Physical activity/inactivity epidemiology: Measurement, prevalence & determinants

Estelle V. Lambert, UCT/MRC Research Unit for Exercise Science & Sports Medicine, University of Cape Town Vicki.lambert@uct.ac.za 6th Annual Seminar on CVD Health Promotion & Chronic Disease Epidemiology, Entebbe, Uganda, 8-18 July 2009
Overview of presentation:

- Definition/s of physical activity/inactivity
- Evidence: health benefits of physical activity
- Evidence in the developing world
- Begin with the end in mind...indicators
- Measurement of physical activity/inactivity
- Determinants & Barriers to Physical Activity
Defining physical activity

**Physical Activity** - Any bodily movement produced by skeletal muscles that results in energy expenditure

**Exercise** - a subset of physical activity defined as a “planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness”

(Acknowledgement: Prof. Fiona Bull, BHF National Centre for PA and Health, Loughborough University)
Defining fitness: health vs performance

Physical Fitness - A set of attributes that people have or achieve that relates to the ability to perform physical activity

Components of Health
- Related Fitness
- Cardio-respiratory fitness (aerobic)
- Muscular endurance,
- Muscular strength,

Components of Performance
- Related Fitness
- Muscular power,
- Speed,
- Agility,
- Balance,
- Reaction time

(Acknowledgement: Prof. Fiona Bull, BHF National Centre for PA and Health, Loughborough University)
Physical activity is a complex behaviour.

Purpose of Activity?

(Acknowledgement: Prof. Fiona Bull, BHF National Centre for PA and Health, Loughborough University)
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Physical activity: how much is enough for health benefits?
Physical activity “dose” response for lowering risk of NCD’s

Protection from all cause mortality (Relative risk, RR)

kcal/wk

0 1000 2000 3000 4000 5000

0.00 0.25 0.50 0.75 1.00 1.25

Lee et al., 1999
Paffenbarger, 1993
Paffenbarger, 1986

Insufficient physical activity lowers risk of NCD’s

Physical activity “dose” response for lowering risk of NCD’s
Prevalence & relative risk of CVD

Risk factors

(Acknowledgement: Prof. Fiona Bull, BHF National Centre for PA and Health, Loughborough University)
Physical Activity: as important as other CHD risk factors?

Blair et al, JAMA 1996;276:205-10

(Acknowledgement: Prof. Fiona Bull, BHF National Centre for PA and Health, Loughborough University)
Current available recommendations for effective physical activity "dose"?

“Every adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the OR do vigorous intensity activity for 20 minutes, at least 3 days per week AND do 8-10 strength exercise, 8-12 times, twice per week. ...” AHA/ACSM 2008

“The current PA guidelines ...of 30 min... is of importance for limiting health risk...however, for preventing weight gain or regain this guideline is likely to be insufficient...likely that moderate intensity of 45-60 min is required to prevent ...obesity...” IOM 2002

Seps per day: 5000-7500 steps per day as low-active, 7500-10000 steps per day as somewhat active, > 10000 steps per day as active- Tudor-Locke 2005
Relative vs absolute exercise intensity: Implications for energy expenditure & dose?

American College of Sports Medicine Guidelines

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Relative intensity</th>
<th>Absolute intensity (METS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% VO₂max</td>
<td>% Max HR</td>
</tr>
<tr>
<td>Very light</td>
<td>&lt; 25</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Light</td>
<td>25-44</td>
<td>30-49</td>
</tr>
<tr>
<td>Moderate</td>
<td>45-59</td>
<td>50-69</td>
</tr>
<tr>
<td>Hard</td>
<td>60-84</td>
<td>70-89</td>
</tr>
<tr>
<td>Very Hard</td>
<td>&gt;85</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Maximum</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

At the same relative intensity, older persons or those with lower functional capacity will be exercising at a much lower absolute exercise intensity...

**YET MOST OF OUR CURRENT EVIDENCE IS BASED ON SELF-REPORT**
CHD Mortality according to absolute and relative self-reported exercise intensity (Harvard Alumni Cohort, $N = 7337$)

<table>
<thead>
<tr>
<th>Subgroup Defined By:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Relative Intensity of Exercise (Self-Rated Level of Exertion)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>No. of Cases</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Energy expended, $\uparrow$ kcal/wk</td>
</tr>
<tr>
<td>$&lt;1000$</td>
</tr>
<tr>
<td>$\geq 1000$</td>
</tr>
<tr>
<td>Absolute intensity of sports or recreational activities, $\uparrow$</td>
</tr>
<tr>
<td>No moderate activity</td>
</tr>
<tr>
<td>184</td>
</tr>
<tr>
<td>At least moderate activity</td>
</tr>
<tr>
<td>367</td>
</tr>
<tr>
<td>Body mass index, $\text{kg/m}^2$</td>
</tr>
<tr>
<td>$&lt;25$</td>
</tr>
<tr>
<td>$\geq 25$</td>
</tr>
</tbody>
</table>

*(Circulation. 2003;107:1110-1116.)*
Exercise doses: equi-potent for health benefits... the “weekend warrior”?

- 6 x 30 min x 10 kcal/min
- 2 x 180 min x 5 kcal/min
- 18 x 10 min x 10 kcal/min
- 3 x 60 x 10 kcal/min
Accumulating activity

“short bursts” of PA versus continuous aerobic activity?

- DeBusk; Am J Cardiol 1990:1010
- cardiovascular training effects of short duration (<10 mins) activity
- short bout group showed greater adherence
- increases in VO2 max similar in both groups
Hope for the “weekend warrior”?

“Weekend warriors” accumulate > kcal/wk in 1 or 2 sessions, compared to insufficiently active 500-100 kcal/wk or regularly active > 1000 kcal/wk, 3 or more x week)

(Lee et al., Am J Epidemiol 2004; 160(7): 636-641)
Sitting Time and Mortality from All Causes, Cardiovascular Disease, and Cancer.
Katzmarzyk PT, Church TS, Craig CL, Bouchard C. Med Sci Sports Exerc. 2009 Apr 3

The diagram shows the hazard ratio of all-cause mortality in Canadian cohort for different sitting times. The x-axis represents sitting time, and the y-axis represents the hazard ratio. The hazard ratio increases as the sitting time increases from "Almost none of the time" to "Almost all the time".
Overview of the Health benefits of physical activity

Physical Activity

- mood, anxiety, QOL, depression, social benefits, mental health

Other possible health benefits
- prostate Ca.
- lung disease
- arthritis

Diabetes
- Colon cancer
- Breast cancer
- Osteoporosis

BMI
BP
Cholesterol

Stroke, other CVD

CHD

Slide courtesy of Professor A. Berman
Other benefits of physical activity

- Fun and Friendship
- Sustainable communities
- Economic development
- Quality of Life
- Independent Living
- Social capital
- Community Wellbeing
- Peace / Development
- Educational achievement
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Do we know enough?
Common forces, competing health agenda & DPAS prioritisation in developing countries:

- Double burden of infectious & chronic disease;
- Double burden of under- & over-nutrition;
- Impact of obesity epidemic on chronic disease morbidity;
- High-risk behaviours, sedentary lifestyles and high prevalence of tobacco use;
- Problems of health equity (chronic diseases are not diseases of affluence)

(Source: NFCS; Steyn et al. 2005)

(Prevalence (% of children ages 1-8 yrs)

(Murray and Lopez 1997)

(Source: NFCS; Steyn et al. 2005)

(Prevalence of obesity (BMI >30) in adult women %

(http://www.iotf.org/media/globalprev.htm)
Physical inactivity STEPS surveillance
AFRO region: available data – women

(Guthold et al., AJPM 34: 2008)

Figure 2. Prevalence of physical inactivity for women in 51 countries, grouped by WHO region, World Health Survey, 2002–2003. Age-adjusted to WHO standard population.
Physical inactivity STEPS surveillance
AFRO region: available data – men
(Guthold et al., AJPM 34: 2008)
Physical activity: importance of domains for health promotion (example SADHS 2003)

<table>
<thead>
<tr>
<th>Age</th>
<th>% work</th>
<th>% leisure</th>
<th>% transport</th>
<th>% total Physical Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>10.3</td>
<td>76.4</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>25-34</td>
<td>37.9</td>
<td>46.9</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td>45.9</td>
<td>34.5</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>42.5</td>
<td>31.1</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>43.8</td>
<td>27.8</td>
<td>28.4</td>
<td></td>
</tr>
<tr>
<td>65+</td>
<td>37.8</td>
<td>22.3</td>
<td>39.9</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>37.2</td>
<td>33.1</td>
<td>29.7</td>
<td></td>
</tr>
<tr>
<td>Grades 1-5</td>
<td>40.6</td>
<td>36.7</td>
<td>22.7</td>
<td></td>
</tr>
<tr>
<td>Grades 6-7</td>
<td>38.7</td>
<td>43.5</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Grades 8-11</td>
<td>24.8</td>
<td>59.2</td>
<td>16.1</td>
<td></td>
</tr>
<tr>
<td>Grade 12</td>
<td>31.5</td>
<td>52.6</td>
<td>15.9</td>
<td></td>
</tr>
<tr>
<td>Higher</td>
<td>9.8</td>
<td>69.9</td>
<td>20.3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>28.7</td>
<td>53.4</td>
<td>17.9</td>
<td></td>
</tr>
</tbody>
</table>
Physical activity and nutrition: obesity in Africa

Hypertension, Diabetes & Obesity in relation to physical activity in Cameroon

Urban Prevalence of Diabetes & Obesity in Cameroon


<table>
<thead>
<tr>
<th>City</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yaounde</td>
<td>5.96</td>
<td>4.94</td>
</tr>
<tr>
<td>Douala</td>
<td>9.38</td>
<td>9.5</td>
</tr>
<tr>
<td>Bamenda</td>
<td>5.72</td>
<td>4.61</td>
</tr>
<tr>
<td>Garoua</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>5.8</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Physical inactivity high: at work 70% of adults, and 90% during leisure time.
Further evidence for association...

**Physical Inactivity Is the Major Determinant of Obesity in Black Women in the North West Province, South Africa: The THUSA Study**

H. Salome Kruger, PhD, Christina S. Venter, DSc, Hester H. Vorster, DSc, and Barrie M. Margetts, PhD

*From the School of Physiology, Nutrition and Consumer Science, Potchefstroom University for CHE, Potchefstroom, South Africa; and the Institute of Human Nutrition, University of Southampton, Southampton General Hospital, Southampton, United Kingdom*

<table>
<thead>
<tr>
<th>Age group*</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (25–34 y)</td>
<td>1.12</td>
<td>0.44</td>
<td>0.01</td>
<td>3.08</td>
<td>1.30</td>
</tr>
<tr>
<td>3 (35–44 y)</td>
<td>1.93</td>
<td>0.46</td>
<td>&lt;0.0001</td>
<td>6.90</td>
<td>2.82</td>
</tr>
<tr>
<td>4 (45–54 y)</td>
<td>2.07</td>
<td>0.50</td>
<td>&lt;0.0001</td>
<td>7.91</td>
<td>2.97</td>
</tr>
<tr>
<td>5 (55+ y)</td>
<td>1.98</td>
<td>0.52</td>
<td>&lt;0.0001</td>
<td>7.22</td>
<td>2.59</td>
</tr>
<tr>
<td>Household income</td>
<td>0.397</td>
<td>0.114</td>
<td>0.001</td>
<td>1.49</td>
<td>1.19</td>
</tr>
<tr>
<td>Physical activity†</td>
<td></td>
<td></td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle third</td>
<td>−0.66</td>
<td>0.26</td>
<td>0.01</td>
<td>0.52</td>
<td>0.31</td>
</tr>
<tr>
<td>Top third</td>
<td>−0.973</td>
<td>0.28</td>
<td>0.001</td>
<td>0.38</td>
<td>0.22</td>
</tr>
</tbody>
</table>

*Note: Table values indicate statistical significance.*
WHO estimates that about 2 million deaths are attributable to physical inactivity worldwide, every year

World Health Report 2002
### Comparative risk assessment for all-cause mortality in South Africa 2000

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Deaths</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsafe sex/STI’s</td>
<td>26.3</td>
<td>1</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>9.0</td>
<td>2</td>
</tr>
<tr>
<td>Tobacco smoking</td>
<td>8.5</td>
<td>3</td>
</tr>
<tr>
<td>Alcohol harm</td>
<td>7.1</td>
<td>4</td>
</tr>
<tr>
<td>High BMI</td>
<td>7.0</td>
<td>5</td>
</tr>
<tr>
<td>Interpersonal violence</td>
<td>6.7</td>
<td>6</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>4.6</td>
<td>7</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4.3</td>
<td>8</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td>3.3</td>
<td>9</td>
</tr>
<tr>
<td>Low fruit &amp; veg intake</td>
<td>3.2</td>
<td>10</td>
</tr>
</tbody>
</table>

(Norman et al., SAMJ 97: 637-641, 2007)
Estimating the ‘burden’ attributable to insufficient levels of physical activity:

**Attributable fraction:**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Coronary Heart Disease</th>
<th>Breast Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 - 44</td>
<td>0.12</td>
<td>0.18</td>
</tr>
<tr>
<td>45 - 59</td>
<td>0.14</td>
<td>0.20</td>
</tr>
<tr>
<td>60 - 69</td>
<td>0.16</td>
<td>0.20</td>
</tr>
<tr>
<td>70 - 79</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>80+</td>
<td>0.20</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Between 10-12% of all pre-mature mortality (DALYs) may be attributed to insufficient levels of physical activity in adult South Africans

(Lambert EV, Joubert JD, Norman R, Estimating the burden of physical inactivity in South Africa, in preparation)
Physical activity domains: developed & developing countries

Generic Schema

Example 1 – developed country

Example 2 – developing country
Human-powered transport: an economic imperative for Africa?

Non-Motorised Transport and its socio-economic impact on poor households in Africa
Cost-benefit analysis of bicycle ownership in rural Uganda

Results of an empirical case study in cooperation with FABIO/BSPW (Jinja, Uganda)

Jürgen Heyen-Perschon
Hamburg 2001

Impresses health and may prevent non-communicable disease?
Bicycle in a rural Ugandan household will...

1. Substantially more frequent visits to markets and medical facilities.
2. 23% fewer journeys to carry out domestic tasks.
3. Even regional destinations up to 40 km away are within reach.
4. A saving of almost 2 hours in transport time per day.
5. Relieving the housewife of 46% of all of her transport loads.
7. A 35% higher income from selling harvest products on external markets.
8. Diversification of the composition of domestic income as a result of taking up new, non-agricultural work activities.
9. Not least, a substantial increase in family income.

Jürgen Heyen-Perschon
Bicycle sales in Africa increase dramatically when governments eliminates import tariffs (9.5 per 1000 persons to 16.4 per 1000 in Kenya) in just one year from 2001-2002.

(ITDP Sustainable Transport vol 17, Winter 2006)
Bicycles improving health care delivery in Africa!

“An increasing number of health care service providers are turning to bicycles as growing part of their health care service delivery…”
(Sustainable Transport Autumn 2006, V16, ITDP)

ITDP donated 130 bicycles to health NGO’s in South Africa, Ghana, Senegal & Kenya;

- South African hospice workers saw 15 x patients than on foot
- Youth Against Aids workers in Ghana reached 50% more beneficiaries
- Health workers in Senegal saved nearly 60% time travelling between patients;
- Transport costs for these agencies were also reduced.
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• Determinants & Barriers to Physical Activity
• “The evidence from developing countries seems similar to developed countries

• Given the burden of NCDs globally, its time for taking physical inactivity seriously as a global cardiovascular risk factor

• The Global strategy on Diet and Physical Activity provides a framework for national action…”
"...begin with the end in mind..."

“Think about PA measurement as a health promoter, but measure it like an epidemiologist or psychometrician” Adrian Bauman ICPAPH 2006

Why?

- prevalence rates in populations
- monitor secular trends
- correlates & determinants
- effectiveness of interventions (evaluation)
- relative risk estimates (dose-response)
- energy requirement/expenditure
- exercise Rx adherence...
“...begin with the end in mind...”

“Think about PA measurement as a health promoter, but measure it like an epidemiologist or psychometrician” Adrian Bauman ICPAPH 2006

**What can be measured or derived?**

<table>
<thead>
<tr>
<th>Domains</th>
<th>Types</th>
<th>Properties</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>HEPA</td>
<td>Frequency</td>
<td>Continuum (METhrs/wk)</td>
</tr>
<tr>
<td>Discretionary</td>
<td>Non-HEPA</td>
<td>Duration</td>
<td>Prevalence%</td>
</tr>
<tr>
<td>Transport</td>
<td>Sedentary</td>
<td>Absolute/Relative EE</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Household</td>
<td></td>
<td>Patterns/regularity</td>
<td>Quintiles, etc.</td>
</tr>
</tbody>
</table>

And... Physical activity or energy expenditure?

Must be measured
“Think about PA measurement as a health promoter, but measure it like an epidemiologist or psychometrician” Adrian Bauman ICPAPH 2006

Who?

- Population at large (demographic and health surveys);
- Sub-populations within communities;
- Various stages of lifecourse;
- Vulnerable groups and cohorts;
- Individuals undergoing interventions;
- Patient groups;
“...begin with the end in mind...”

How?

1. Reliable
2. Valid
3. Responsive (tracks)
4. Acceptable
5. Feasible (cost)
6. Respondent burden
7. Patterns of activity

Practicality

Subjective

Global Self Report
Activity Logs
Diaries
Direct observation
Motion Sensors
HR Monitors
Doubly Labelled Water
Calorimetry

Objective

Accuracy
Definition of ‘moderate’ & ‘vigorous’ activity:

**Moderate PA**
- “Activities that cause you to be a little out of breath, puff and pant but able to speak, cause light sweating, and your heart to beat faster…”
- Equivalent to:
  - 4.8-6.4 km/h or
  - 3-6 METS

**Vigorous PA**
- “Activities that cause you to be out of breath, have difficulty talking, causes your heart to pound, heavy sweating…”
- Equivalent to:
  - > 6.4 km/h or
  - > 6 METS

(Bohlmann et al., MSSE 2001; 33 (5, Suppl): S119).
# Global Physical activity Questionnaire

Questions assessing different types of physical activity undertaken in 3 domains (plus sitting):

- **“work”**
  - Vigorous
  - Moderate
  - # days in a typical week
  - Duration on a typical day

- **transport**
  - Cycling & Walking
  - # days in a typical week
  - Duration on a typical day

- **sport, recreation, leisure**
  - Vigorous
  - Moderate
  - # days in a typical week
  - Duration on a typical day

- **sedentary**
  - Sitting
  - Time spent sitting on a typical day
## Global Physical Activity Questionnaire:
### Work domain

<table>
<thead>
<tr>
<th>Questions</th>
<th>Response</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity at work</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] for at least 10 minutes continuously? &lt;br&gt;[Activity is regarded as vigorous intensity if they cause a large increase in breathing or heart rate] &lt;br&gt;<em>(INSERT EXAMPLES</em> [USE SHOWCARD])</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>If No, go to P4</td>
<td></td>
</tr>
<tr>
<td>2. In a typical week, on how many days do you do vigorous-intensity activities as part of your work? &lt;br&gt;&quot;Typical week&quot; means a week when a person is doing vigorous-intensity activities and not an average over a period. &lt;br&gt;Valid responses range from 1-7.</td>
<td>Number of days</td>
<td></td>
</tr>
<tr>
<td>3. How much time do you spend doing vigorous-intensity activities at work on a typical day? &lt;br&gt;Think of one day you can recall easily. Consider only those activities undertaken continuously for 10 minutes or more. &lt;br&gt;Probe very high responses (over 4 hrs) to verify</td>
<td>Hours : minutes : ___ hrs : ___ mins</td>
<td></td>
</tr>
<tr>
<td>4. Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously? &lt;br&gt;[Activity is regarded as moderate intensity if they cause a small increase in breathing or heart rate] &lt;br&gt;<em>(INSERT EXAMPLES</em> [USE SHOWCARD])</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>If No, go to P7</td>
<td></td>
</tr>
<tr>
<td>5. In a typical week, on how many days do you do moderate-intensity activities as part of your work? &lt;br&gt;Valid responses range from 1-7.</td>
<td>Number of days</td>
<td></td>
</tr>
<tr>
<td>6. How much time do you spend doing moderate-intensity activities at work on a typical day? &lt;br&gt;Think of one day you can recall easily. Consider only those activities undertaken continuously for 10 minutes or more. &lt;br&gt;Probe very high responses (over 4 hrs) to verify</td>
<td>Hours : minutes : ___ hrs : ___ mins</td>
<td></td>
</tr>
</tbody>
</table>
## Global Physical Activity Questionnaire:

### Transport domain

The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. [insert other examples if needed]

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>If No, go to P 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?</td>
<td>1</td>
<td>2</td>
<td>P7</td>
</tr>
<tr>
<td>In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?</td>
<td>Number of days</td>
<td></td>
<td>P8</td>
</tr>
<tr>
<td>How much time do you spend walking or bicycling for travel on a typical day?</td>
<td>Hours : minutes</td>
<td>hrs mins</td>
<td>Pg (a-b)</td>
</tr>
</tbody>
</table>

### Sedentary behaviour

The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent [sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television], but do not include time spent sleeping. [INSERT EXAMPLES] [USE SHOWCARD]

<table>
<thead>
<tr>
<th>Question</th>
<th>Hours : minutes</th>
<th>hrs mins</th>
<th>P16 (a-b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much time do you usually spend sitting or reclining on a typical day?</td>
<td></td>
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</tr>
</tbody>
</table>
Global Physical Activity Questionnaire: Leisure or Discretionary time

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like running or football for at least 10 minutes continuously?</td>
<td>Yes</td>
<td>No 2</td>
<td>P10</td>
</tr>
<tr>
<td>Activities are regarded as vigorous-intensity if they cause a large increase in breathing and/or heart rate.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?</td>
<td>Number of days</td>
<td>P11</td>
<td></td>
</tr>
<tr>
<td>Valid responses range from 1-7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?</td>
<td>Hours: minutes</td>
<td>P12</td>
<td></td>
</tr>
<tr>
<td>Think of one day you can recall easily. Consider the total amount of time doing vigorous recreational activities for periods of 10 minutes or more. Probes vary high responses (over 4 hrs).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, cycling, swimming, volleyball for at least 10 minutes continuously?</td>
<td>Yes</td>
<td>No 2</td>
<td>P13</td>
</tr>
<tr>
<td>Activities are regarded as moderate-intensity if they cause a small increase in breathing and/or heart rate.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?</td>
<td>Number of days</td>
<td>P14</td>
<td></td>
</tr>
<tr>
<td>Valid responses range from 1-7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?</td>
<td>Hours: minutes</td>
<td>P15</td>
<td></td>
</tr>
<tr>
<td>Think of one day you can recall easily. Consider the total amount of time doing moderate recreational activities for periods of 10 minutes or more. Probes vary high responses (over 4 hrs).</td>
<td></td>
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</tr>
</tbody>
</table>
Show cards: Bangladesh

Show cards: Indonesia

Show cards: Taiwan

Show cards: South Africa
Understanding self-reported physical activity levels

South African Demographic and Health Survey - GPAQ 2003 Physical Activity (N=6909 adults 15-64 yrs) (Preliminary report, DOH)

- Men
- Women

Prevalence (%)

- Inactive
- Minimally active
- Sufficiently active

>150 min of health enhancing (> 600 MET/min/wk)
Physical activity - urban and non-urban

South African Demographic and Health Survey (N = 6909):

- Urban Men
- Non-Urban Men
- Urban Women
- Non-Urban Women

Prevalence (%)
**SECTION 1 & 2: OCCUPATIONAL ACTIVITIES; WALKING/CYCLING TO WORK (PAST YEAR)**

<table>
<thead>
<tr>
<th>Job name</th>
<th>code</th>
<th>Date at start and finish (mm/yy)</th>
<th>months held</th>
<th>cycle to work</th>
<th>walk to work (min/day)</th>
<th>Job schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>start</td>
<td>finish</td>
<td>min/day</td>
<td>slow pace</td>
<td>brisk pace</td>
</tr>
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</tbody>
</table>

**SECTION 3: LEISURE-TIME ACTIVITIES**

In the table below, check all activities the subject did at least 6 times over the past year. Do not include activities related to his/her job.

<p>| | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Housework</td>
<td>12</td>
<td>Painting</td>
<td>23</td>
<td>Aerobic dancing</td>
<td>34</td>
<td>Table Tennis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Needle work</td>
<td>13</td>
<td>Construction work</td>
<td>24</td>
<td>Swimming</td>
<td>36</td>
<td>Cycling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hair dressing</td>
<td>14</td>
<td>Hunting</td>
<td>25</td>
<td>Leisure walking</td>
<td>36</td>
<td>Horse riding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Home repairs</td>
<td>15</td>
<td>Fishing</td>
<td>26</td>
<td>Jogging</td>
<td>37</td>
<td>Classical dance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gardening (around the house)</td>
<td>16</td>
<td>Teaching (at home)</td>
<td>27</td>
<td>Gymnastic</td>
<td>38</td>
<td>Light traditional dance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Light farming</td>
<td>17</td>
<td>Reading/Writing</td>
<td>28</td>
<td>Karate/Wrestling</td>
<td>39</td>
<td>Vigorous traditional dance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Intense farming</td>
<td>18</td>
<td>Type writing/computer work</td>
<td>29</td>
<td>Football</td>
<td>40</td>
<td>Sexual intercourse</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>Wood splitting</td>
<td>19</td>
<td>Video game</td>
<td>30</td>
<td>Handball</td>
<td>41</td>
<td>Playing music</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Animal rearing</td>
<td>20</td>
<td>Indoor games</td>
<td>31</td>
<td>Basketball</td>
<td>42</td>
<td>Singing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Driving</td>
<td>21</td>
<td>Cinema/Video/TV watching</td>
<td>32</td>
<td>Volleyball</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>Carpentry</td>
<td>22</td>
<td>Discussions (meetings)</td>
<td>33</td>
<td>Lawn Tennis</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
**Sub-Saharan Physical activity questionnaire:**

2.1 **PAST YEAR**  
Write down the number of sessions per week, the number of months per year, and the mean duration of a session for each activity performed over the past year.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Code</th>
<th>Month/year</th>
<th>Sessions/wk</th>
<th>Min./session</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

2.2. **PAST MONTH**  
Write down the number of sessions over the past month and the mean duration of a session for each activity performed during this period of time.

<table>
<thead>
<tr>
<th>Sessions/week</th>
<th>Min./Session</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**SECTION 4: PERSONAL EVALUATION OF PHYSICAL ACTIVITY**

- How would you describe your physical activity for the past year?
  - intense [ ]  moderate [ ]  light [ ]  null [ ]
- Would you like to do more, less, the same, or doesn't know?
  - More [ ]  Less [ ]  The same [ ]  Doesn't know [ ]
Pedometers

Disadvantages

- Insensitive to some forms of PA (e.g., swimming, cycling)
- No data on frequency, intensity, duration of PA
- Step counts influenced by body size and speed of locomotion

Advantages

- Lower cost objective measure
- Total volume of PA
- Useful for detecting change
Average number of steps per day?

**Children**
- UK: 12000-16000 (Rowlands et al., 1999)
- US: 10 661-13 872
- Australia: 11 221-15 023
- Sweden: 12 0411-18 346 (Vincent et al., 2003)

**Adults**
- = 6000 – 7000 steps/day (not including structured/planned PA) (Tutor-Locke & Bassey, 2004)

**Older adults**
- = 3500 – 5500 steps/day
- 6000 steps/day (not including structured PA) (Tutor-Locke & Myers, 2001)
Steps in rural RSA and risk for obesity:

Adjusting for age, motor vehicle access, education, tobacco use and co-morbidities, BMI decreased 1.4 kg.m\(^{-2}\) per 5000 steps.day\(^{-1}\) (p = 0.035), and compared to sedentarism the risk of obesity (BMI >30 kg.m\(^{-2}\)) was 52% lower for 10000 steps.day\(^{-1}\) (p = 0.028).

Objective measurement of PA in rural setting- how are steps accumulated?

<table>
<thead>
<tr>
<th>Hour</th>
<th>Steps/hour Mean SE</th>
<th>Steps/min Mean</th>
<th>Sedentary 0&lt;cts&lt;100</th>
<th>Light 100&lt;=cts&lt;760</th>
<th>Moderate-1 760&lt;=cts&lt;1952</th>
<th>Moderate-2+Vig cts&gt;=1952</th>
<th>Total</th>
<th>% Total</th>
<th>Mean</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>06:00</td>
<td>842 23</td>
<td>14</td>
<td>30</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>56</td>
<td>52.1</td>
<td>31</td>
<td>3</td>
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<tr>
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<td>19</td>
<td>24</td>
<td>15</td>
<td>15</td>
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<td>16</td>
<td>4</td>
<td>60</td>
<td>17.8</td>
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<tr>
<td>09:00</td>
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<td>19</td>
<td>25</td>
<td>17</td>
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<td>59</td>
<td>17.8</td>
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<td>10:00</td>
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<td>17</td>
<td>28</td>
<td>17</td>
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<td>3</td>
<td>60</td>
<td>17.8</td>
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<td>2</td>
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<td>12:00</td>
<td>924 22</td>
<td>15</td>
<td>30</td>
<td>16</td>
<td>12</td>
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<td>59</td>
<td>17.8</td>
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<td>13</td>
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<td>14</td>
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<td>3</td>
<td>59</td>
<td>17.8</td>
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<td>14:00</td>
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<td>13</td>
<td>33</td>
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<td>3</td>
<td>59</td>
<td>17.8</td>
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<td>14</td>
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<td>2</td>
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<td>16:00</td>
<td>890 22</td>
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<td>32</td>
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<td>3</td>
<td>59</td>
<td>17.8</td>
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<td>17:00</td>
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<td>2</td>
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<td>17.8</td>
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<td>2</td>
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<tr>
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<td>6</td>
<td>44</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>59</td>
<td>17.8</td>
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</thead>
<tbody>
<tr>
<td>Total</td>
<td>460</td>
<td>221</td>
<td>157</td>
<td>45</td>
<td>883</td>
<td></td>
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<td>100.0</td>
<td>100</td>
</tr>
<tr>
<td>% Total</td>
<td>52.1</td>
<td>25.1</td>
<td>17.8</td>
<td></td>
<td></td>
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</tbody>
</table>
Physical activity/inactivity measurement in Africa: some questions

Table 1. Unadjusted sex-specific descriptive statistics for anthropometric, pedometry and demographic variables

<table>
<thead>
<tr>
<th>Descriptive variables</th>
<th>Male (n = 273)</th>
<th>Female (n = 516)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>28.4 (17.6)</td>
<td>40.5 (20.9)</td>
</tr>
<tr>
<td>Age distribution (quartiles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.7 – 18.4 yrs</td>
<td>38.1 (104)</td>
<td>18.0 (93)</td>
</tr>
<tr>
<td>18.5 – 28.8 yrs</td>
<td>31.5 (86)</td>
<td>21.7 (112)</td>
</tr>
<tr>
<td>28.9 – 51.2 yrs</td>
<td>18.3 (50)</td>
<td>28.5 (147)</td>
</tr>
<tr>
<td>51.3 – 95.7 yrs</td>
<td>12.1 (33)</td>
<td>31.8 (164)</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>59.4 (12.0)</td>
<td>66.5 (16.2)</td>
</tr>
<tr>
<td>Stature (cm)</td>
<td>167.2 (9.2)</td>
<td>158.5 (7.9)</td>
</tr>
<tr>
<td>Body-mass-index (kg.m⁻²)</td>
<td>21.2 (4.0)</td>
<td>26.5 (6.4)</td>
</tr>
</tbody>
</table>

Obesity

Waist circumference (cm)

Average steps.day⁻¹

Village

SOUTH AFRICAN PREVALENCES FOR PHYSICAL ACTIVITY/INACTIVITY (WHHS, 2002-2003; DDHSS, 2005-2007)

- Inactive
- Minimally active
- Active

Prevalence (%)

Urban (n = 1231) Rural (n = 797) All (n = 2028) Rural (n = 789)

IPAQ (SA WHHS) Pedometer (DDHSS)

Demographic and Measurement type category
Using objective measures: motion sensors or pedometers

- Small, unobtrusive devise worn on the hip in line with the knee by attaching to belt/waistband (R100 each).

- Assesses motion by counting steps
  - Mechanical device - vertical movement (up/down motion) deflects a lever arm, one step is recorded for each deflection.

- Some also measure distance and calories but with questionable validity.

- Output = steps/day
“...you’ve got means, motive and opportunity...”

Measure other potential correlates, effect modifiers, and confounders...

- Physical environment for PA
- Inter- and intra-personal (age, religion, education)
- Social norms
- Upstream policy environment, etc.
Overview of presentation:

- Definition/s of physical activity/inactivity
- Evidence: health benefits of physical activity
- Evidence in the developing world
- Begin with the end in mind…indicators
- Measurement of physical activity/inactivity
- Determinants & Barriers to Physical Activity

What do we need to know to intervene?
Socio-ecological model for behaviour change to prevent NCD’s

‘Social Ecology - the study of the influence of the social context on behavior, including institutional and cultural variables.’ (Sallis & Owen, 2002)
Barriers to physical activity in individuals

Barriers to participation in leisure-time physical activity for insufficiently active respondents (by age group)

Example: UK 199
Prevalence of inactivity in Africa linked to economic indicators and obesity

Prevalence of inactivity in African countries undertaking surveillance is associated with higher GNI (pp) and higher prevalence of obesity (BMI > 30 kg/m²)

(data derived from WHO and World Bank websites)
Obesity & poverty in Gambia: photoessay

Food preparation in rural home after day’s working the fields; communal eating

Preparation of day’s catch in urban women, “fast food” rich in fats and oils, and large portion sizes
Childhood undernutrition co-exists with maternal overweight; women bear the majority of obesity-related morbidity.

Women eat a lot to be “strong” for their work; these young adolescent girls are now expressing some concern at being referred to as “fat”.
I have high blood pressure. I’ve never been to the doctor but I know.

Day after day if there’s food I’ll eat it. I want to maintain my weight because it doesn’t disturb me. I feel better than thin women, I feel sorry for them. My babies have always been big and healthy.

I’d like to halve my weight.
Lay health beliefs and their impact on the prevention and control of diabetes in four urban areas of Cameroon

**Increasing prevalence & worsening control**

- Lack of monitoring of weight
- Fatalism about obesity
- Obesity associated with affluence and authority – ‘good living’ in men
- Poor knowledge about composition of balanced diet
- Only gross obesity seen as problematic
- Diabetes mainly caused by excessive sugar intake, and can be prevented with bitter drinks
- Culture of lay management delays presentation to medical facilities
- Poverty limits use of medical facilities
- Medical facilities viewed as best place for treatment

**Increasing overweight and obesity**

- Physical inactivity not linked to causation of diabetes
- Barriers to healthy diet – poverty and seasonal availability of fruits
- Lack of time for physical activity
- Negative perceptions of walking as physical activity
- Poor infrastructure

**Increasing physical inactivity**

**Diabetes Prevalence**

**Diabetes Control**

**Decreasing prevalence & improving control**

- Positive view of physical activity, especially through sport
Physical activity and obesity: issues regarding culture and gender (RSA)

“Living in urban areas means we are much less active than before…”

“A woman needs big arms to cook a big pot of food…”

“Xhosa women are not allowed to wear sports outfits and exercise in public…”

“There are no facilities, time or money enough to exercise…”

“If a fat person loses weight, they are considered “thin, even if still overweight by Western standards…”

“being thin is associated with being unhappy or ill”

“I was meant to be big…”

Physical activity: barriers including the built environment (can we extrapolate from Global North?)

Domains of activity amenable to environmental interventions

Walking / cycling for transport and recreation

= Increased total Physical Activity

Built environment attributes are related to physical activity patterns.

Active transport and recreation are influenced differently.
Active Transport

Walking for **recreation** influenced by:
- Access
- Aesthetics

Walking for **transport** influenced by:
- Ease of pedestrian access
- Urban planning
Environmental Barriers

Physical Barriers

Factor

Climate/Season
Lack of time
Easy Access
Home equipment

Influence

Negative
Negative
Positive
Unknown

Geography
Economics
Safety

Pollution
Crime
Perception!
Neighborhood Walkability

Methods:
- Walkability Index
- Calculated at district level
- Four environmental attributes:
  - Dwelling density
  - Street connectivity
  - Land use mix
  - Net retail area

Score:
1 = low walkability; 10 = high walkability

Scores: 4 - 40

Owen et al., 2007 Am J Prev Med
Environmental barriers to physical activity may be, in part, a matter of perspective...

Studies have found mismatches between objectively measured environmental constructs and perceived environmental determinants; need to multivariate adjustment or category level analysis and triangulation of data in new settings.
Traffic barriers to physical activity

Mean maximal unloaded walking speed in senior adult South Africans is equal to 1.36 m/sec; loaded walking speed was 0.73 m/sec; Mean walking speed required to cross at 4 road crossings was 0.86 m/sec; Over 50% felt that there was not sufficient time to cross at the robot; Nearly 45% felt apprehension; 17% anxiety and over 10% felt fear when crossing.


http://www.youtube.com/watch?v=pfgAv-vh9YU
Measurement tools for environmental determinants for PA...examples

- IPAQ Environmental module
- NEWS and NEWS-A
- NQLS1 and NQLS2
- SPACES
- Land use audit checklist
- GIS
International Prevalence Study - Environmental module

1. What is the rua type?
   - Detached
   - Townhouse
   - Mix of rental types
   - Apartment
   - Do not know

2. Many stores at a distance of my home:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Do not apply
   - Do not know

3. Is it within 10 min walking distance of my home?
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Do not know

4. There are sidewalks:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Do not know

5. There are facilities to separate paths or trails that you:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Do not know

6. My neighborhood has walking trails, bike paths, etc. Would you say that y:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Do not know

7. The crime rate in my say that you:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Do not know

10. There are (i): you say you:
    - Strongly disagree
    - Somewhat disagree
    - Somewhat agree
    - Strongly agree
    - Don't know

11. How many of your household:
    - Motor
    - Don't know

14. Places for bicycling (such as bike paths) in and around my neighborhood are well maintained and not obstructed. Would you say that you:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Don't know

15. There is so much traffic on the streets that it makes it difficult or unpleasant to ride a bicycle in my neighborhood. Would you say that you:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Don't know

17. There are many places to go within easy walking distance of my home. Would you say that you:
   - Strongly disagree
   - Somewhat disagree
   - Somewhat agree
   - Strongly agree
   - Don't know
IPS Environmental module: test-retest reliability in Nigeria

Constructs:

- Aesthetic: (ICC = 0.91, 95% CI = 0.86 – 0.94),
- Safety from crime during the day (neighborhood safety): (ICC = 0.43, 95% CI = 0.26 – 0.57).
- Neighborhood infrastructures: (ICC = 0.66 – 0.88)
- Access to destination items: (ICC = 0.49 – 0.74),
- Social environment: (ICC = 0.62) and
- Street connectivity: (ICC = 0.78).

(Oyeyemi, IJBNPA 2008, 5:38, Sample of 103 university students)
### Environmental Audit tools

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Definition</th>
<th>Example of measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Density and intensity</strong></td>
<td>Amount of activity in a given area</td>
<td>• Persons/jobs per hectare&lt;br&gt;• Commercial floor space vs land space&lt;br&gt;• Distance from house to nearest store&lt;br&gt;• Share of land area for different uses&lt;br&gt;• Retail vs residential ratios</td>
</tr>
<tr>
<td><strong>Land use mix</strong></td>
<td>Proximity of different land uses/destinations</td>
<td>• No. Intersections in a given area&lt;br&gt;• Average block length&lt;br&gt;• Ratio of building height:street width&lt;br&gt;• Average distance: street to buildings&lt;br&gt;• % of ground in shade by afternoon&lt;br&gt;• Graffiti per square area&lt;br&gt;• Rate of decline in density as distance from town increases</td>
</tr>
<tr>
<td><strong>Street connectivity</strong></td>
<td>Directness and alternatives for routes through network</td>
<td></td>
</tr>
<tr>
<td><strong>Street scale</strong></td>
<td>3D space along street bounded by buildings</td>
<td></td>
</tr>
<tr>
<td><strong>Aesthetic qualities</strong></td>
<td>Attractiveness and appeal</td>
<td></td>
</tr>
<tr>
<td><strong>Regional structure</strong></td>
<td>Distribution of activities and transport w/in region</td>
<td></td>
</tr>
</tbody>
</table>

(Handy et al., AM J Prev Med 2002; 23(2S): 64-73)
SPACES environmental audit

9 Domains (67 items)

- Design / Function
- Safety
- Aesthetics
- Destinations
- Facilities / structure
- Walking / cycling surface
- Street network
- Traffic safety
- Personal safety
- Permeability
- Streetscape (furniture)
- Views
- Subjective assessment
Block groups (N=210, 1784 street groups audited) with the highest poverty rates were 21 times more likely to have physical disorder. . . differential investment is likely to influence disparities in rates of physical activity.

Kelly et al., 2007;61;978-983 J Epidemiol Community Health
**SPACES: examples of items on Paths & Traffic**

### A. Path for walking &/or cycling: (only if a path present)

<table>
<thead>
<tr>
<th>2. Type of path:</th>
<th>Side 1</th>
<th>Side 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Go to section B</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>No path</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Footpath</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Shared path – with markings</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Shared path – no markings</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Path location:</th>
<th>Side 1</th>
<th>Side 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next to road</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Within 1m of kerb</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Between 1 &amp; 2m of kerb</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Between 2 &amp; 3m of kerb</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>More than 3m from kerb</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

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<tr>
<th>4. Path material:</th>
<th>Side 1</th>
<th>Side 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous concrete</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Concrete slabs</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Paving bricks</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Grass or sand</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Under repair</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

### 14. Traffic control devices: (tick all applicable)

- Roundabouts
- Speed humps or ramps
- Chicanes, chokers, kerb extensions or lane narrowing
- Traffic signals
- None

### 15. Other routes available:

- Lane
- Access lane through cul-de-sac/no through road
- Path through park
- None

### 16. Type of crossings:

- Zebra or children
- Traffic signals
- Bridge/overpass
- Underpass
- None
Audit Tool for Land Use (Check List)

LAND USE ENVIRONMENT

4. What types of parks and recreation?
   a. Public.
   b. Private.
   c. Other.

TRANSPORTATION

5. Is availability of a:
   a. Parking?
   b. Street.
   c. Sidewalk.
   d. Other.

CONTACT:

6. Are there:
   a. Schools?
   b. Hospitals?
   c. Commercial centers?
   d. Other.

FACILITIES

7. Is availability of:
   a. Tables?
   b. Chairs?
   c. Other.

SOCIAL ENVIRONMENT

8. Are there:
   a. Clubs?
   b. Churches?
   c. Other.

AESTHETICS

9. Are there:
   a. Trees?
   b. Plants?
   c. Other.

SIGNAGE

10. Are there:
    a. Signs?
    b. Other.

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School transport survey: not cycling to school:

(Pretorius and Bester, 2004)
Geographical Information Systems

- Electronic databases
- Often routinely collected data
- Across a variety of government depts and private sector
- Used to build layers of data

Global positioning for surveying community and individual data and nutrition and activity patterns:

- Shops; schools, churches, friends community recreational areas; points of entry to public transport

- Mode of transport, euclidian distance vs road network, # trips, etc.
How you measure (PA) depends on what data you want, who wants it, and the time and resources available!

-Fiona Bull, Loughborough University