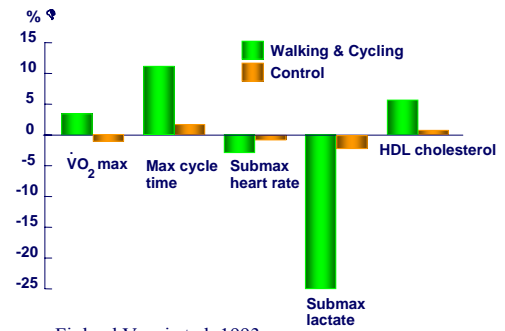
Source: Bouchard C. (2001) Med. Sci Sports Exerc

Public health recommendations (1996)

- Effective Health Enhancing PA dose
  - Moderate-intensity
  - Frequent (daily, >= 5 days)
  - 30 minutes per day
  - Accumulation throughout the day in several bouts (>= 10 minutes)

- Applicable in transport by walking /cycling

Effects of work commuting exercise

Source: Finland Vuori et al, 1993

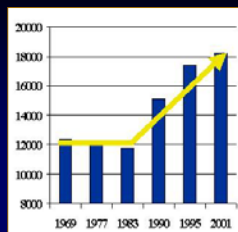## 2. Obesity epidemic is linked to inactivity……

measured by sitting hours , or
by failing to meet minimal HEPA dose
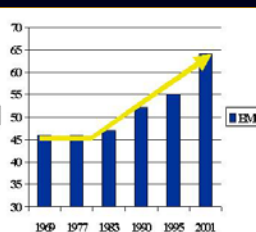

The Fate of the Commuter

A commuter who spends 2 hours each day commuting…will spend the equivalent of 11 40-hour weeks sitting in their car each year!

Trend in VMT   Trend in BMI

Growth trend for annual household vehicle miles of travel
(50% overall growth)

Growth trend for percent of Americans 'overweight'
(40% overall growth)

Graphics above show that VMT follows closely to Body Mass Index growth from 1969 to 2001.

http://nhts.ornl.gov/2001/presentations/walking/index.shtml

Be active every day in as many ways as you can

Leisure time

At work

Transport

Home

PROMOTING ACTIVE TRANSPORT

Australia

Increasing PA through walking and cycling including the use of public transport

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Examples

- 2000 Health Promotion strategy - structural changes to support walking and cycling;
- National PA guidelines: 'make a habit of walking / cycling instead of using the car'
- Repeated Media awareness days and collaboration between sectors around:

'Walk to Work Day' (WTWD), 'Walk Safely to School Day'.

- The RTA implemented the 'Bike Plan 2000' in Sydney Greater Metropolitan

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What information do we have to evaluate this strategy from a PA public health perspective?


Limitation of current data sources

- National Health surveys focus only on leisure time exercise, ignoring other domains
- Current PA measure (1997) asked about walking for exercise and for travel in one question; not useful to determine interventions effect specifically around transport.
- Very limited data on cycling; usually grouped under moderate-intensity types of exercise.
- Travel related PA is largely incidental and might be difficult to recall in time frame used in health surveys.

NSW Household Travel Survey (HTS)

- a continuous survey, carried out every day of the year (NSW Dept of Transport/ infrastructure/planning) since 1997.
- ≈ 3,500 households each year provide information on all trips undertaken **in the previous 24 hours** by each member of the household.
- Can be compared with the one-off 1991 Home Interview Survey which used similar methods.
- For each trip information is collected on:
  - mode of travel used
  - the purpose of the trip
  - location of origin and destination
  - time of departure and arrival.

Transportation reports for Sydney Greater Metropolitan

Mode share (% of all trips)
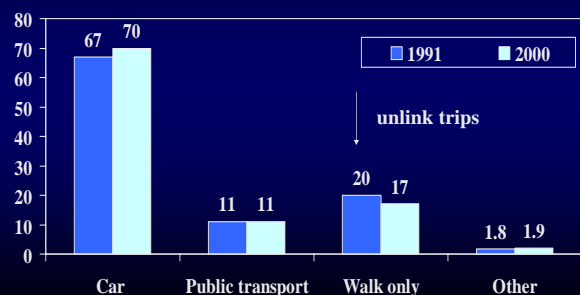
Public health approach

1. **How much can PA be increased by *active commuting* [daily walking /cycling trips] ?**

2. **How many people engage in *active travel / commuting* and actually accrue effective dose (HEPA) ?**

3. **Has *active commuting* changed over the years? Where? For whom?**

4. **What are the trip purposes that have the greatest potential for influencing health**

5. **Profile of active travelers are they also the avid exercisers (no population gain) or in general less active group?**

Methods

- Aggregated trips were disaggregated back to the *person level* to calculate population estimates.

- Unlink trip data sets were used, in which each mode defines a trip (e.g. walking to the bus stop is a trip defines by the purpose to 'change mode').

- 21 codes for trip purposes were re-grouped according to public health interest (e.g., trips to sport venue as participant)

- 3 recent years of HTS data used to compare with 1991 Survey when 12,000 households were interviewed over 12 month period.

- Results presented for adults ($>= 15$ yrs) with conservative 99% Confidence intervals due to cluster sampling.

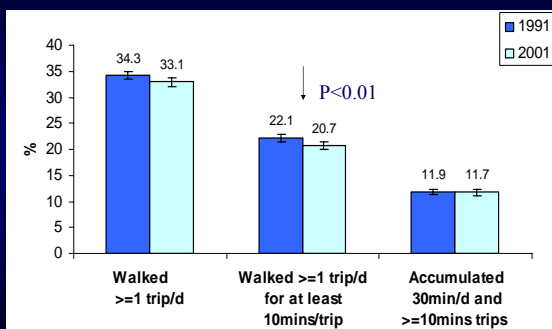## 1. How much PA (minutes) be gained on average from walking/cycling trips?

	N trips	Mean mins	Median mins	Q1-Q3
Any walking	23,650	9.3	5	5-10
1. walk only	12,467	11.0	8	5-15
2. walk to link	11,183	7.5	5	3-10
Any cycling	991	20.8	15	10-25

2. Population estimates for walking applying different HEPA criteria (99/2001)
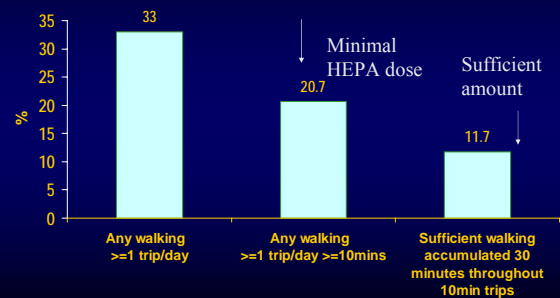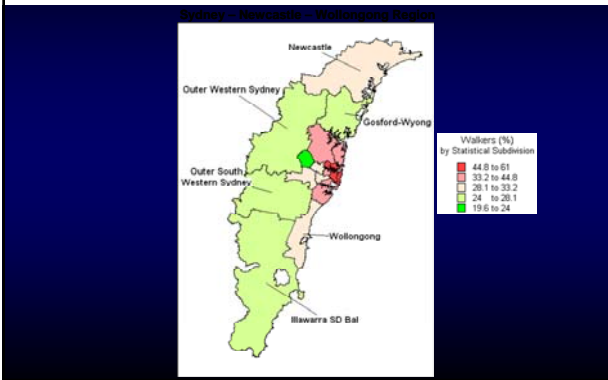

3. What has changed since 1991?
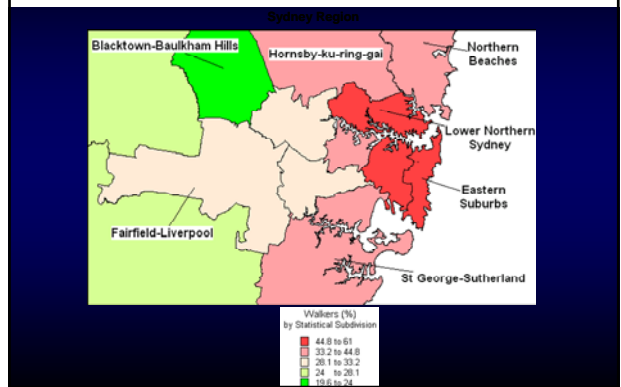
(Person-based analyses)

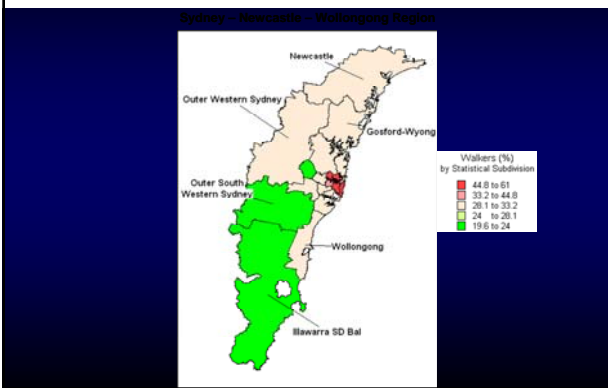Geographical variations in walking and has it changed?

Transport Data Centre 1991 Travel Survey
Percentage of Walkers by Statistical Subdivision, 1991

Transport Data Centre 1991 Travel Survey
Percentage of Walkers by Statistical Subdivision, 1991

Transport Data Centre 1991 Travel Survey
Percentage of Sufficient Walking by Statistical Subdivision, 1991

Transport Data Centre 1991 Travel Survey
Percentage of Sufficient Walking by Statistical Subdivision, 1991
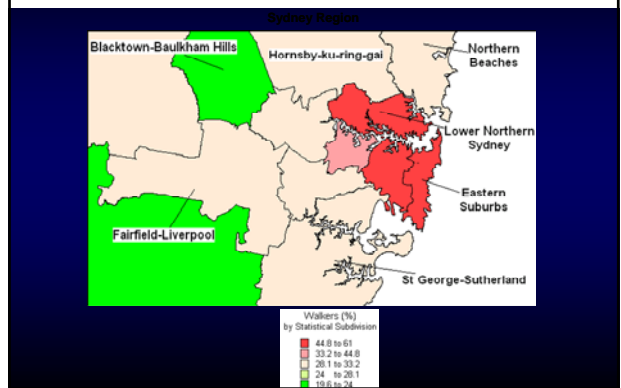
What are the trip purposes ?

Which trip have the greatest
potential for influencing health?

The purposes of walking trips undertaken by walkers in SGM during 1999-2001
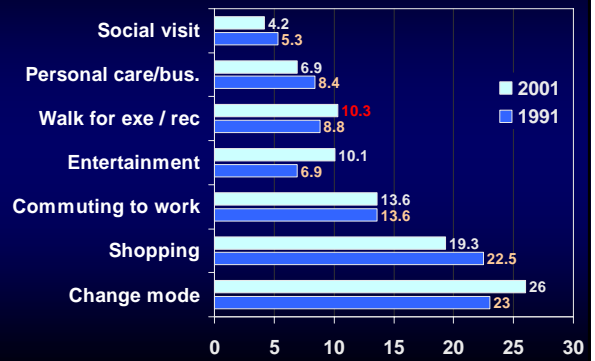(trip-based analyses, n=23,605)
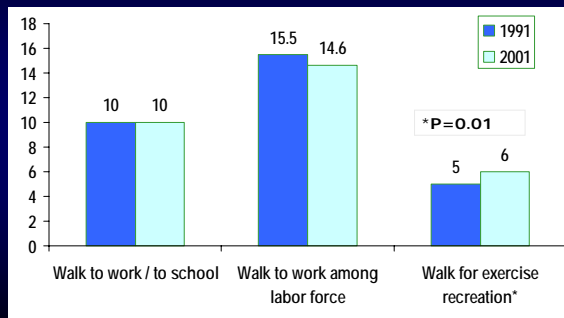
Slide 1
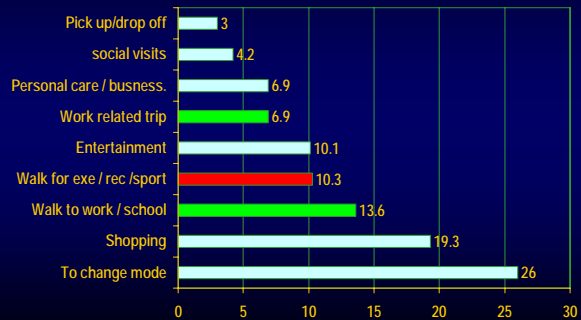
Which of the purposes contribute to HEPA ?

Trip	N of trips	Mean (min)	Median (min)	Q25	Q75
Walk for exercise recreation*, to do sport	2,170	18.1	15	8	25
Walk to work or learning place	8,473	12.4	10	7	15
Walk for Entertainment**	2,414	9.5	5	5	10
Walk for shopping	4,466	8.3	5	3	10

* walk/jog to exercise, going to park, walking the dog, window shopping

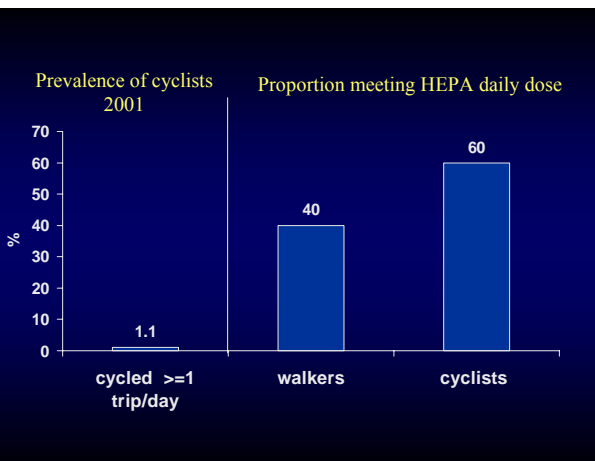** to restaurant, club, concert, movie, gallery, hobby course, church, picnic

Slide 2

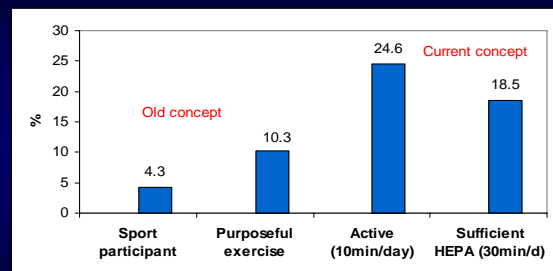**Change in the proportion of walking trips by their purposes (trip-based analyses)**

Social visit: 4.2 (2001), 5.3 (1991)
Personal care/bus.: 6.9 (2001), 8.4 (1991)
Walk for exe / rec: 10.3 (2001), 8.8 (1991)
Entertainment: 10.1 (2001), 6.9 (1991)
Commuting to work: 13.6 (2001), 13.6 (1991)
Shopping: 19.3 (2001), 22.5 (1991)
Change mode: 26 (2001), 23 (1991)

Slide 3

Translating "trip purposes" into population estimates? (person-based analyses)

Walk to work / to school: 10 (1991), 10 (2001)
Walk to work among labor force: 15.5 (1991), 14.6 (2001)
Walk for exercise recreation*: 5 (1991), 6 (2001) *P=0.01

Slide 4

Similar analyses with a focus on cycling

Slide 5

Prevalence of cyclists 2001 | Proportion meeting HEPA daily dose

cycled >=1 trip/day: 1.1
walkers: 40
cyclists: 60

Slide 6

Proportion of people who meet HEPA through utilitarian and leisure time PA

Sport participant: 4.3 (Old concept)
Purposeful exercise: 10.3
Active (10min/day): 24.6 (Current concept)
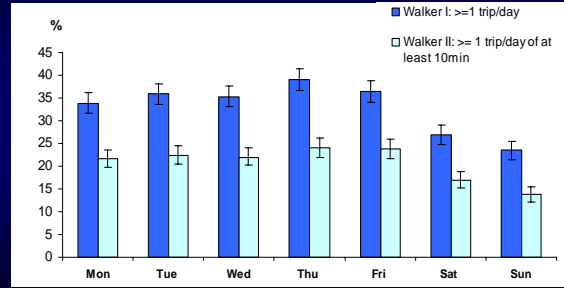Sufficient HEPA (30min/d): 18.5

Purposeful exercise –walk or cycled for exercise, recreation or participated in sport

Active –sport participants, or walking or cycling (>=10min) to places for any purpose
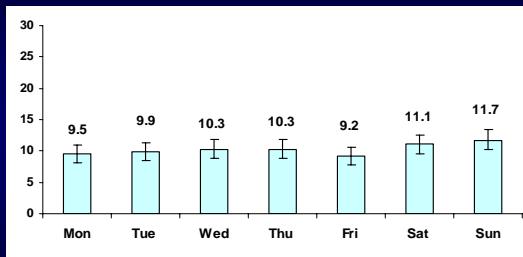
Slide 1

Daily variations?

Slide 2

Weekly pattern in walking for any purpose?

Legend: Walker I: >=1 trip/day; Walker II: >= 1 trip/day of at least 10min

Regardless of definition, in weekends people walk less.

Slide 3

Weekly pattern of purposeful exercise*?

Values: Mon 9.5, Tue 9.9, Wed 10.3, Thu 10.3, Fri 9.2, Sat 11.1, Sun 11.7

* Sport, walking or cycling for exercise or recreation

Slide 4

The prevalence of 'minimally active adults' by the day of the week

Values: Mon 25.6, Tue 26.7, Wed 26, Thu 27.4, Fri 26.6, Sat 21.1, Sun 19
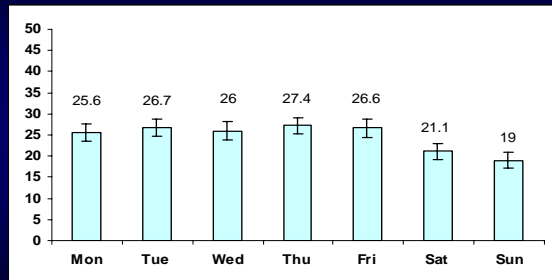
Lowest estimates on weekends presumably when people have more time - obvious strategic recommendation – organise more events!!

Slide 5

High- risk group

Having more than 1 car in the households

Slide 6

The number of cars in the household main barrier for meeting HEPA by walking

Legend: Walker : >=1 trip/day of at least 10min; sufficient walking: >29min/day by long trips

Walker values: 46.3, 23.7, 15, 11.3
Sufficient walking values: 29.3, 13.5, 8.1, 5.5

Number of cars in the household: 0, 1, 2, 3+
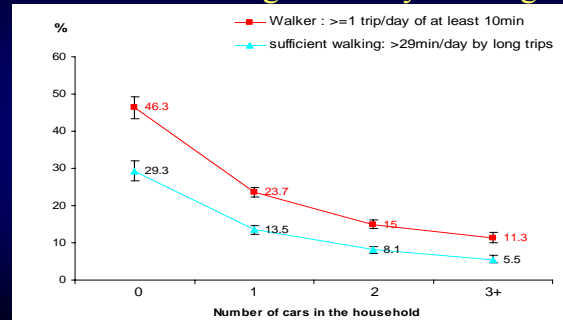
Profile of walkers
(HEPA minimal dose)

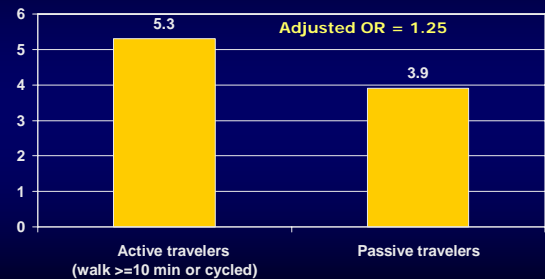More likely to walk for all purposes
- Women
- Middle aged (45-59) adults
- Having a full time job
- Singles (never married)
- Being sport participant

Less likely to walk
- Living alone
- being a single parent

Percent of *sport participants* among active and passive travelers

Implications

- Population benchmark according to HEPA in 2001
  - 3 out of 10 walked at least once
  - 2 out of 10 walked for 10 minutes or more
  - 1 out of 10 accrue sufficient amount of PA through active travel!
  - 5 out 10 did not engage in any active trip or sport
- Trips to work by walking contribute significant HEPA dose.
- A quarter of the walking trips link with public transport are beneficial.
- The prevalence of "active adults" is doubled by 'walking for all purposes'
- Prevalence of active people is lower on weekends, when people have more time, a potential for intervention.

Limitations and strength

- The 24hrs travel diary should be validated as a PA measure.
- Recreational and exercise walking and cycling could be under-estimated in such context.
- The regularity (habit) of active travel is unknown.

  - Finding here are consistent with other PA surveillance and non-traditional data sets
  - Support environmental theory

Broader approaches to PA promotion

Utilitarian PA

- Environmental and policy changes
- Acceptable (normative)
- Sustainable
- potential to reach large numbers

Leisure time PA

- Requires active voluntary participation
- Motivational issues
- Less sustainable
- Difficult to reach large numbers.

Thanks….

The measurement of physical activity

What should be measured and how?

………depends on the purpose

Assessment of PA for public health use

- To determine PA levels and trends in populations
- To identify high-risk groups
- To evaluate health promotion strategies

  Large, representative sample

  – Measure should be reliable and valid
  – acceptable to most subjects
  – Low cost } Questionnaires
  – Simple measure (policy makers, health professionals, public)
  – Easy to analyze and report (timely discharge of results)

Aspects of PA measurement

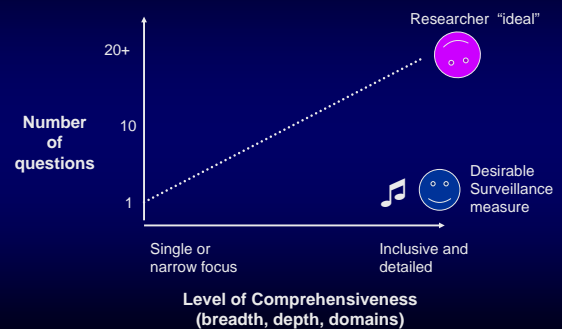**Type -** the main physiological systems that are activated during the activity

Intensity- the degree of overload an activity imposes on physiological systems in comparison to resting states.

Frequency - the number of times a person engages in an activity over a pre-determined period of time

Duration - the temporal length of the activity

Domain - when or for what purposes; leisure time PA, utilitarian PA in the course of one's daily schedule (transport, work, domestic setting)

Assessment Dilemma

Researcher "ideal"

20+

Number of questions   10

1

Desirable Surveillance measure

Single or narrow focus   Inclusive and detailed

Level of Comprehensiveness (breadth, depth, domains)

Assessment Dilemma

Researcher "ideal"

20+

"Usual" compromise

Number of questions   10

1

Desirable surveillance

Single or narrow focus   Inclusive and detailed

Level of Comprehensiveness (breadth, depth, domains)