Background on “Advancing the Future of Physical Activity Measurement and Guidelines” Project
Pre-conference Think Tank to Advance the Future of Physical Activity Measurement and Guidelines

November 1, 2006
Halifax, N.S.
Think Tank Objectives

• Discuss the nature of PA guidelines, prescriptions and recommendations
• Discuss messaging, delivery, expectations and effectiveness of PA guides
• Share current findings on PA monitoring and surveillance as they relate to the assessment of people meeting PA guidelines
• Provoke detailed discussions on the current state of understanding in this area, including potential benefits or harm of existing PA guidelines
Think Tank Objectives

• Discuss whether certain groups need special guidelines
• Generate potential research projects and collaborations
• Initiate a possible review of Canada’s PA Guides
• Share think tank outcomes with delegates at the CSEP and SCAPPS conference
Physical Activity Guide

Choose a variety of activities from these three groups:

**Physical Activity Improves Health.**

- Endurance
  - 4-7 days a week
  - Continuous activities for your heart, lungs, and circulatory system.

- Flexibility
  - 3-7 days a week
  - Stretching, bending, and stretching activities to keep your muscles elastic and joints mobile.

- Strength
  - 2-4 days a week
  - Activities against resistance to strengthen muscles and bones and improve posture.

**Get Active Your Way, Every Day—For Life!**

Scientists say accumulating 60 minutes of physical activity every day to stay healthy or improve your health. As you progress in moderate activities you can cut down to 30 minutes, 5 days a week. Add up your activities in periods of at least 10 minutes each. Start slowly and build up.

**Time needed depends on effort**

| Very Light Effort | Light Effort | Moderate Effort | Vigorous Effort | Maximum Effort |
|-------------------|-------------|----------------|----------------|--|---|
| 60 minutes 30-60 minutes 20-30 minutes | 60 minutes 30-60 minutes 20-30 minutes | 60 minutes 30-60 minutes 20-30 minutes | 60 minutes 30-60 minutes 20-30 minutes | 60 minutes 30-60 minutes 20-30 minutes |
| Walking | Jogging | Cycling | Swimming | Spinning |
| Reading | Swimming | Running | Tennis | Running |
| Watching TV | Badminton | Playing tennis | Playing basketball | Playing basketball |
| Stretching | Stretching | Stretching | Stretching | Stretching |
| Range needed to stay healthy | Range needed to stay healthy | Range needed to stay healthy | Range needed to stay healthy | Range needed to stay healthy |

**You Can Do It—Getting started is easier than you think!**

Physical activity doesn’t have to be very hard. Build physical activities into your daily routine.

- Walk whenever you can get off the bus early, use the stairs instead of the elevator.
- Reduce inactivity for long periods, like watching TV.
- Get up from the couch and stretch and bend for a few minutes every hour.
- Play actively with your kids.
- Choose to walk, wheel or cycle for short trips.

**Benefits of regular activity**

- Better health
- Improved fitness
- Better posture and balance
- Better resistance
- Weight control
- Stronger muscles and bones
- Lessening the effects of inactivity
- More energy
- Better sleep
- More independence in daily life

**Health risks of inactivity**

- Increased risk of cancer
- Heart disease
- Stroke
- High blood pressure
- Diabetes
- Depression
- Cataracts

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Released in 1999
Canada’s Physical Activity Guides
For Children and Youth (2002)
Is it time to renew or refresh?

- Has our understanding evolved?
  - Revised guidelines for weight management
  - Built environment, community design

- Have our measurements evolved?
  - Direct measurement opportunities

- Have our messages changed?
  - Terminology, graphics, targets

- Have our methods of messaging changed?
  - Pamphlets vs cell phone / computer prompts

- Could uptake be enhanced?
  - Social marketing and communications

- Should physical activity be isolated?
  - Integrated lifestyle guide?
Is it time to renew or refresh?

- Should we have a new suite of guides?
  - Gender-specific
  - Ethnic-specific
  - Prenatal, Pre-school
  - Personalized guides

- Can new measurement technologies be useful adjuncts?
  - Pedometers

- Is our messaging and content up-to-date?
  - How should activity be accumulated to promote health?
  - What is a bout? Does it differ across age?

- Form and format
  - Part of a larger integrated strategy?
  - Collector cards
ACKNOWLEDGEMENTS

This think tank was supported in part through the Canadian Institutes of Health Research – Institute of Nutrition, Metabolism and Diabetes workshop support for research development and knowledge exchange.

The workshop is endorsed by the Canadian Society for Exercise Physiology.

Support was provided by Refreshments Canada and Acadia University.
In the meantime…

- Full Think Tank Report and all presentations on CSEP website (www.csep.ca)
- Funding proposal had been submitted to PHAC and FNIHB
- Funding was approved within a couple days of the Think Tank
- Funding was for the commissioned papers and the research retreat
- Coordinating committee established by CSEP to guide the project
PAMG Project (phase 1) Objectives

- initiate a review of Canada’s PA Guidelines and Guides (adult version now 9 years old; older adult 8 years old; children and youth 5 years old)
- commission a series of background papers to form a foundation of knowledge
- host a research retreat to share current findings on PA monitoring and surveillance as they relate to the assessment of people meeting PA guidelines
- provoke detailed discussions on the current state of understanding in this area, including potential benefits or harm of existing PA guidelines
- generate potential research projects and collaborations
In the meantime...

- Funding proposal had been submitted to PHAC and FNIHB (phase 2)
- Phase 2 funding approved in July, 2007
- BASES involved in similar initiative
- NIH / CDC / President’s Council involved in similar initiative
PHAC Project (phase 2) Objectives

• ensure rigorous review of the commissioned papers through a national and international review process
• share workshop outcomes with delegates at the 2007 CSEP Conference at a special symposium
• publish a Special Issue of *Applied Physiology, Nutrition & Metabolism* (APNM) and *Canadian Journal of Public Health* (CJPH) containing all of the commissioned papers (14 papers – both languages)
• Give scholarly and professional presentations at appropriate conferences and meetings 2007-08
Summary of
“Advancing the Future of Physical Activity Measurement and Guidelines”
Project and Journal Supplement
(14 papers)
Overview of the Papers

- Introduction
- PAG background and development
- PAG for adults
- PAG for older adults
- PAG for children and youth
- PAG for preschool children
- PAG for persons with a disability
- PAG for Aboriginal Peoples
- Has their release had an impact?
- Messaging strategies, expectations and evaluation
- Limitations of physical activity data
- Physical activity and inactivity profiling opportunities
- New frontiers in physical activity assessment
- Summary and future directions
Research that Informs Canada’s Physical Activity Guides: An Introduction
(Tremblay, Shephard, Brawley)

- Review of guidelines think tank
- Commissioned papers and working research retreat (phase 1)
- Publication and dissemination of commissioned papers (phase 2)
- Relevant biological and behavioural outcomes
- Journal supplement content review
- Summary of papers, authors and affiliations
- Definitions of key terms
Canada’s physical activity guides: background, process, and development

(Sharratt and Hearst)

In spite of significant initiatives going back to the Fitness and Amateur Sport Act of 1961,

“...Canadians have yet to adopt regular, systematic physical activity as a cultural norm.”
• 1997 Canadian F-P/T Ministers responsible for sport, physical activity, and recreation approved the development of a national physical activity guide

• 1998 Canada’s Physical Activity Guide to Healthy Active Living

• 1999 Canada’s Physical Activity Guide for Older Adults

• 2002 Canada’s Physical Activity Guide for Children (6-9 years of age)

• 2002 Canada’s Physical Activity Guide for Youth (10-14 years of age)
PROCESS (common to all guides)

- National Advisory Committees, co-chaired by Health Canada and CSEP
- Phase I: preliminary market research
- Phase II: scientific review process
- Phase III: prototype development
- Phase IV: national concept testing
- Pre-launch and launch activities
EVALUATION

• Adult and Older Adult Guides
  - indication of numbers shipped

• Children and Youth Guides
  - the usability and distribution of the four-page Guides (without support resources) as used by an intermediary
  - the usability of the Guide, teacher-support resources and pedometer, by a teacher within a school environment (N=85 schools across Canada)
  - the degree to which the Guide and supplementary materials were used, following their initial use as per evaluation #2 (Survey administered 5 months later).
In developing and publishing the Guides, the Public Health Agency of Canada responded to growing public concern about the prevalence of sedentary living and its alarming health consequences (e.g., heart disease, type 2 diabetes, hypertension and obesity).

These guides have been released in series over five years (1998-2002) and distributed to millions of Canadians of all ages. They are the Public Health Agency of Canada’s most requested resource.
Evidence-Informed Physical Activity Guidelines for Adult Canadians
(Warburton, Katzmarzyk, Rhodes, Shephard)

• An update on the scientific biological and psychosocial bases for Canada’s physical activity guides for healthy active living, with particular reference to the effect of physical activity on the health of adults aged 20-55 years
International Physical Activity Guides

- Moderate-intensity physical activity on most (preferably all) days of the week.
- Equates to a volume of exercise approximately equivalent to 1000 kcal/week (4200 kJ/week) or 150 to 400 kcal/day.
  - Equivalent to a brisk walk or approximately 3-6 METs.
- Recent guidelines also include:
  - Intensities based on relative effort (e.g. perceptions of effort, body temperature, heart rate, and breathing rate).
  - Short bouts of exercise
  - “Every little bit counts, but more is even better – everyone can do it!”
  - Musculoskeletal Fitness
    - At least 2 days/week
Physical Activity Guide to Healthy Active Living

Physical activity improves health.

Every little bit counts, but more is even better – everyone can do it!

Get active your way – build physical activity into your daily life...
- at home
- at school
- at work
- at play
- on the way... that’s active living!

Endurance
- 4-7 days a week
- Continuous activities for your heart, lungs, and circulatory system.

Flexibility
- 3-7 days a week
- Gentle bending, stretching, and stretching activities to keep your muscles and joints flexible.

Strength
- 2-4 days a week
- Activities against resistance to strengthen muscles and bones and improve posture.

Increase Endurance Activities
Increase Flexibility Activities
Increase Strength Activities
Reduce Sitting for Long Periods

You Can Do It – Getting started is easier than you think

Physical activity doesn’t have to be very hard. Build physical activities into your daily routine.
- Walk whenever you can – get off the bus early, use the stairs instead of the elevator.
- Reduce inactivity for long periods, like watching TV.
- Get up from the couch and stretch and bend for a few minutes every hour.
- Play activities with your kids.
- Choose to walk, wheel or cycle for short trips.

Starting slowly is very safe for most people. Not sure? Consult your health professional.

For more information, contact the Canadian Masterpiece of the Canadian Society for Exercise Physiology.

Benefits of regular activity:
- Better health
- Improved fitness
- Better posture and balance
- Better self-esteem
- Weight control
- Stronger muscles and bones
- Feeling more energetic
- Reduced risk of chronic disease
- Increased independence living in later life

Health risks of inactivity:
- Increased risk of death
- Heart disease
- Obesity
- High blood pressure
- Adult-onset diabetes
- Depression
- Stroke
- Cancer
- Stroke
- Cancer

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METHODS

• Evidence-informed document relying on:
  – Major systematic reviews, meta-analyses and consensus statements

• Eight chronic conditions were identified as diseases with the strongest supporting literature:
  – Cardiovascular disease
  – Hypertension
  – Type 2 diabetes
  – Obesity,
  – Colon cancer
  – Breast cancer
  – Depression
  – osteoporosis
THE EVIDENCE

• Active adults have at least a 20-35% reduced risk of premature mortality

• Modest enhancements in physical activity / fitness in previously sedentary individuals have been associated with large improvements in health status

• 40-60% reduction in the incidence of Type 2 diabetes in high-risk individuals over 3-4 years
THE EVIDENCE

• Physical activity reduces the relative risk of colon and breast cancer by 20-40%.
• It appears that moderate intensity exercise is sufficient to lower SBP and DBP.
• Preliminary evidence to indicate that the current physical activity guidelines are sufficient to maintain and improve bone health.
• Habitual physical activity is associated with improved psychological well-being.
THE EVIDENCE

• Obesity
  – It is more “normal” to be overweight or obese than it is to be normal weight
  – Prevention of weight gain
    • 45-60 min of physical activity
  – Long-term weight loss
    • 60-90 min of physical activity
  – Current guidelines may be a prescription for obesity
Why would physical activity / fitness lead to better health outcomes?

• **Routine physical activity has been shown to:**
  – Improve body composition (e.g., reduce abdominal obesity and improve weight control)
  – Enhance lipid lipoprotein profiles (e.g., reduced triglycerides, higher HDL cholesterol, lower LDL:HDL ratios)
  – Improve glucose homeostasis and insulin sensitivity
  – Reduce blood pressure
  – Improve autonomic tone
  – Reduce systemic inflammation
  – Improve coronary blood flow
  – Augment cardiac function
  – Enhance endothelial function
Further Refinement of the Dose Response: Minimal vs. Optimal Levels

Questions
• What is the shape of this curve for the eight conditions identified?
• What minimal change in risk status is considered clinically significant and/or meaningful?
• What is the maximal dose?
• Do we need to create gender-specific and ethnic-specific physical activity goals?

Relative Risk of Chronic Disease

Inactive/Unfit

Active/Fit

High

Low
Evidence-informed recommendations for physical activity in adult Canadians

- The majority of the international PA guidelines support the incorporation of moderate-intensity PA on most (preferably all) days of the week.
- The current Canadian PA guidelines for adults are consistent with international guidelines, expert opinion and literature supporting marked reductions in the risk for varied chronic conditions and premature mortality.
- The prevention of weight gain and the maintenance of weight loss require greater PA levels than the general physical activity recommendations.
- The minimal amount of PA currently advocated may be a prescription for obesity.

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Evidence-informed recommendations for physical activity in adult Canadians

• If the entire Canadian population followed the current physical activity guidelines:
  – Approximately one third of deaths related to coronary artery disease could be prevented
  – Approximately one quarter of deaths related to stroke could be prevented
  – Approximately 20% of deaths related to colon cancer and type 2 diabetes could be prevented
  – Up to 14% of deaths related to breast cancer could be prevented
  – Up to 20% of deaths related to hypertension could be prevented
  – Approximately one quarter of deaths related to osteoporosis could be prevented
Ageing and Physical Activity: Evidence to Develop Exercise Recommendations for Older Adults
(Paterson, Jones, Rice)

- analyze epidemiological and experimental research that contributes to evidence-informed recommendations of physical activity (PA) for healthy, community-dwelling older adults (>65 y)

- determine the amounts and types of PA (or exercise) needed to prevent disease, promote health, and maintain function, and independence into older age
Cardiorespiratory (CR) Decline with Ageing and Loss of Functional Abilities

Ageing is characterized by loss of functional capacity

- in older age thresholds of the requisite fitness are crossed; inability to perform some tasks related to quality of life, mobility, ADLs, … to loss of independence

- with this evidence relating CR fitness of older adults, not to morbidity and mortality, but to functional limitations (impairment) and loss of independence

- improved function and performance would relate to increased CR fitness (rather than the accumulation of PA without gains in fitness)

Stathokostas, Paterson J Appl Physiol 2004
Epidemiology of PA and Older Adults

Epidemiological data:
- *inactivity a major risk factor;* PA and/or CR fitness associated with decreased risk of morbidity and all-cause mortality,
- critical analysis re older adults regarding *dose; amounts and types of PA (or exercise) and/or degree of CR fitness to prevent disease or promote health,* (i.e., improve the odds of remaining healthy)
- and *remain independent* (reduce risk of dependent living)

Blair et al. 1989; Lakka et al., 1994; Ekelund et al. 1988; Lee et al. 1985; Sandvik et al. 1993; Sobolski et al. 1987; Arfaiz et al. 1992; Myers et al. 2004 – older group
CR Fitness, Morbidity and Mortality - Conclusions

Epidemiological data - activities reducing risk: *minimal threshold of required intensity of at least moderate, if not moderately vigorous, and >50% VO$_2$max and in the 60-70% range; intensity of exercise training studies to elicit improvements in CR fitness*

1. Epidemiology - dose of physical activity to reduce “health risk” and increase longevity - requires *increase in CR fitness*
2. In older adults, activities such as *brisk walking will improve CR fitness*
3. Volume (duration, frequency) linear dose-response; *1000 kcal/week associated with 20-30% reduction in RR*

average 45-year old (sample of epidemiological studies) – 41/2 METS is ~ 50% VO2max (threshold) -- older adults (age 65+ years) with a CR fitness of <25 ml/kg.min the term “moderate”, or minimum recommendation of 41/2 METS is 60 - 70% VO2max
Determinants of Independence/Dependence
(Paterson et al., 2004)

- Study first longitudinal follow-up to provide evidence that CR is a critical determinant of dependence/independence in older adults
  1. Lower CR fitness \( (\text{VO}_2\text{max}) \) significantly associated with increased odds of dependent living in the elderly (after controlling for age, disease, gender, and other covariates)

- CR fitness critical determinant of dependence, & functional loss or disability
  2. Given \( \text{VO}_2\text{max} \) for independent lifestyle \(~15 \text{ ml.kg}^{-1}.\text{min}^{-1}\), and age-related decline, at \( >\text{age 78 y} - 1/4 \) at minimum threshold
  3. Relationship of \( \text{VO}_2\text{max} \) with dependency similar to that with morbidity and all-cause mortality (OR = 0.86) i.e., higher \( \text{VO}_2\text{max} \) decreased the odds of subsequent dependence by 14\% for each ml/kg.min, or ~50\% lower in those of above average CR fitness
Determinants of Independence/Dependence

(Paterson et al., 2004)

4. 10% - 20% (~3 - 4 ml.kg-1.min-1) increase in VO$_2$max with exercise training predicts 50% decrease in odds for becoming dependent.

5. PA level was not related to subsequent dependence; no amount of general leisure was beneficial against function decline.

Ferrucci et al. (1999) – “active” life expectancy (from 65 y) increased with moderate and heavy activity (versus low) respectively by 3.3 to 5.7 y; PA reduced the duration of disability prior to death; “compression of morbidity”
Neuromuscular function and age

- **Strength**: age-related decline (muscle mass (fibre number and size) and muscle weakness = sarcopenia); and accelerated decline in older age;
- **Power** – reduction in contractile speed;
- Impinge on function, ADL, disability (especially women);
- Strength (resistance) and power training (regular progressive overload @ 60-80% 1-RM and “variation”) result in “large” improvements; neural changes & muscle adapts even in older age; effective for maintenance of muscle mass and specific muscle group performance (2 or 3 days/week);
- Nevertheless whether training gains in muscle function enhance mobility, and ADL, or improve disability not fully determined and may be limited
- **Balance, mobility important factors in preventing falls**
SUMMARY

CR fitness decline with age: by mid-70s approach thresholds for functional daily activities

- Higher CR fitness is associated with decreased morbidity and all-cause mortality, AND improved odds of remaining independent
- Moderately vigorous exercise, NOT more activities of daily living (“accumulation”) required to improve CR fitness for function, and reduced risk from moderately vigorous activity ~4 ½ METs or 60% VO\(_2\)\(_{\text{max}}\); 1000 kcal/wk (3 hrs brisk walking)
- Improves fitness and is associated with a 20-30% reduction in risk of morbidity, mortality and loss of independence; progression to higher intensity and volume will further increase fitness and achieve a 60% reduction in risk
SUMMARY

With the ageing of society and current sedentary lifestyle

- increase of CR fitness and muscle strengthening exercises are important in prevention of disease, compression of morbidity, and maintenance of function and independence into older age. Adoption of recommended physical activities would reduce these risks by 30 to 50%.

Practical Conclusion:

- Public health initiatives aimed at preserving and or improving CR fitness in the later years provide an important strategy for maintaining independence
- Initiatives to encourage physical activity in older adults should emphasize exercise, such as brisk walking, to maintain or improve CR fitness

“Get Fit for Active Living”
Physical Activity Guidelines for Children and Youth

(Janssen)

• Canada’s first physical activity guidelines for children and youth were introduced in 2002: separate guidelines for children (6-9 years) and youth (10-14 years) were developed.

• Updates the evidence related to the biological and psycho-social health benefits of physical activity in school-aged children and youth since 2002.
Canada’s Physical Activity Guides
For Children and Youth
5 Key Recommendations in Canada’s Physical Activity Guide for Children and Youth

1. *Increase* the time currently spent on physical activity by 30 min/d, and gradually progress to 90 min/d more.

2. Physical activity can be accumulated throughout the day in periods of 5-10 minutes.

3. The increase in physical activity should include 60 minutes of moderate activity and 30 minutes of vigorous activity.

4. Participate in endurance, flexibility, and strength activities.

5. Reduce non-active “screen time” activities. Starting with 30 min/d less and gradually progressing to 90 min/d less.
Physical Activity Guides for Children and Youth Developed in Other Countries and Organizations

• Prior to 1998, physical activity guidelines for children and youth were consistent with physical activity guidelines for adults, and were based on studies conducted in adults.

• Since 1998 most international physical activity guidelines have recommended that children and youth participate in at least 60 minutes of physical activity on a daily basis.
Physical Activity Guides for Children and Youth Developed in Other Countries and Organizations

Evidence-based review of the literature published in 2005 by a CDC sponsored Expert Panel made the following conclusions:

1. **Strong** evidence to conclude that physical activity has beneficial effects on adiposity (within overweight and obese youth), musculoskeletal health and fitness, and several components of cardiovascular health.

2. **Adequate** evidence to conclude that physical activity has beneficial effects on adiposity levels in those with a normal weight, on blood pressure in normotensive youth, on plasma lipid and lipoproteins levels, on non-traditional cardiovascular risk factors, and on several components of mental health.
Dose-Response Relation Between Physical Activity and Health in Children and Youth

- Dose-response studies are particularly useful for determining the minimal and optimal amount of physical activity required for good health and for developing physical activity guidelines.

- The dose-response relation between physical activity has been well studied in adults; however, few studies exist in children and youth.

- The limited evidence suggests more activity is better throughout the entire physical activity range.
Dose-Response Relation Between Physical Activity and Cardiovascular Risk Factors in Children and Youth

L.B. Andersen et al., Lancet 2006;368:299-304

<table>
<thead>
<tr>
<th>Physical Activity (min per day)</th>
<th>Quintile 1</th>
<th>Quintile 2</th>
<th>Quintile 3</th>
<th>Quintile 4</th>
<th>Quintile 5</th>
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<tr>
<td>9-yr-olds</td>
<td>38 ± 20</td>
<td>69 ± 20</td>
<td>92 ± 26</td>
<td>116 ± 32</td>
<td>167 ± 49</td>
</tr>
<tr>
<td>15-yr-olds</td>
<td>34 ± 15</td>
<td>53 ± 24</td>
<td>70 ± 24</td>
<td>88 ± 32</td>
<td>131 ± 47</td>
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Odds Ratios (95% CI) for Clustered Cardiovascular Risk

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Considerations for Canada’s Physical Activity Guidelines for Children and Youth

Numerous positive aspects of Canada’s physical activity guides for children and youth were noted.

- recommend different types of activity (e.g., aerobic, strength)
- include both moderate and vigorous intensity activities
- physical activity can be accumulated in 5-10 minute bouts
- prescribe developmentally appropriate activities
- promote the enjoyable nature of physical activity

Consideration should be given to including a minimal physical activity target of 60 min/d and an optimal physical activity of up to several hours per day.

The lack of physical activity guidelines for pre-school children and 15-19 year olds needs to be addressed.
3 Key Future Research Directions

1. Comprehensive dose-response studies of physical activity and health in the paediatric age group are urgently needed.

2. Need for research to determine whether the volume, intensity, and type of physical activity required for healthy children and youth is appropriate for children and youth with disease, physical disabilities, and mental disabilities.

3. Experimental studies need to be consistent with the types of activities children and youth participate in and their activity patterns.
Physical Activity for Preschool Children: How Much and How?
(Timmons, Naylor, Pfeiffer)

• Alarming trends in childhood obesity even among preschool children

• With increased attention comes the need to identify the amount and type of physical activity appropriate for optimal development of preschool children
BACKGROUND

- Many “adult” diseases originate in early childhood (e.g., obesity, atherosclerosis, osteoporosis); physical inactivity may accelerate their progression.
- Childhood obesity is becoming more prevalent during the preschool years; excess body fat is associated with several co-morbidities that can reduce health-related quality of life.
- Some evidence associates better developed gross motor skills with higher levels of physical activity.
- Current efforts and strategies to promote physical activity in preschoolers do not have scientific backing for the role of enhanced physical activity in improving health in these children.
- The key question for parents and caregivers regarding active living of their preschooler is “How much activity does my child need?”
THE EVIDENCE

• **Physical health:**
  – Increasing existing physical activity levels by ~30 min per day (most studies use sessions of 20 min per day 3× per week) can lead to improved bone properties, motor skills, and aerobic fitness.
  – This approach appears to have little impact on adiposity; more activity may be necessary to prevent excess weight gain.

• **Psychosocial health:**
  – As little as 20 additional min of aerobics-type activity per day may improve aspects of self-esteem.
Correlates of Physical Activity

• **Important correlates of PA in preschool children**
  - the availability of outdoor spaces and time spent outside; more availability and more time = more PA
  - parental interactions and modeling of activity; more interactions = more PA
  - the child’s gender; boys more active than girls
  - Childcare; childcare/preschool characteristics influence PA
  - Cultural differences associated with ethnicity may be important predictors of PA in young children
CONCLUSIONS

• Chronic diseases can begin in early life
• Obesity is becoming more prevalent in preschoolers
• Parents and caregivers want to know how much PA is needed for their preschooler
• The evidence supporting a link between PA and health in preschoolers is VERY weak
• Strong correlates of PA in preschoolers may be targets for PA promotion
Benefits of Physical Activity for People with Physical Disabilities

(Martin Ginis, Hicks)

- Increased cardiovascular fitness
- Increased strength
- Improved quality of life
- Some reductions in symptomatology
Recommendations for the Development of a Guide for People with Disabilities

• Promote HRQL and overall health benefits of activity
• Provide guidelines for a range of activities
• Suggest strategies to overcome key barriers
  – Aspects of the built & natural environments
  – Financial costs of participation
  – Lack of knowledge
  – Psychological barriers
• Indicate cautions and considerations for people with specific types of disabilities
Physical Activity of Aboriginal People in Canada: Issues and Challenges

(Young, Katzmarzyk)

- Oral history and ethnographic observations – overall level of physical activity declining with rapid social and economic changes post WWII

- Dearth of quantitative data on physical activity, despite huge literature on Aboriginal health
EVIDENCE NEEDED

Descriptive:
• Patterns and levels of physical activity
• Prevalence of activity categories
• Regional variation and secular trends

Analytical:
• Correlates (determinants or consequences) of physical inactivity

Experimental/quasi-experimental:
• Description/evaluation of intervention programs/projects
METHODOLOGIC ISSUES

• Cultural environmental context
  – concept of “leisure time” appropriate?
  – “country living”, traditional activities

• Adapting instruments from non-aboriginal populations – how?

• Few original attempts:
  – Kriska’s Modifiable Activity Questionnaire [based on Pima Study] – tried in Sandy Lake, Ontario

• Even fewer involving physical measures
CONCLUSIONS

• There is as yet no scientific evidence to justify creating different physical activity recommendations for this group.
  – Lack of descriptive data that is valid, reliable, comprehensive, and representative of major regions and cultural groups across the country.
  – Need for more studies to identify determinants and barriers to physical activity in a variety of environmental and cultural contexts.
  – Need for scientifically rigorous research to investigate gene-behaviour-environment interactions in the development of chronic diseases that may be unique to Aboriginal people.

• The inclusion of a section on Aboriginal people in this Supplement recognizes their important health needs, the tremendous disparities in health status, and the urgent need for the promotion of physical activity as components of a broader strategy to abort the emerging epidemic of chronic disease.
Canada’s Physical Activity Guides: Has their release had an impact?
(Cameron, Craig, Bull, Bauman)

• Examine the reach of different versions of Canada’s physical activity guide (CPAG) and their impacts, including immediate effects (awareness, knowledge, beliefs, future intention to be active, first steps toward behavioural change) and population levels of physical activity
PURPOSE

To examine the:

• *reach* of CPAG (unprompted and prompted recall)

• *impact*
  – knowledge
  – beliefs about the benefits
  – intention
  – first steps, and
  – overall physical activity
METHODOLOGY

- CFLRI’s 2003 Physical Activity Monitor
- Adults, aged 18 years and older (n=8,892)
- Representative, cross-sectional sample
- Telephone interview
Impact and reach of CPAG

- 3.9% aware (unprompted) of any acceptable PA guidelines
- 37.3% heard of CPAG (prompted)
- more likely among females; increased by education and household income
- seeking information and initiating action (trial) behaviours were associated with recall (both unprompted and prompted).
- beliefs about the benefits of physical activity and intention to be active were also associated with prompted recall.
Accumulating sufficient activity (IPAQ)

Associated with:
• Unprompted recall of guidelines (only)
• Knowledge about the amount of PA required for health
• Future intention to be active
• Seeking information
• Initiating action

Trends in PA:
• Increase in % of active adults and youth between 1994-2005.
• Increase in % of active youth immediately after CPAG release but no change in overall annual rate of increase
• No significant changes in trend-line for adults
CONCLUSIONS

• CPAG not sufficiently disseminated to reach majority of Canadian population
  – distribution through intermediaries with differing reach.

• More intensive, sustained, coordinated and well-resourced communications campaigns may be required to increase population reach
  – particularly when PA recommendations are complex.
Physical Activity Guides for Canadians: messaging, strategies, realistic expectation for change, and evaluation

(Brawley, Latimer)

• the process and challenge of translating physical activity guidelines into meaningful and persuasive messages
• a brief outline of evidence-based strategies for designing effective messages and messaging campaigns
• summarize conclusions from major published reviews about mass-media approaches to delivering messages promoting physical activity involvement
RECOMMENDATIONS

- Public health practitioner and researcher beware. Effective message design and messaging are not simple matters of providing information and novel advertising.
- Physical activity guidelines must be translated into messages that are informative, thought provoking, clear, and persuasive.
- Increase the likelihood of a successful and sustainable campaign by developing a plan grounded in behavioural change theory.
- Be aware of moderators of messaging impact such as factors in the information and campaign environment and gatekeepers who facilitate or hinder campaign progress.
- Physical activity guidelines and messages alone are not a solution to the epidemic of physical inactivity.
Limitations of Canada’s Physical Activity Data: Implications for Monitoring Trends (Katzmarzyk, Tremblay)

- the current low level of physical activity among Canadians is a dominant public health concern
- a clear understanding of physical activity patterns and trends is of paramount importance
- irregularities in monitoring, analysis and reporting procedures create potential confusion among researchers, policy-makers and the public alike
Short-comings of Current Surveillance Approaches

- discrepancies in physical activity thresholds across surveys
- respondent bias
- response bias
- changing modes of data collection
- subtle changes to data collection instruments over time
- surveillance is almost exclusively for leisure-time physical activity, with little emphasis on occupational, active commuting or physical activity during chores
Trends in Self-reported Physical Activity Levels

- NPHS/CCHS <3.0 KKD
- PAM <3.0 KKD
- NPHS/CCHS <1.5 KKD
Respondent Bias

- bias refers to any deviation from the truth

- social desirability to report healthy behaviours may have increased as the benefits of physical activity have been publicized

- the “active living” approach to the promotion of physical activity has emphasized that many activities like walking, gardening and yard work, which previously were not viewed as “exercise” now “count” as physical activity
Changing Modes of Data Collection

• mode of data collection (self-administered, interviewer administered, telephone vs in-person, proxy interview, etc.) or the proportion of data collected through the different modalities can affect prevalence estimates

• the proportion of respondents in the Canadian Community Health Survey interviewed by telephone increased from 53% in 2000-2001 to 70% in 2003

• the prevalence of obesity in 2003 was 17.9% from personal interviews and 13.2% from telephone interviews; the corresponding results for inactivity were 42.3% and 34.4% respectively
Changes to Data Collection
Instruments over Time

- activities listed in the CCHS questionnaires have changed over time

- yoga/tai chi and cross-country skiing were discontinued after 1994/95 and 1996/97, respectively

- basketball was added in 1996, in-line skating was added
- in 1998, and snowboarding and soccer were added in 2000

- the changes in several physical activity options to the physical activity questionnaire over time make it difficult to discern true temporal trends
Trends in Self-reported Conditions and Physical Activity Levels

Change from Baseline (100%)

Year


High Blood Pressure
Diabetes
Obesity
Physical Inactivity
• efforts to monitor physical activity in Canada have a long history and are laudable

• there are several implications to the lack of rigour with which the surveillance of physical activity has been and is being conducted there is great confusion as to the appropriate threshold that should be employed to define “physical inactivity” or “physical activity”

• questions remain regarding the meaning of the self-reported data obtained from national surveys

• there are dangers in making national strategies and targets based on data collected using the current surveillance systems
Physical Activity and Inactivity Profiling: The Next Generation

(Esliger, Tremblay)

• Many physical activity measurement tools/techniques produce only summary variables

• Current activity monitoring technologies can provide more detailed information on physical activity/inactivity behaviour which can be used to explore more comprehensively the relationships between health and movement frequency, intensity, and duration
Objective Physical Activity Monitors
### (a) Subject characteristics.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Gender</th>
<th>Age (y)</th>
<th>Accelerometer model</th>
<th>Epoch</th>
<th>No. of days monitored</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jim Socks</td>
<td>Male</td>
<td>10</td>
<td>Actigraph 7164</td>
<td>1 min</td>
<td>7</td>
<td>lat 43° 58'N, long 80°45'W</td>
<td>18–24 Sept. 2007</td>
</tr>
</tbody>
</table>

### (b) Subject's activity profile.

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts (×1000)</td>
<td>2865</td>
<td>409</td>
<td>424</td>
<td>373</td>
<td>302</td>
<td>436</td>
<td>566</td>
<td>365</td>
<td>451</td>
<td>396</td>
<td>349</td>
</tr>
<tr>
<td>Average counts/min&lt;sup&gt;a&lt;/sup&gt;</td>
<td>459</td>
<td>516</td>
<td>523</td>
<td>498</td>
<td>394</td>
<td>541</td>
<td>705</td>
<td>465</td>
<td>509</td>
<td>579</td>
<td>418</td>
</tr>
<tr>
<td>Light (&lt;3 METs) (min)</td>
<td>4560</td>
<td>651</td>
<td>665</td>
<td>618</td>
<td>675</td>
<td>659</td>
<td>610</td>
<td>658</td>
<td>722</td>
<td>515</td>
<td>721</td>
</tr>
<tr>
<td>Moderate (3.00–5.99 METs) (min)</td>
<td>958</td>
<td>137</td>
<td>136</td>
<td>139</td>
<td>87</td>
<td>136</td>
<td>174</td>
<td>126</td>
<td>157</td>
<td>166</td>
<td>112</td>
</tr>
<tr>
<td>Hard (6.00–8.99 METs) (min)</td>
<td>45</td>
<td>6.43</td>
<td>8</td>
<td>2.5</td>
<td>5</td>
<td>13</td>
<td>14</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Very hard (9+ METs (min))</td>
<td>5</td>
<td>0.71</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vigorous (6+ METs) (min)</td>
<td>50</td>
<td>7.14</td>
<td>9</td>
<td>2.5</td>
<td>5</td>
<td>13</td>
<td>19</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MVPA (3+ METs) (min)</td>
<td>1008</td>
<td>144</td>
<td>145</td>
<td>142</td>
<td>92</td>
<td>149</td>
<td>193</td>
<td>128</td>
<td>163</td>
<td>168</td>
<td>115</td>
</tr>
</tbody>
</table>

Accumulation of physical activity (MVPA)

**How**

| Sporadic (<10 continuous min) | 750 | 107 | 107 | 109 | 80  | 113 | 132 | 128 | 80  | 132 | 85  |
| No. of sporadic bouts | 383 | 54.7 | 52.8 | 59.5 | 36  | 52  | 56  | 70  | 50  | 70  | 49  |
| Average min/sporadic bout | 2   | 2   | 2   | 1.8 | 2.2 | 2.2 | 2.4 | 1.8 | 1.6 | 1.9 | 1.7 |
| Short bout (10–19 continuous min)<sup>b</sup> | 186 | 26.6 | 24  | 33  | 12  | 36  | 34  | 0   | 38  | 36  | 30  |
| No. of short bouts | 15  | 2.1 | 2   | 2.5 | 1   | 3   | 3   | 0   | 3   | 3   | 2   |
| Average min/short bout | 12.4 | 10.7 | 9.6 | 13.5 | 12  | 12  | 11.3 | 0   | 12.7 | 12  | 15  |
| Long bout (20+ continuous min)<sup>c</sup> | 72  | 10.3 | 14.4 | 0   | 0   | 0   | 27  | 0   | 45  | 0   | 0   |
| No. of long bouts | 3   | 0.4 | 0.6 | 0   | 0   | 0   | 1   | 0   | 2   | 0   | 0   |
| Average min/long bout | 24  | 7.1 | 9.9 | 0   | 0   | 0   | 27  | 0   | 22.5 | 0   | 0   |
| Short & long bout (10+ continuous min) | 258 | 36.9 | 38.4 | 33  | 12  | 36  | 61  | 0   | 83  | 36  | 30  |

**When**

| Early morning (0600–0830) | 17  | 2.4 | 3.4 | 0   | 3   | 4   | 2   | 6   | 2   | 0   | 0   |
| Morning commute (0830–0900) | 59  | 8.4 | 11.2 | 1.5 | 13  | 5   | 9   | 16  | 13  | 3   | 0   |
| In school (0900–1500) | 437 | 62.4 | 63.2 | 60.5 | 33  | 61  | 93  | 50  | 79  | 78  | 43  |
| Recess (1015–1030) | 42  | 6   | 4.8 | 9   | 4   | 6   | 3   | 8   | 11  | 7   |     |
| Lunch (1200–1300) | 167 | 23.9 | 26.6 | 17  | 23  | 47  | 28  | 19  | 16  | 12  | 22  |
| After school (1500–2100) | 286 | 40.9 | 35.8 | 53.5 | 16  | 26  | 58  | 34  | 45  | 64  | 43  |
| Late night (2100–0000) | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |

Note: Variables outlining when MVPA is accumulated are based on theoretical times of the events listed.

<sup>a</sup>Average counts/min were calculated based on wear minutes only (i.e., sleep minutes were excluded); MVPA, moderate and vigorous physical activity.

<sup>b</sup>Allowing 1 min < 3 METs.

<sup>c</sup>Allowing 2 min < 3 METs.
(a) Subject characteristics.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Gender</th>
<th>Age (y)</th>
<th>Accelerometer model</th>
<th>Epoch</th>
<th>No. of days monitored</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jane Go</td>
<td>Female</td>
<td>10</td>
<td>Actical</td>
<td>15 s</td>
<td>7</td>
<td>lat 53° 10’N, long 106°43’W</td>
<td>16–22 Jan. 2007</td>
</tr>
</tbody>
</table>

(b) Subject’s activity profile.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep (h)</td>
<td>79.1</td>
<td>11.3</td>
<td>11.3</td>
<td>1.2</td>
<td>10.9</td>
<td>11.6</td>
<td>10.1</td>
<td>12.3</td>
<td>11.9</td>
<td>8.6</td>
<td>13.9</td>
</tr>
<tr>
<td>Sedentary (PAR&lt;1.5) (min)</td>
<td>3024</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>490</td>
<td>474</td>
<td>443</td>
<td>407</td>
<td>345</td>
<td>507</td>
<td>358</td>
</tr>
<tr>
<td>Light (PAR 1.5–2.99) (min)</td>
<td>4189</td>
<td>598</td>
<td>603</td>
<td>587</td>
<td>652</td>
<td>603</td>
<td>642</td>
<td>582</td>
<td>537</td>
<td>679</td>
<td>495</td>
</tr>
</tbody>
</table>

Accumulation of inactivity (sedentariness)

**How**

- Sporadic (<10 continuous min)
  - No. of sporadic bouts: 1269
  - Average min/sporadic bout: 1
- Short bout (10–19 continuous min)
  - No. of short bouts: 655
  - Average min/short bout: 13.4
- Long bout (20+ continuous min)
  - No. of long bouts: 1097
  - Average min/long bout: 32.3

**When**

- AM commute (0800–0845): 76
- Morning recess (1030–1045): 24
- Lunch time (1200–1300): 188
- PM commute (1530–1615): 144

Note: PAR, physical activity ratio (based on cut-points by Puyau et al. 2004). Variables outlining when inactivity is accumulated are based on theoretical times of the events listed.

*Allowing 1 min with a PAR ≥1.5.
*Allowing 2 min with a PAR ≥1.5.
CHILDREN 8-13 yrs MEETING PHYSICAL ACTIVITY GUIDELINES – AVERAGE DAY

A

Average MVPA Per Day

Participant ID Number

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PROPORTION OF CHILDREN 8-13 yrs MEETING PHYSICAL ACTIVITY GUIDELINES – DAYS/WEEK

100
90
80
70
60
50
40
30
20
10
0

1 Day 2 Days 3 Days 4 Days 5 Days 6 Days 7 Days 7 Days
(Avg)

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CHILDREN 8-13 yrs MEETING PHYSICAL ACTIVITY GUIDELINES – AVERAGE DAY BOUTS ONLY

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PROPORTION OF CHILDREN 8-13 yrs MEETING PHYSICAL ACTIVITY GUIDELINES – DAYS/WEEK

BOUTS ONLY

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Incidental Movement, Lifestyle Embedded Activity and Sleep: New Frontiers in Physical Activity Assessment

(Tremblay, Esliger, Tremblay, Colley)

- Canadian public health messages relating to physical activity have historically focused on the prescription of purposeful exercise

- potential impact of incidental (non-exercise or non-purposeful) physical activity and lifestyle embedded activities (chores and incidental walking) upon TEE and indicators of health

- the relationship of physical inactivity, including sleep, to physical activity, TEE and health outcomes
Physical Activity
Marginalization

IS OUR FRAME OF REFERENCE
CHANGING?
“I NEVER SEEM TO FIND TIME TO EXERCISE.”

YOUR KIDS ARE LISTENING

WHY NOT JOIN THEM? WHAT IF YOU WERE TO TALK TO YOUR CHILDREN ABOUT EXERCISE腸.

AND WHAT IF YOU STARTED TO WALK AROUND THEIR ROOMS MULTIPLE TIMES TO MAKE SURE THEY ARE HAVING A GOOD TIME.

REGION OF PEEL

FOR MORE INFORMATION, VISIT WWW.REFERENCE CHANGING.CA

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Trends in Households with Entertainment Equipment that Promotes Sedentary Behaviour

Statistics Canada, 2001; 2004; 2006

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“Ironically the childhood obesity epidemic has coincided with a dramatic increase in children’s organized sport. This does not mean that organized sports contribute to obesity, but that an over-scheduled, over-organized childhood may”

R. Louv. *Last Child in the Woods*. (p.16) 2005
What about “incidental movement”
or “lifestyle embedded activity”
or “NEAT”
(nonexercise activity thermogenesis)
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>ODDS OF OBESITY</th>
<th>ODDS OF OVERWEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organized Sport</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Unorganized Sport</td>
<td>0.58**</td>
<td>0.77**</td>
</tr>
<tr>
<td>Art/Music/Dance</td>
<td>NS</td>
<td>0.88*</td>
</tr>
<tr>
<td>Clubs</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Video Games</td>
<td>NS</td>
<td>1.19**</td>
</tr>
<tr>
<td>TV 2-3 hrs/day</td>
<td>NS</td>
<td>1.15*</td>
</tr>
<tr>
<td>TV 3-5 hrs/day</td>
<td>1.51**</td>
<td>1.36**</td>
</tr>
<tr>
<td>Low SES</td>
<td>NS</td>
<td>1.18*</td>
</tr>
<tr>
<td>High SES</td>
<td>0.60**</td>
<td>0.76**</td>
</tr>
<tr>
<td>Single Parent</td>
<td>1.36**</td>
<td>NS</td>
</tr>
</tbody>
</table>

Comparison of MVPA Accumulation

(A) Minutes of MVPA

- Total
- Long
- Short
- Sporadic

(B) Minutes of MVPA

- Long
- Short
- Sporadic

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Average Steps Taken Per Day

Steps Taken Per Day

<table>
<thead>
<tr>
<th>Group</th>
<th>CAN PLAY Boys</th>
<th>Amish Boys</th>
<th>CAN PLAY Girls</th>
<th>Amish Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps Taken</td>
<td>11946</td>
<td>17174</td>
<td>10735</td>
<td>13620</td>
</tr>
</tbody>
</table>

Group by Gender

Active Healthy Kids Canada Report Card 2007

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Despite having no physical education, no institutionalized sport, and low socioeconomic status, Old Order Mennonite and Amish children are more active and less obese than children living a contemporary Canadian lifestyle.

Tremblay et al., MSSE, 2005
Bassett et al., MSSE, 2007
Sleep

- Most extreme, most common and most extended form of sedentary behaviour – and completely ignored in physical activity guidelines
- Trends show children, adolescents and young adults are sleeping less
- Paradox - less sleep associated with increased obesity
- Shorter sleep = longer wake = greater movement opportunities, but also greater fatigue and eating
- Studies show direct relationship between sleep time and activity time (decreased sleep = decreased PA)
- Less activity associated with lower quality sleep
- Sleep may influence both physical activity and obesity AND their relationships with health outcomes

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CONCLUSIONS

• Greater care and attention is required in our monitoring and surveillance measures
• It is time to graduate to greater detail of physical activity profiling
• Consideration should be given to a “complete day” approach to physical activity guidelines to prevent behaviour compensation
• Much more research is required to better understand the relationships between physical activity and health/wellness and inform PA guidelines
Physical Activity Guidelines and Guides for Canadians: Facts and Future

(Tremblay, et al.)

• In general, the detailed information provided in this supplement supports the physical activity guidelines outlined in Canada’s physical activity guides.

• Guidelines are lacking for preschool children and for youth aged 15–19 years.

• Evidence to support the creation of specific guides for Canadians with a disability and specific guides may also be needed for Aboriginal groups.
• Refinement of existing guides may be required to counter trends to a growing prevalence of overweight and obesity

• Physical activity guideline messaging requires crafting that avoids disenfranchising sedentary individuals, while still conveying the benefits of progressive amounts of physical activity

• Differentiating between minimal and optimal levels of physical activity should be explored

• The impact of the existing guides has been modest, but would likely be enhanced through comprehensive and coordinated communication and intervention strategies

• New, time-stamped, objective measurement techniques should be exploited to overcome previous limitations in physical activity surveillance
RECOMMENDATIONS

• Expert committee / consensus symposium to assess evidence to change guidelines and/or guides
• Evaluate evidence using the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument
• Creation of clinical practice guidelines be explored
• Address gaps in existing guides (e.g. preschool, teens, disabled, Aboriginal, individualized guides)
• Target populations have input if any changes are made
• Canada should provide international leadership in harmonizing guidelines
• Partner with ParticipACTION on a national integrated and sustained dissemination and promotion strategy
• Ongoing evaluations and assessments
• Further research on PA, health and messaging
ACKNOWLEDGEMENTS

• Physical Activity Measurement and Guidelines Project researchers and authors
• Healthy Living Program, Public Health Agency of Canada
• First Nations and Inuit Health Branch, Health Canada