



Innovation, Technology and Childhood Healthy Active Living: *moving forward by looking back*

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New Brunswick School District #2
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Chronic Disease Prevention Alliance of Canada
Canadian Federation of Biological Societies
Heart and Stroke Foundation of Canada
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Ontario School Boards Association
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Ontario Ministry of Health and Long-Term Care
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City of London
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University of Ottawa
University of Stirling
Alberta Recreation and Parks Association
Canadian Pediatric Society
The Lawson Foundation
Active Healthy Kids Global Alliance

Ophea
Responics, Inc.
Physical and Health Education Canada
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Canadian Society for Exercise Physiology
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Nova Scotia Recreation Commission
PEI Health
Canadian Fitness and Lifestyle Res Institute
CAHPERD
Health Canada
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CHEO Research Institute
Jalisco Ministry of Health
World Obesity Federation
Canada Foundation for Innovation
Thunder Bay Public Health
Organix Foundation
Stanford University
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Ontario College of Family Physicians
University of Adelaide
Canada Foundation for Innovation
South Africa Nutrition Society
Shanghai Sports University
Southwest University (China)
Dairy Farmers of Manitoba
Technical University of Munich
Ontario Parks
Mitacs



Objectives

- Develop an appreciation for the importance of primary prevention in combating childhood obesity.
- Gain insight into alternative approaches to promoting healthy behaviours from cross-cultural and international comparisons.
- Appreciate the importance of the whole day when prescribing healthy movement behaviours.
- Understand the potential ramifications of contemporary childhood behaviour trends on obesity risk and future health.



Overview

- Personal reflections
- Obesity vs healthy active living
- Innovation and technology vs back to the basics
- Active Healthy Kids Global Alliance – Global Matrix
- 24-Hour Movement Behaviour Guidelines
- Some thoughts going forward



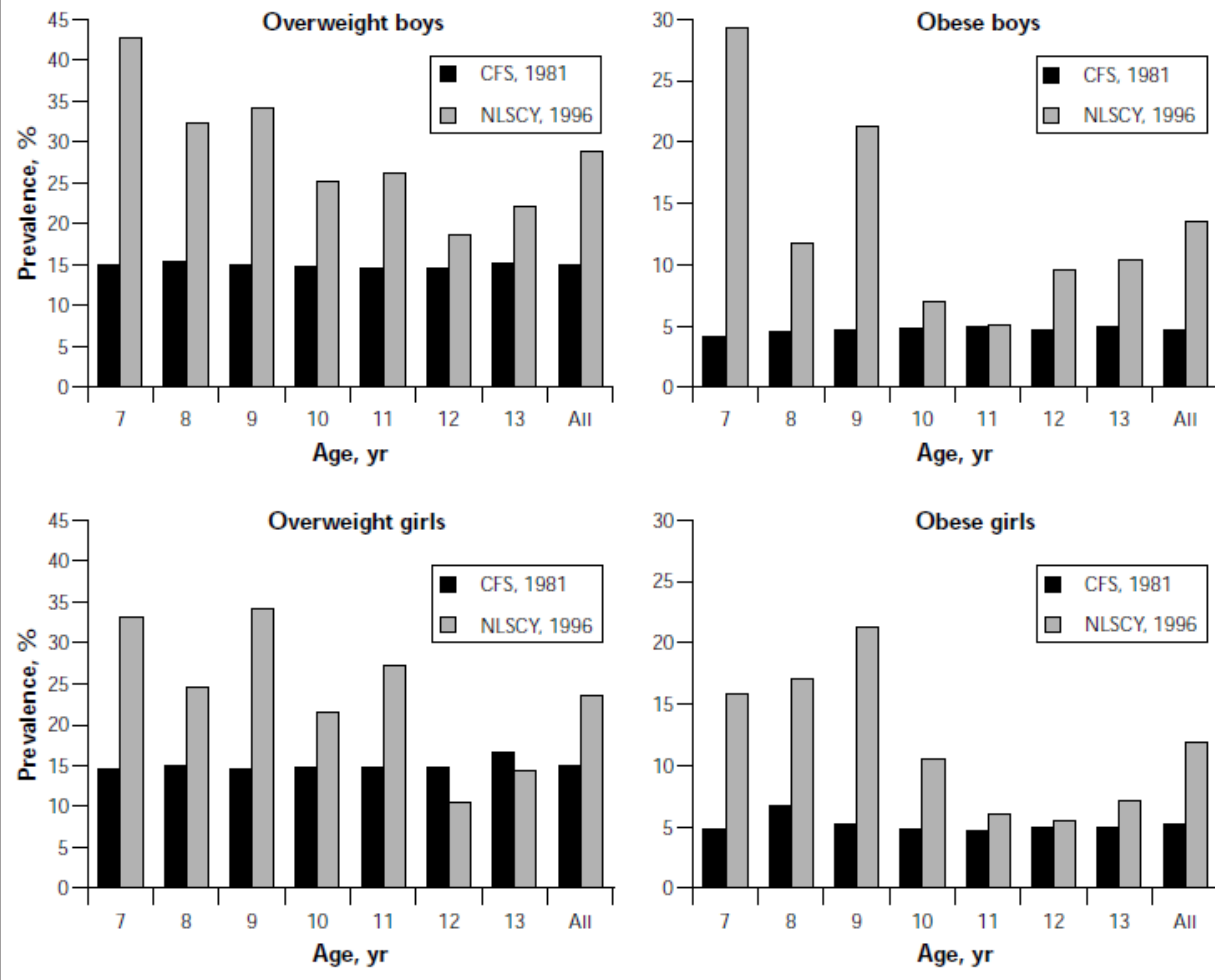
FITKIDS...

A LIFESTYLE FOR ALL

*Designed to instill positive fitness
and lifestyle habits in kids.*

Mark Tremblay

P.O. Box 7153
Ottawa, Ontario K1L 8E2



“Childhood obesity
in Canada
nearly tripled
since 1981”

Tremblay and Willms.
CMAJ 163(11):1429-1433, 2000

Fig. 2: Prevalence of overweight (> 85th age- and sex-specific percentile) and obesity (> 95th age- and sex-specific percentile) using the 1981 CFS data¹⁴ as baseline for boys and girls aged 7–13 years.

WEAVING RESEARCH INTO POLICY: PARTNERSHIP SUCCESS RELATED TO THE CHILDHOOD OBESITY EPIDEMIC

Dr. Mark Tremblay, Ph.D., FACSM

University of Saskatchewan

Dr. Joan Campbell, Ph.D.

Canadian Population Health Initiative

Dr. Douglas Willms, Ph.D.

Canadian Research Institute for Social Policy

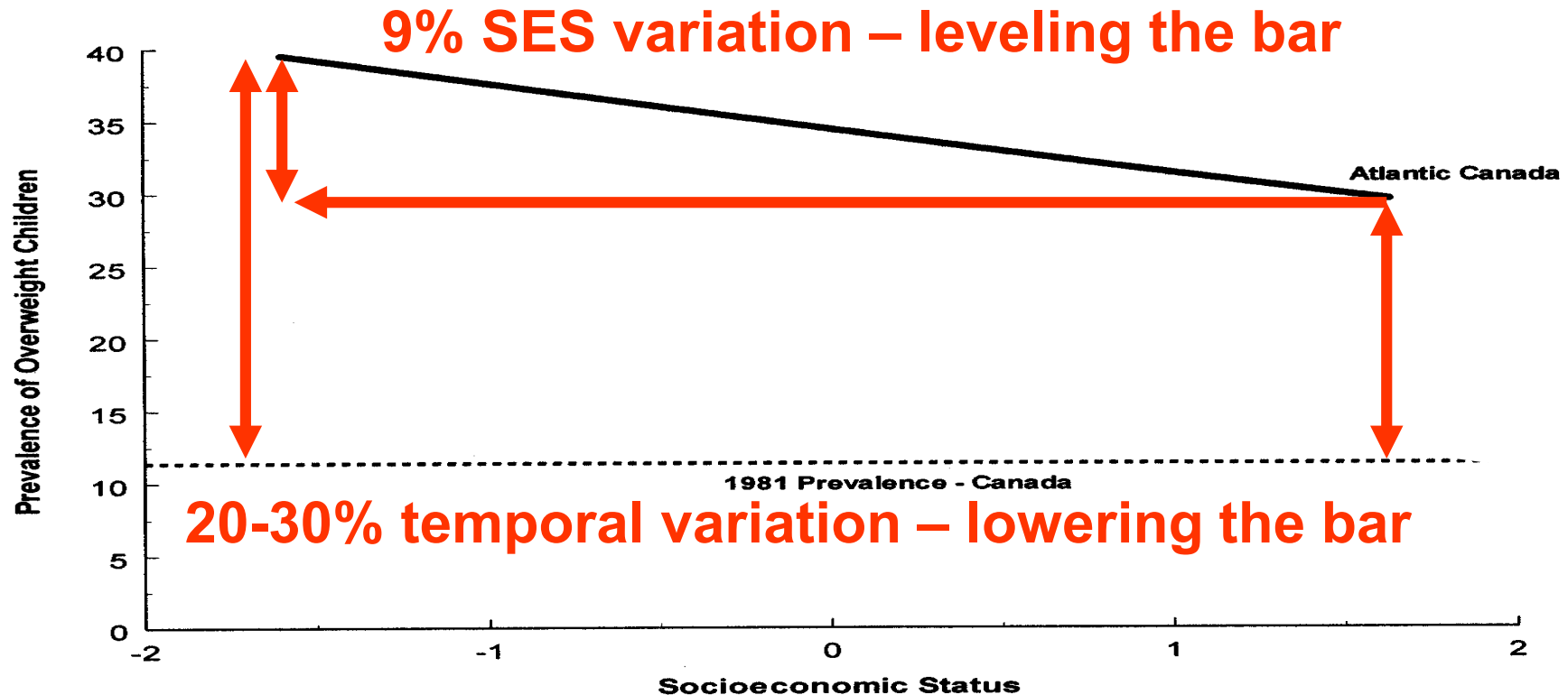
POLICY IMPLICATIONS

- Rapid rise in Type II diabetes
- Burden of illness related to obesity
- Surveillance required to monitor secular trends (direct monitoring important)
- Physical inactivity / nutrition policies
- Spatial variation is significant - regional level intervention required
- Problem evident at young age (<7)

“UPSTREAM” POLICY ISSUES

- Inequities in access to healthy food choices
- Availability of unhealthy food choices
- Marketing of unhealthy foods aimed at children
- Inequities in access to physical activities
- Lack of infrastructure for physical activities
- Excessive infrastructure for physical inactivity
- Role of communities, schools
- NEED FOR COHERENT, INTEGRATED NUTRITION AND FITNESS POLICIES

VARIATION IN CHILDHOOD OBESITY



INTEGRATED PAN-CANADIAN HEALTHY LIVING STRATEGY 2005

- Vision: a healthy nation in which all Canadians experience the conditions that support the attainment of good health
- Goals
 - Improve overall health outcomes
 - Reduce health disparities

HEALTHY LIVING TARGETS 2005

- Healthy Eating
 - By 2015, increase by 20% the proportion of Canadians who make healthy food choices
- Physical Activity
 - By 2015, increase by 20% the proportion of Canadians who participate in regular physical activity 30 min/day MVPA
- Healthy Weights
 - By 2015, increase by 20% the proportion of Canadians at a normal BMI (18.5-24.9)



Research Institute

Healthy Active Living and Obesity Research

Pediatric Obesity in Canada: Are we making any progress and where do we go from here?

Mark Tremblay, Ph.D.

¹Director of Healthy Active Living and Obesity Research (HALO),

Children's Hospital of Eastern Ontario Research Institute

²Professor, Department of Pediatrics, University of Ottawa

³Chief Scientific Officer, *Active Healthy Kids Canada*

Are we making any progress?

- We are definitely doing more, but...
 - Childhood obesity is high and rising
 - Inactivity is high and rising
 - Diet quality is poor and deteriorating
 - Built environments are obesogenic, promoting inactivity and excess eating
 - Existing policies and legislation are often barriers to progress
- We are swimming against the current
- Doesn't seem like we are making progress, but looks can be deceiving – stay the course, but current efforts are insufficient

Where do we go from here?

- Acknowledge the scope and magnitude of the challenge
- Promising approaches AT ALL LEVELS require increased and sustained support – this is NOT a resource-neutral challenge
- Hold public and private players accountable
- Focus on solutions not excuses – empower don't disempower
- Evaluate and measure carefully – careful assessment IS AN INTERVENTION
- Attack from all-sides to change the social norm – focus on the big picture, attribution of impact secondary
- Be politically active and astute – e.g. opportunities to link to the “green agenda”
- Ensure upstream, preventive efforts are pursued and supported



The Health Continuum

Optimum
Wellness

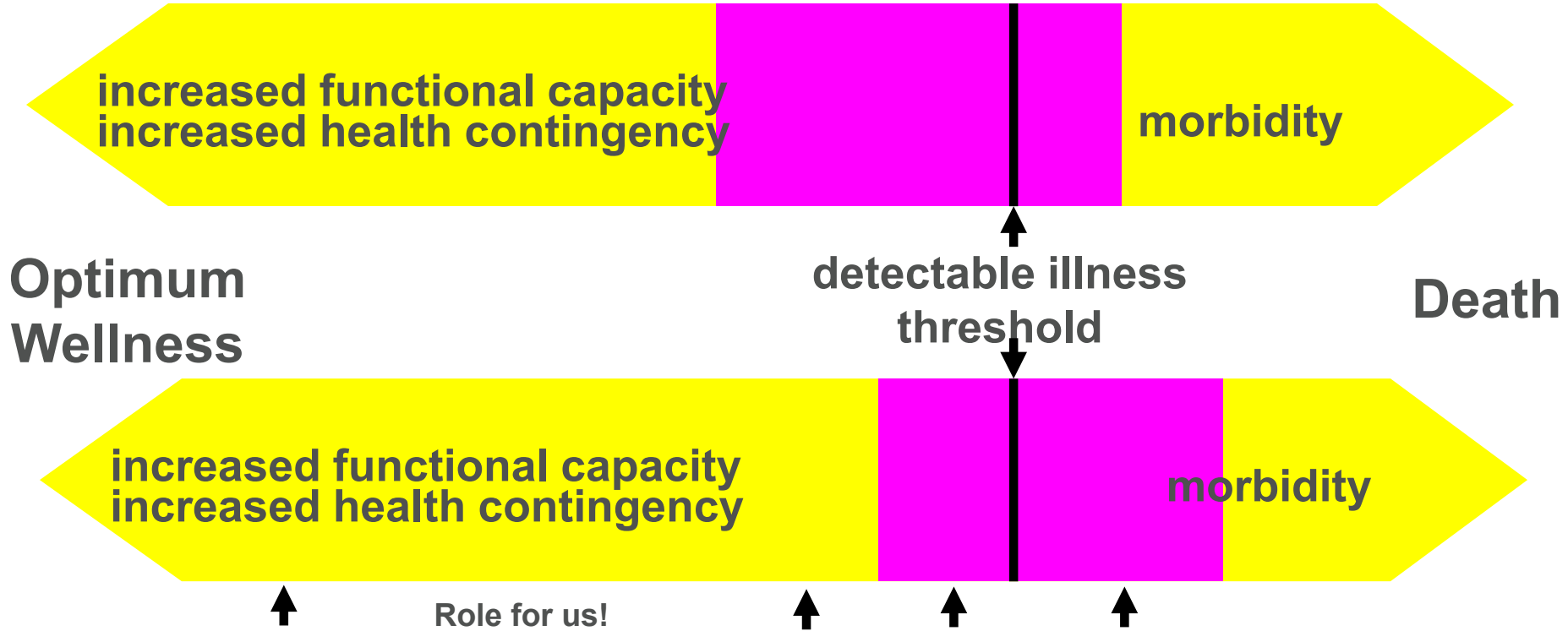
Death



↑
detectable
illness
threshold



Are we mortgaging the health of our population?





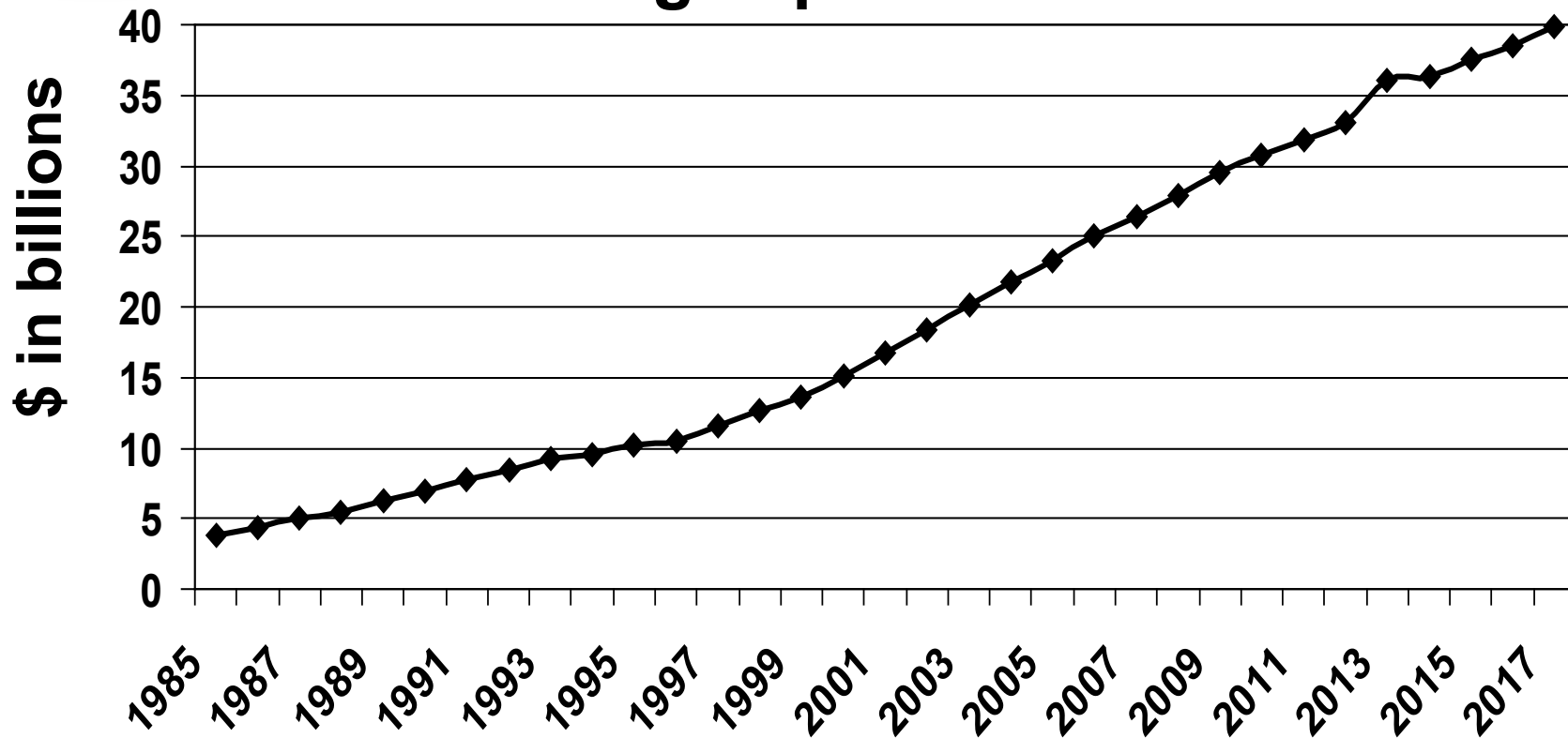
Are we getting healthier?

Previous generation (1924-48) vs baby boomers (1948-1964)

Indicator	Previous	Boomers
excellent health	32.0%	13.2%
walking assistance	3.3%	6.9%
work limitations	10.1%	13.8%
functional limitations	8.8%	13.5%
obesity	29.4%	38.7%
regular exercise	49.9%	35.0%
no regular PA	17.4%	52.2%
hypertension	36.4%	43.0%
hypercholesterolemia	33.8%	73.5%



Trends in drug expenditures in Canada



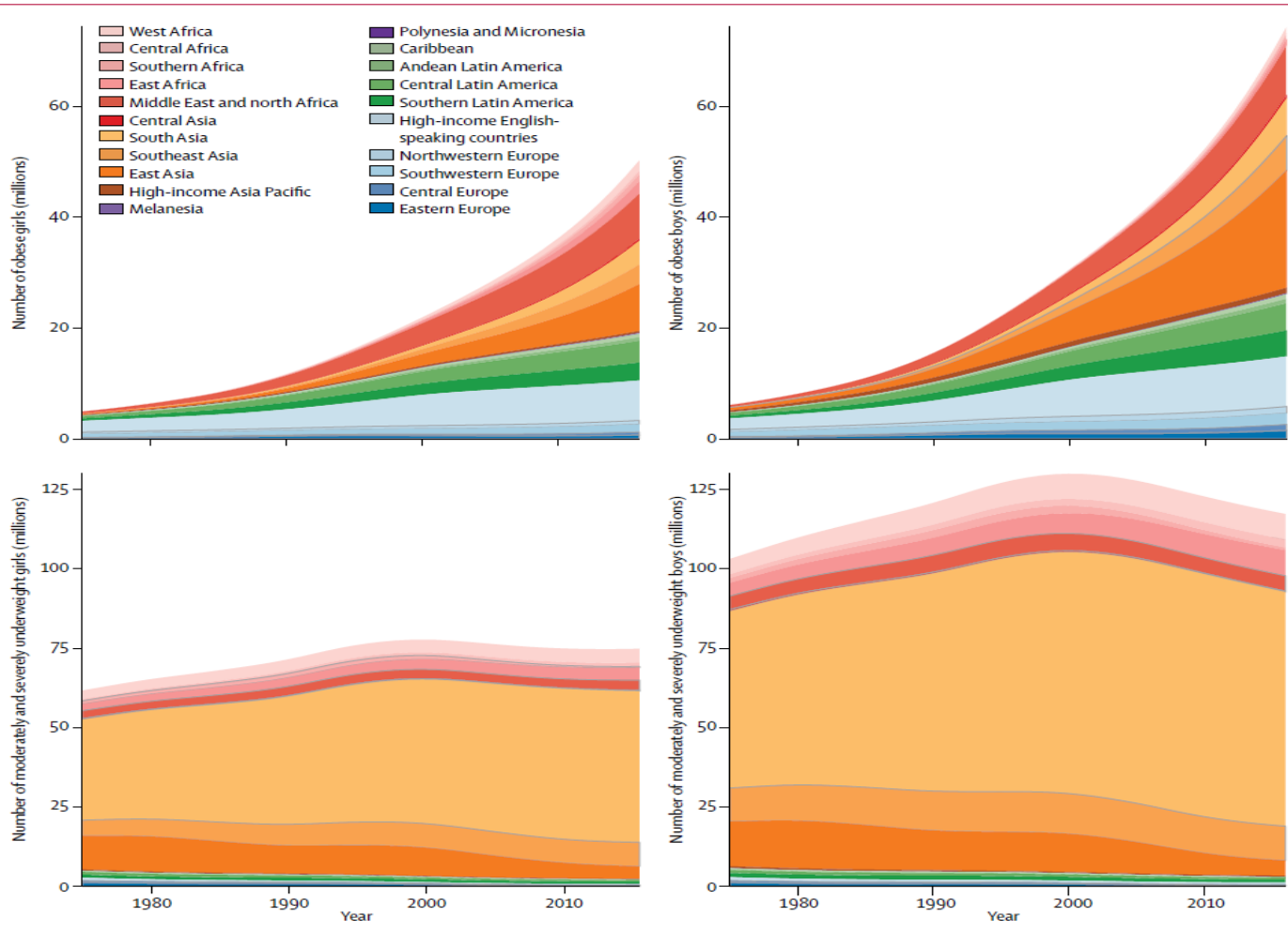


Figure 10: Trends in the number of children and adolescents with obesity and with moderate and severe underweight by region



Physical Activity Transition

The shift from a high activity lifestyle to a more sedentary lifestyle is referred to as the “*physical activity transition*”.



■ school / OPA ■ domestic ■ transport □ leisure

LMIC 2000



HIC 1900



HIC 2000



physical activity transition

*Tremblay et al.
University of
Ottawa Press,
p. 97-110, 2010.*

Activity Energy Expenditure (kcal)

Traditional

Contemporary

Commuting



Chores



Sports

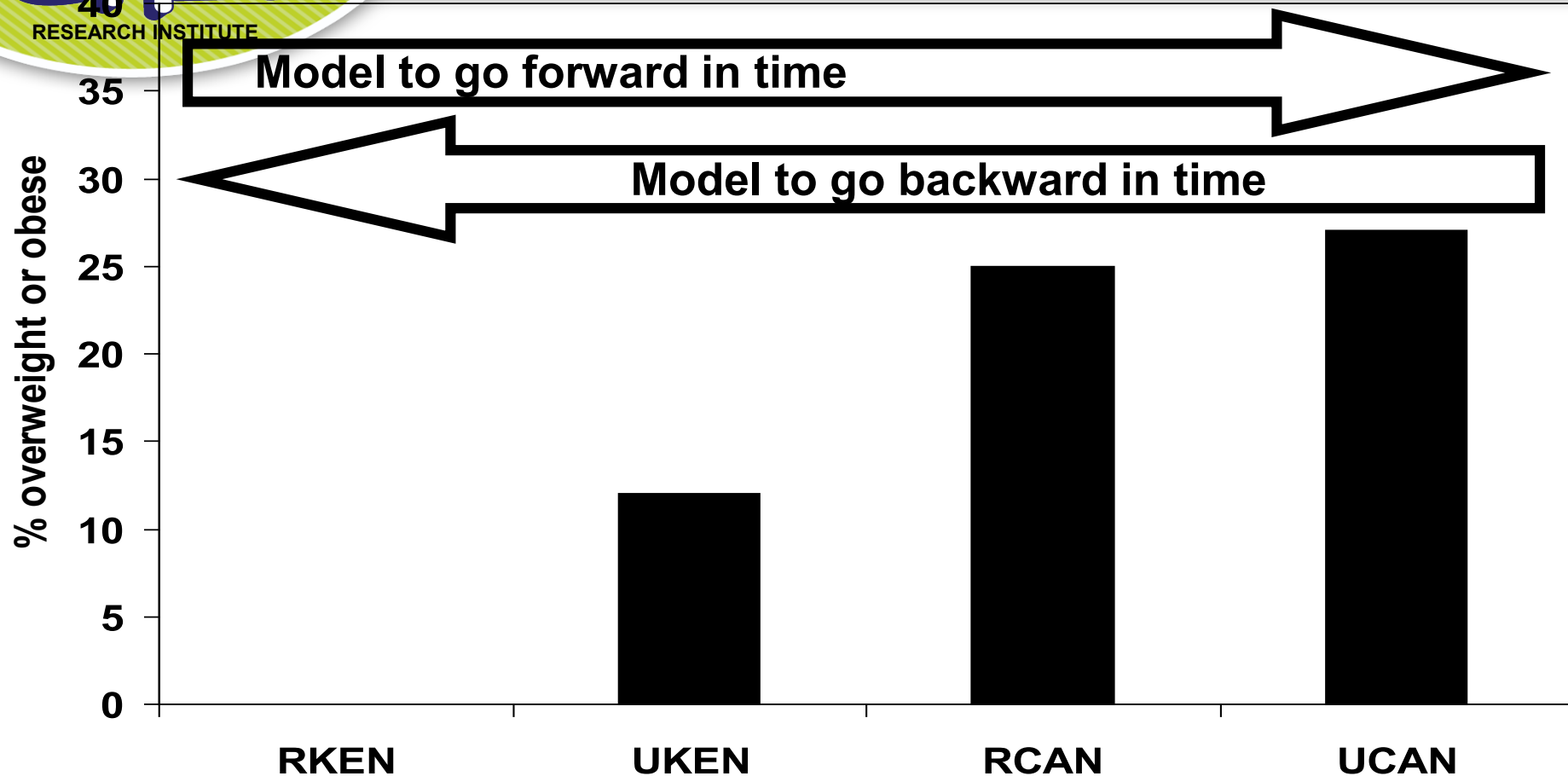


Free Time



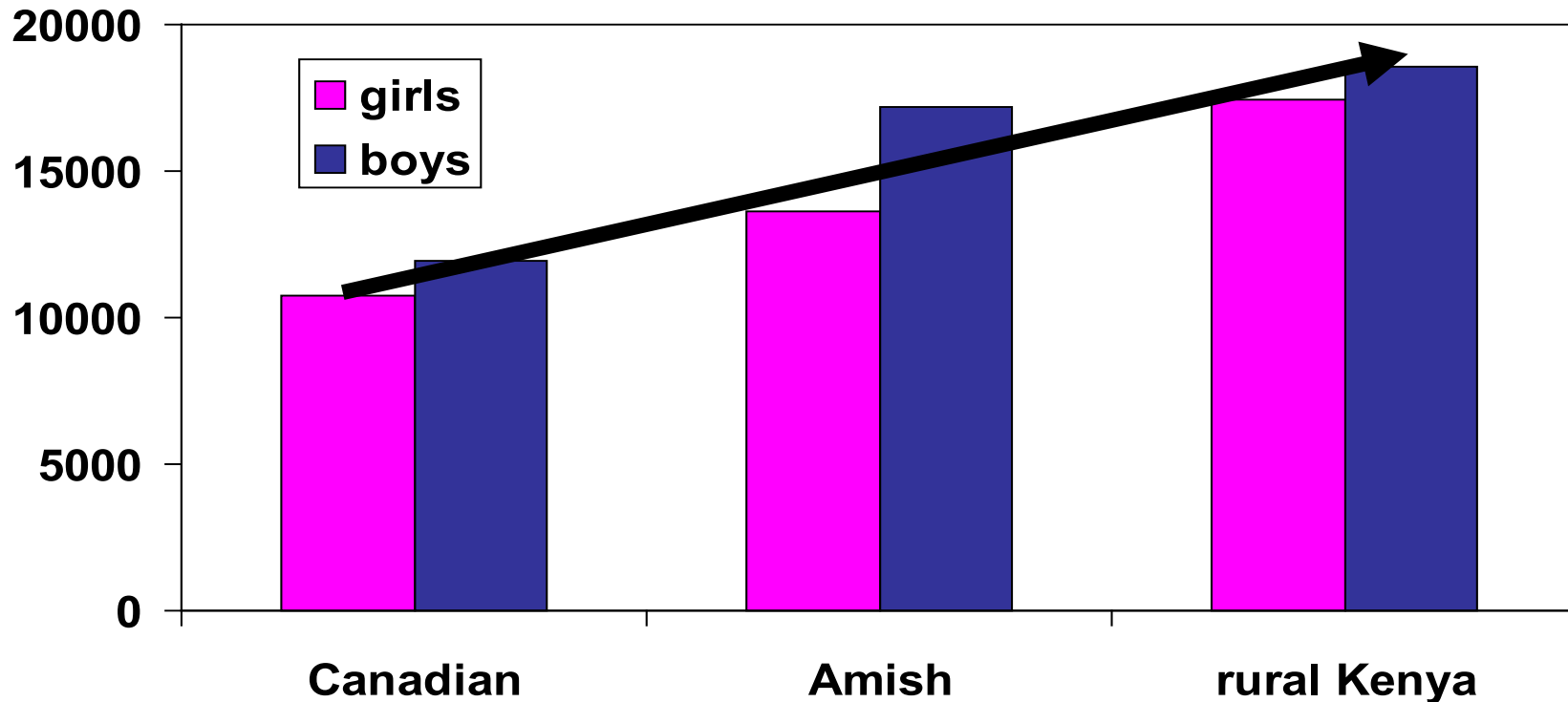


Despite having no physical education, no institutionalized sport, and low socioeconomic status, Old Order Mennonite and Amish children are more active, more fit and less obese than children living a contemporary Canadian lifestyle.





Pedometer Measured Step Counts



Portrait of a typical Canadian 12 year old

Canadian children today are taller, heavier, fatter, rounder, weaker and less flexible than in 1981.

42.7 kg (94 pounds)

Weight

47.6 kg (105 pounds)*

18.4 kg/m²

Body mass index

19.5 kg/m²*

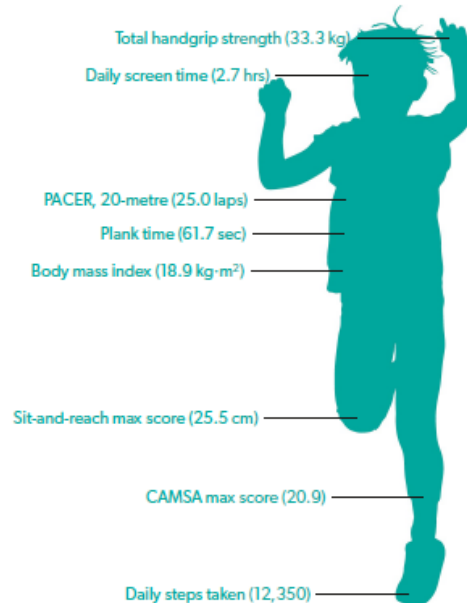
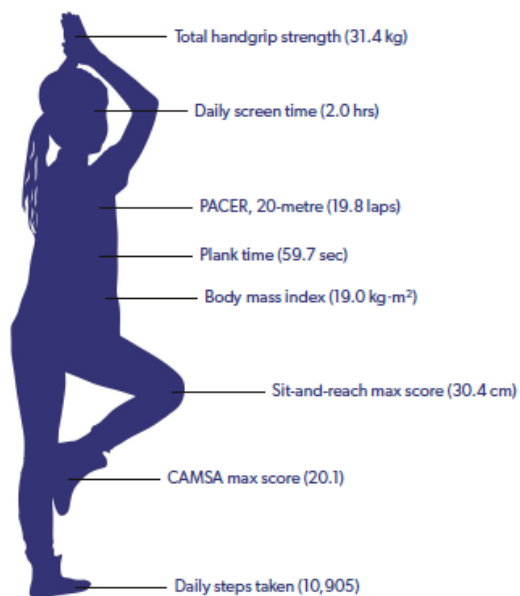
These results forecast accelerated non-communicable disease development, increased health care costs, and loss of future productivity.

32.0 cm

Sit-and-reach

28.2 cm*

Physical literacy portrait of a typical 10-year-old girl and boy, 2014-17 CAPL data



Girl	CAPL Scores	Boy
19.0	Physical competence (/32)	19.7
18.7	Daily behaviour (/32)	18.6
12.2	Motivation and confidence (/18)	12.9
12.2	Knowledge and understanding (/18)	12.0
62.2	Physical literacy score (/100)	63.1



JAMA | **Original Investigation**

Effect of Wearable Technology Combined With a Lifestyle Intervention on Long-term Weight Loss

The IDEA Randomized Clinical Trial

John M. Jakicic, PhD; Kelliann K. Davis, PhD; Renee J. Rogers, PhD; Wendy C. King, PhD; Marsha D. Marcus, PhD; Diane Helsel, PhD, RD; Amy D. Rickman, PhD, RD, LDN; Abdus S. Wahed, PhD; Steven H. Belle, PhD

“the addition of a wearable technology device to a standard behavioral intervention resulted in less weight loss over 24 months”

“Devices that monitor and provide feedback on physical activity may not offer an advantage over standard behavioral weight loss approaches”



Review

Systematic review of the effectiveness of health-related behavioral interventions using portable activity sensing devices (PASDs)

Hamed Abedtash and Richard J Holden

“There is insufficient evidence to draw a conclusion about the general health-related benefits of PASD interventions. PASD interventions may improve intermediate outcomes when coupled with multiple behavioral change techniques. Devices alone or with minimal behavioral change support are insufficient to change health-related outcomes.

A Fitbit and Facebook mHealth intervention for promoting physical activity among adolescent and young adult childhood cancer survivors: A pilot study

Jason A. Mendoza^{1,2,3} | K. Scott Baker^{1,2,3} | Megan A. Moreno^{1,2} | Kathryn Whitlock² |
Mark Abbey-Lambertz² | Alan Waite² | Trina Colburn² | Eric J. Chow^{1,2,3}

“This mHealth PA intervention was feasible and acceptable to AYA childhood cancer survivors and warrants a fully powered RCT.”

“Exploratory analyses found no significant adjusted group differences for change in moderate-to-vigorous PA (4.4 vs. 5.0 min/day; $P = 0.92$) or sedentary time (-4.5 vs. 1.0 min/day; $P = 0.73$), comparing intervention subjects to controls.”



Article

Accuracy in Wrist-Worn, Sensor-Based Measurements of Heart Rate and Energy Expenditure in a Diverse Cohort

Anna Shcherbina ^{1,†}, C. Mikael Mattsson ^{1,2,†}, Daryl Waggott ^{1,3,†}, Heidi Salisbury ³, Jeffrey W. Christle ¹, Trevor Hastie ^{4,5}, Matthew T. Wheeler ^{1,3} and Euan A. Ashley ^{1,3,5,*}

“In conclusion, most wrist-worn devices adequately measure HR in laboratory-based activities, but poorly estimate EE, suggesting caution in the use of EE measurements as part of health improvement programs.”



Review Article

The Ubiquity of the Screen: An Overview of the Risks and Benefits of Screen Time in Our Modern World

Allana G. LeBlanc,¹ Katie E. Gunnell,² Stephanie A. Prince,¹ Travis J. Saunders,³
Joel D. Barnes,² and Jean-Philippe Chaput²

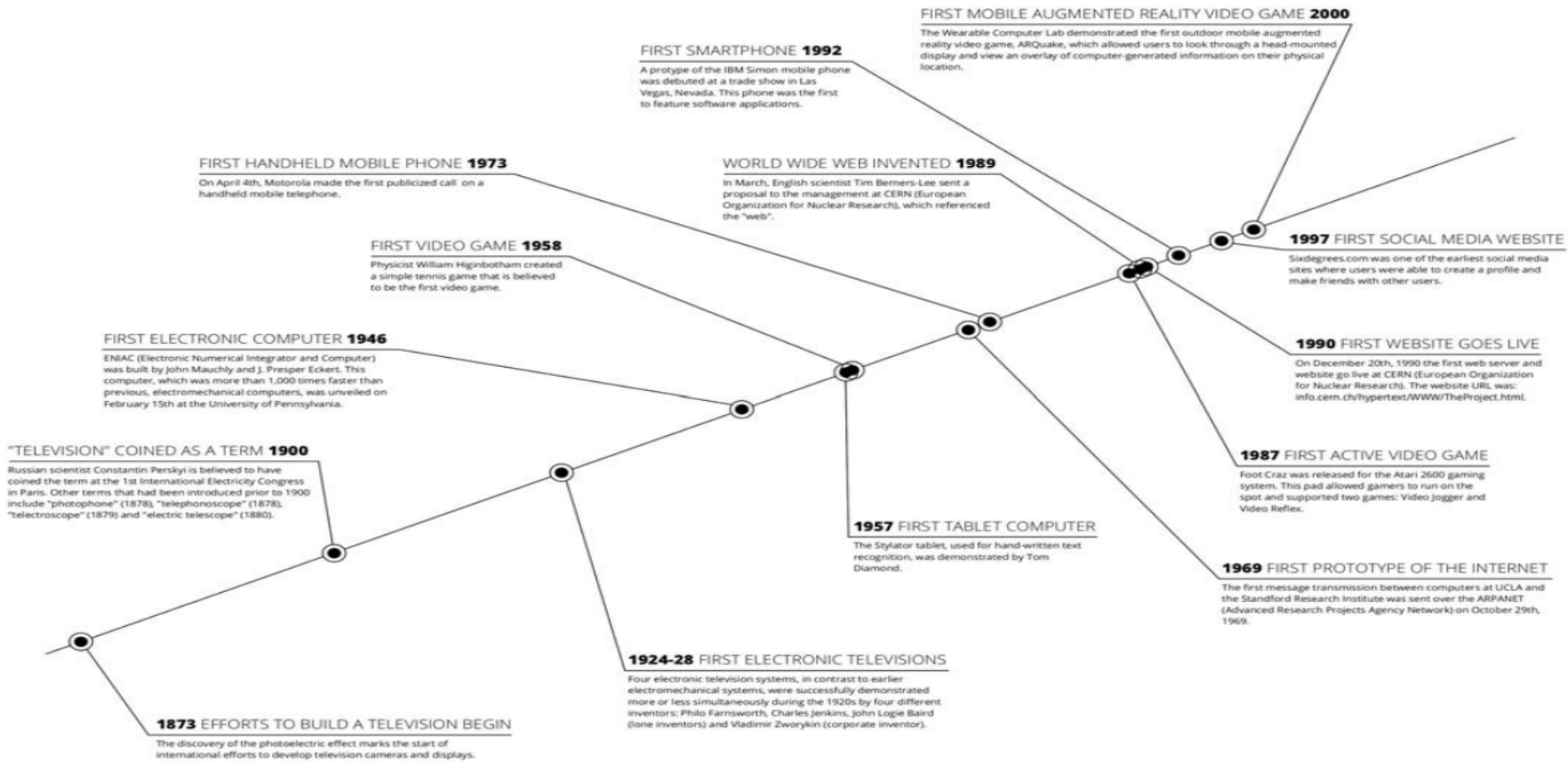


Figure 3: An abridged timeline of the emergence of screen-based technologies.

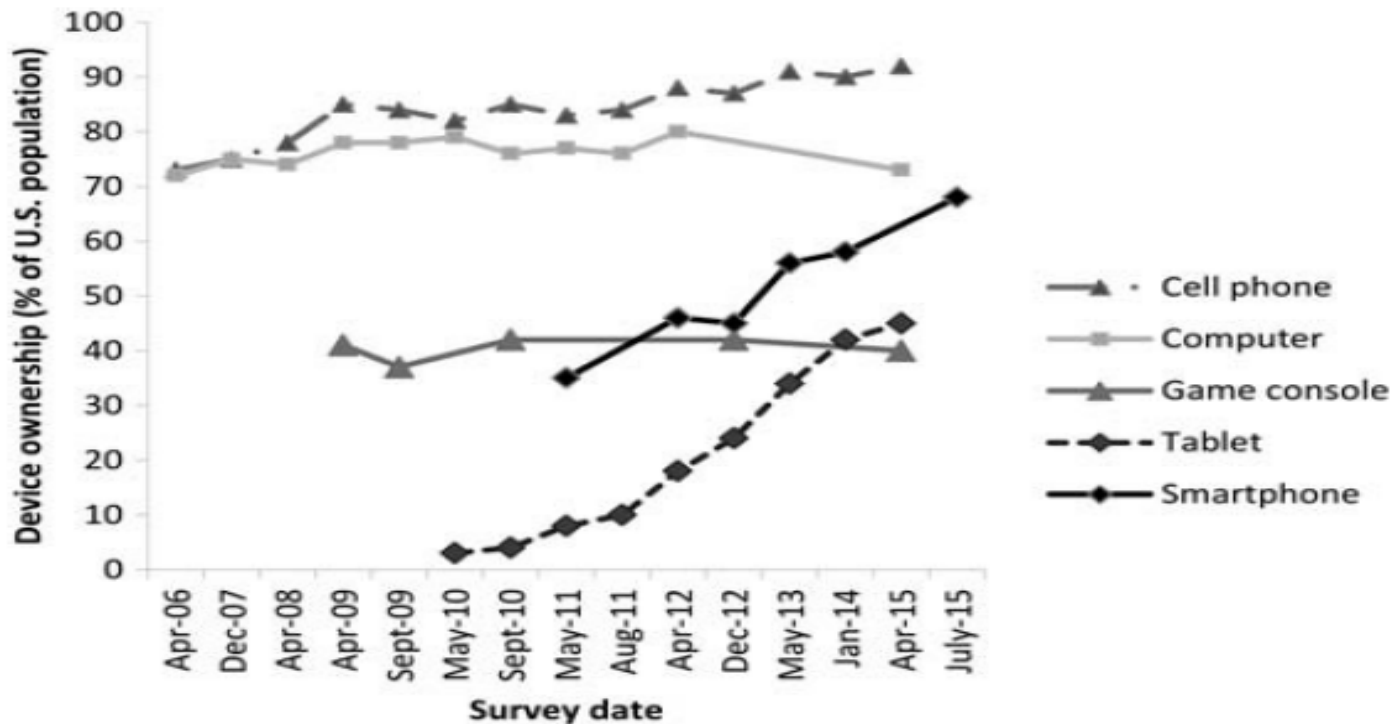


Figure 2: Device ownership by U.S. adults (>18 yr of age) (3).



Associations between 24 hour movement behaviours and global cognition in US children: a cross-sectional observational study



Jeremy J Walsh, Joel D Barnes, Jameason D Cameron, Gary S Goldfield, Jean-Philippe Chaput, Katie E Gunnell, Andrée-Anne Ledoux, Roger L Zemek, Mark S Tremblay

Summary

Background Childhood and adolescence are crucial periods for brain development, and the behaviours during a typical 24 h period contribute to cognitive performance. The Canadian 24-Hour Movement Guidelines for Children and Youth recommend at least 60 min physical activity per day, 2 h or less recreational screen time per day, and 9–11 h sleep per night in children aged 8–11 years. We investigated the relationship between adherence to these recommendations and global cognition.

Lancet Child Adolesc Health 2018

Published Online

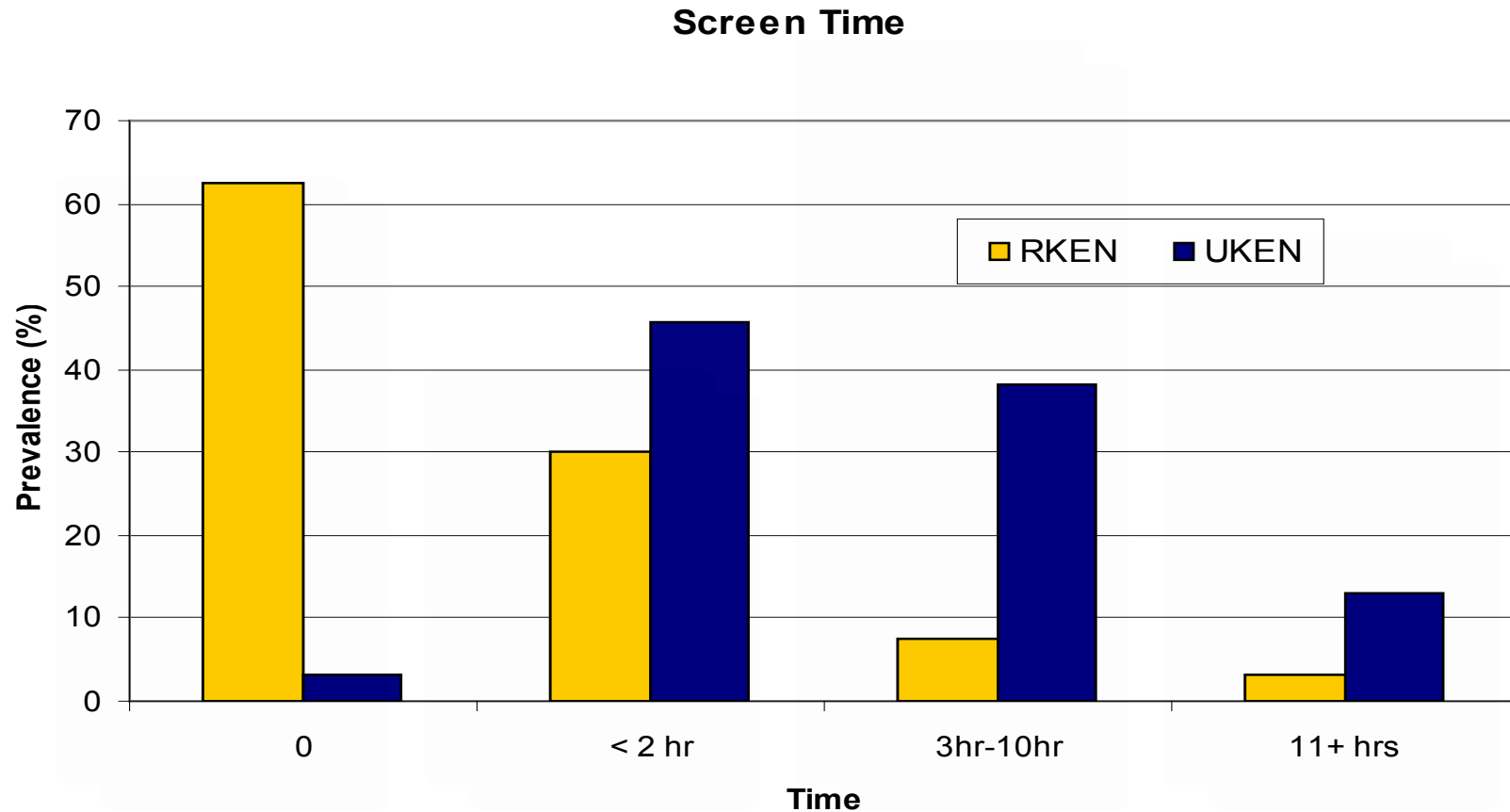
September 26, 2018

[http://dx.doi.org/10.1016/S2352-4642\(18\)30278-5](http://dx.doi.org/10.1016/S2352-4642(18)30278-5)

S2352-4642(18)30278-5

See Online for Summary

Screen Time per week



GRADE

D

Sedentary
Behaviours



The grade this year is a D. This improvement from the F assigned in 2016 does not represent

ParticipACTION Report Cards



Global Matrix:

A comparison of child physical activity across countries



HOW CANADA STACKS UP



OVERALL PHYSICAL ACTIVITY	ORGANIZED SPORT PARTICIPATION	ACTIVE PLAY	ACTIVE TRANSPORTATION	SEDENTARY BEHAVIOURS	FAMILY & PEERS	SCHOOL	COMMUNITY & THE BUILT ENVIRONMENT	GOVERNMENT STRATEGIES & INVESTMENTS
Mozambique B	New Zealand B	New Zealand B	Finland B	Ghana B	Australia C	England A-	Australia A-	Colombia B
New Zealand B	Australia B-	Kenya C	Mozambique B	Kenya B	Canada C	Finland B	Canada B+	Finland B
Mexico C+	Canada C+	Mozambique C	Nigeria B	New Zealand C	Finland C	Australia B-	England B	Scotland B
Kenya C	Finland C	Nigeria C-	Mexico B-	Ireland C-	Kenya C	New Zealand B-	Finland B	South Africa B
Nigeria C	Ghana C	Finland D	England C	Colombia D	New Zealand C	Canada C+	Ireland B	Australia C+
England D+	Kenya C	Australia INC	Kenya C	Finland D	Scotland D-	Kenya C	Scotland B	Canada C
Colombia D	South Africa C	Canada INC	Scotland C	Mexico D	Colombia INC	Mozambique C	United States B-	Kenya C
Ghana D	England C-	Colombia INC	South Africa C	United States D	England INC	Ireland C-	New Zealand C	Mexico C
Finland D	Ireland C-	England INC	New Zealand C-	Australia D-	Ghana INC	United States C-	Ghana D	Mozambique C
South Africa D	United States C-	Ghana INC	Australia D	Canada F	Ireland INC	Ghana D	South Africa D	Ghana D
Australia D-	Colombia D	Ireland INC	Canada D	Nigeria F	Mexico INC	Mexico D	Mexico F	England INC
Canada D-	Mexico D	Mexico INC	Ghana D	Scotland F	Mozambique INC	South Africa D	Mozambique F	Ireland INC
Ireland D-	Mozambique F	Scotland INC	Ireland D	South Africa F	Nigeria INC	Colombia F	Colombia INC	New Zealand INC
United States D-	Nigeria INC	South Africa INC	United States F	England INC	South Africa INC	Nigeria INC	Kenya INC	United States INC
Scotland F	Scotland INC	United States INC	Colombia INC	Mozambique INC	United States INC		Nigeria INC	Nigeria INC

Global Findings

- Wide global variation exists for most indicators, allowing potential for global learning transference
- Most countries are BOTH leading and lagging in some indicators
- In developed countries it seems we have built it but they are not coming
- When children are given the opportunity/freedom, they like to move
- A mix of physical activity opportunities are needed to reach desired levels: sport, play, chores, active transportation

Conclusion From Global Matrix 1.0

The global comparisons remind us of the importance of habitual physical activity, pervasive throughout the day – not simply planned and structured doses of movement. Physical activity is not an item to check off your list of things to do – it is a way of life.

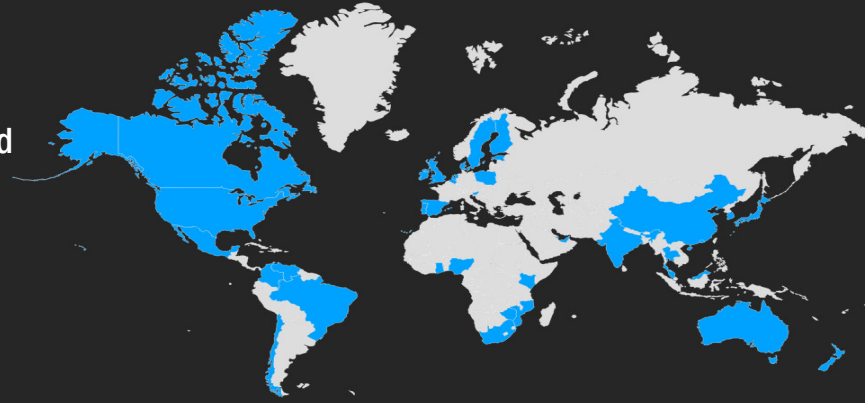
GLOBAL MATRIX 2.0

Report Cards were developed by

38 countries, from

6 continents, representing

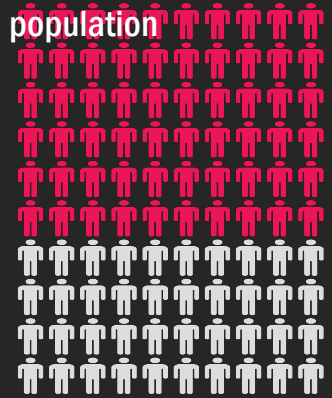
20% of countries in the world



The data reflect

60%

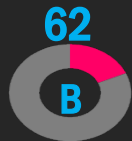
of the world's
population



342 grades were assigned to 9 indicators



We are
succeeding
with
≥80%
of children
and youth



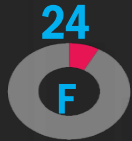
We are
succeeding with
60–79%
of children
and youth



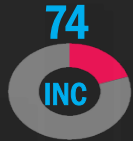
We are
succeeding with
40-59%
of children
and youth



We are
succeeding
with
20-39%
of children
and youth



We are
succeeding
with
<20%
of children
and youth



Incomplete—
inadequate
information to
assign a grade



ACTIVE HEALTHY KIDS
GLOBAL ALLIANCE

For more information visit www.activehealthykids.org

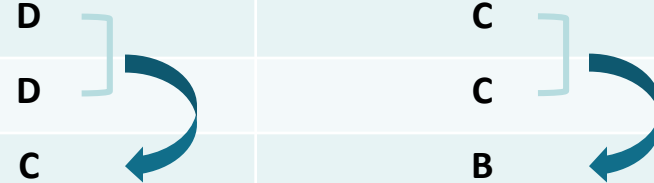


Behaviours

Key findings

- *The **majority** of children and youth in HIC are **not** meeting current PA recommendations*
- *Low overall physical activity in HIC influenced by **automation and convenience***

Country category	Overall PA	Active transport
High-income	D	C
Middle-income	D	C
Low-income	C	B





Sources of Influence

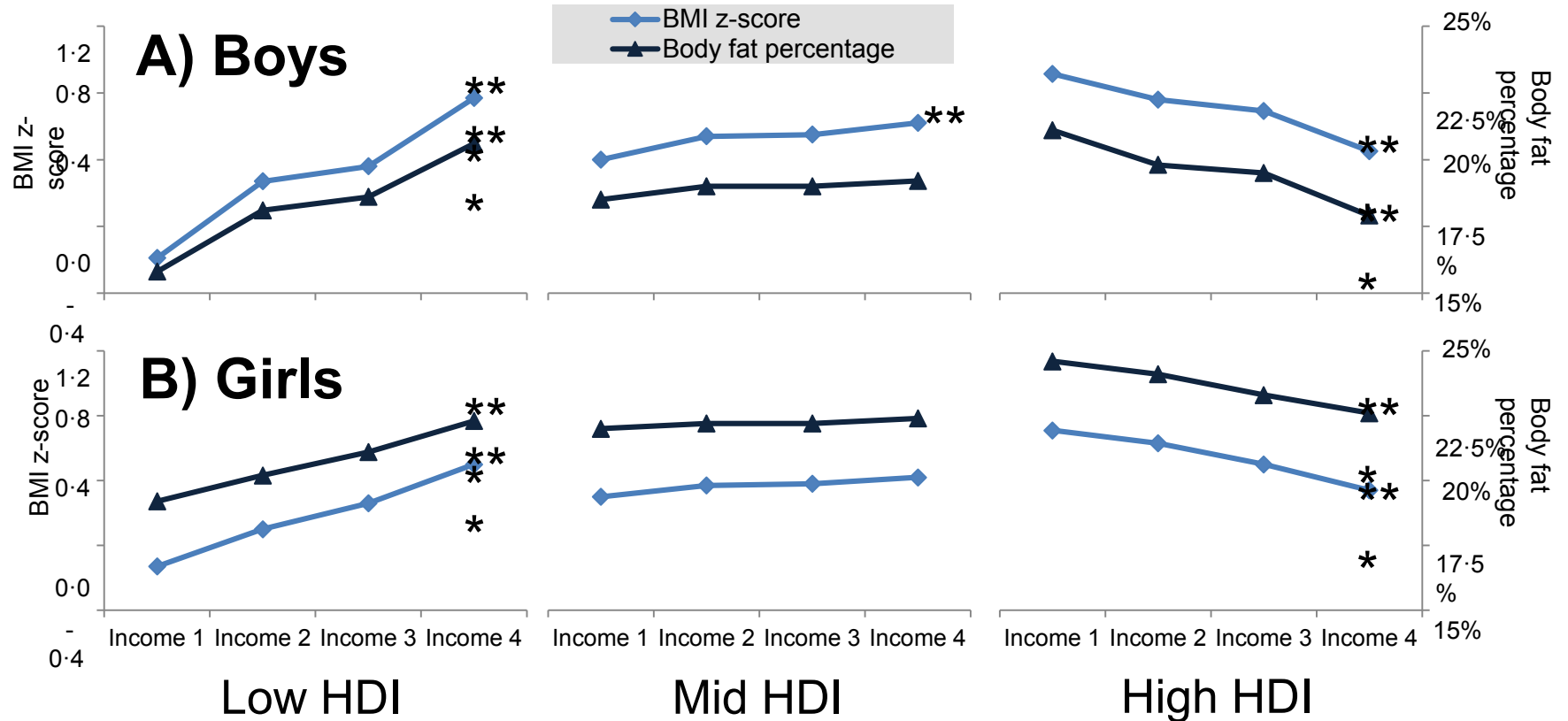
Key findings

- *A majority of HIC reported a supportive community and built environment and a high priority at a governmental level to facilitate physical activity, in contrast to LIC.*

Country category	Community and Built Environment	Government Strategies and Investments
High-income	B	B
Middle-income	C	C
Low-income	D	F

The epidemiological transition and the global childhood obesity epidemic

ST Broyles¹, KD Denstel¹, TS Church¹, J-P Chaput², M Fogelholm³, G Hu¹, R Kuriyan⁴, A Kurpad⁴, EV Lambert⁵, C Maher⁶, J Maia⁷, V Matsudo⁸, T Olds⁶, V Onywera⁹, OL Sarmiento¹⁰, M Standage¹¹, MS Tremblay², C Tudor-Locke^{1,12}, P Zhao¹³ and PT Katzmarzyk¹
for the ISCOLE Research Group



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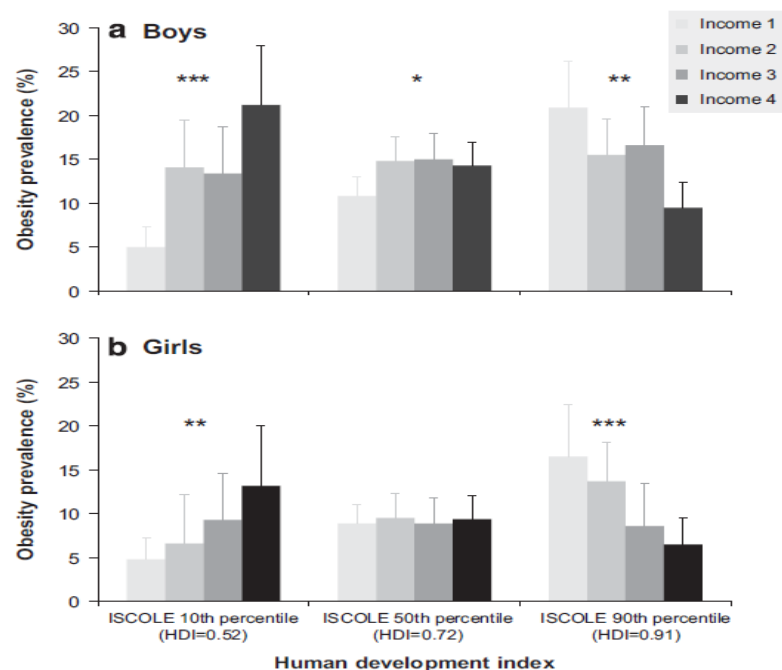
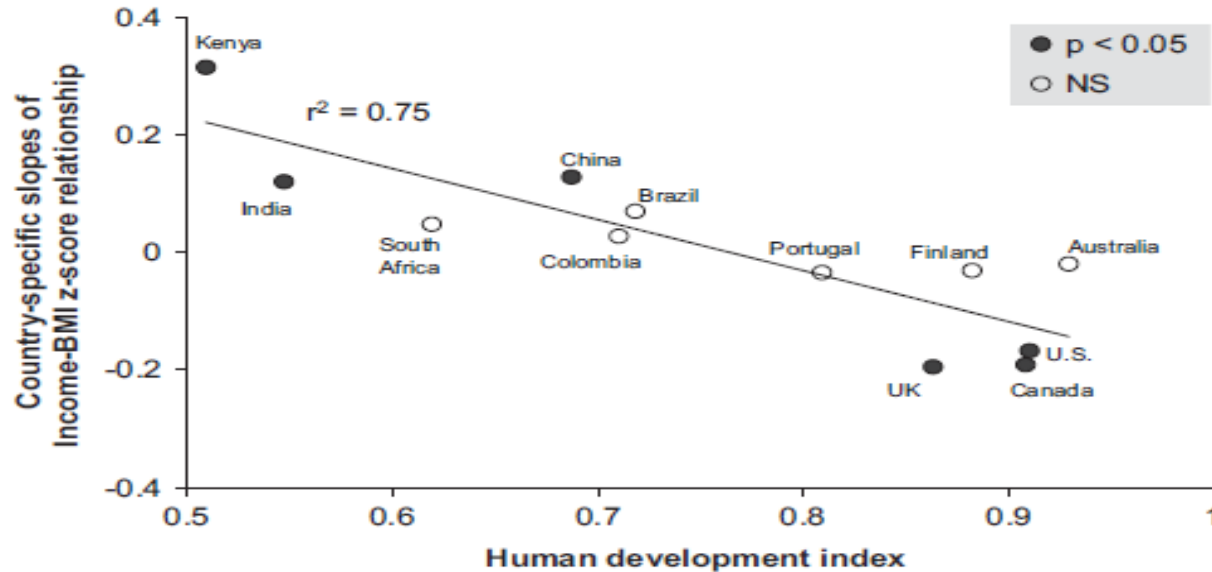


Figure 1. Income gradients in obesity prevalence across HDI levels in boys (a) and girls (b). Data are shown as least-square means at HDI levels corresponding to the 10th, 50th and 90th percentiles of the ISCOLE sample (HDI=0.52, 0.72 and 0.91, respectively). Tests for linear trend are indicated: * $P < 0.05$, ** $P < 0.001$; *** $P < 0.0001$.

The epidemiological transition and the global childhood obesity epidemic

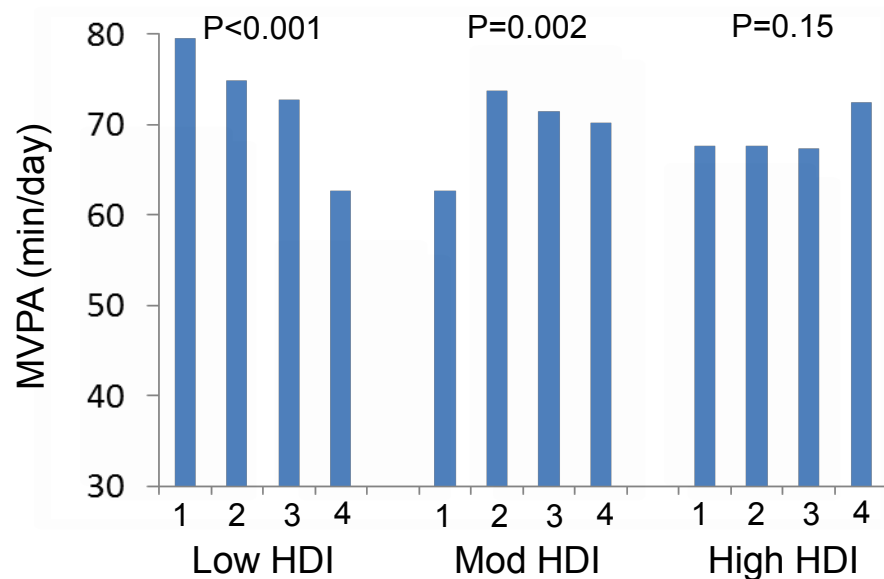
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The Global Context

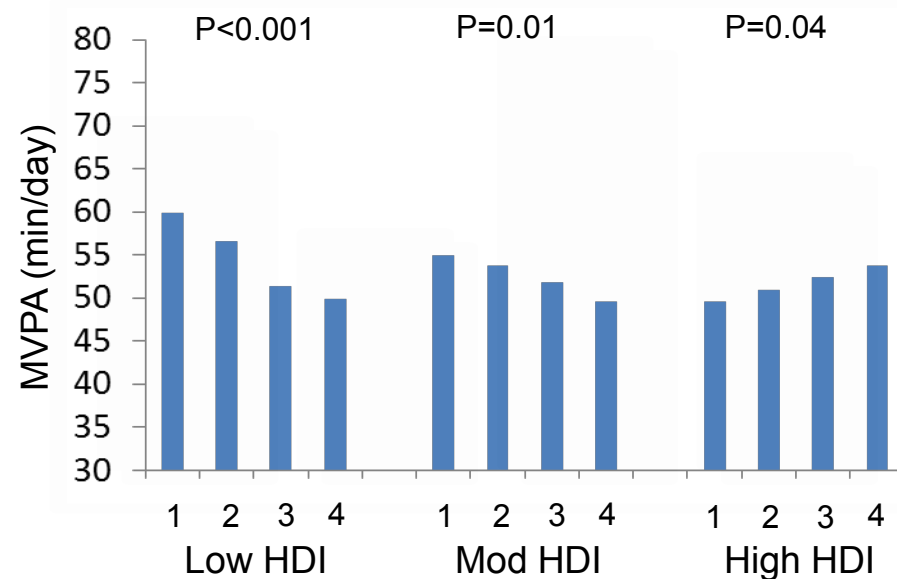


Physical Activity and Epidemiological Transition

Boys



Girls



Global Findings – Key Messages

- Global physical activity and sedentary behaviour grades are poor, reinforcing evidence of global childhood inactivity crisis
- Wide global variation across all indicators
- Average grades across all indicators were highest in Denmark, Slovenia and the Netherlands
- Lower income countries generally have better grades on active behaviours compared to higher income countries, yet worse grades for related strategies, supports and investments.
- Fewer attractive sedentary pursuits and increased autonomy to play and roam outdoors may be as important as infrastructure and structured activities to facilitate higher levels of childhood physical activity

Global Matrix 2.0



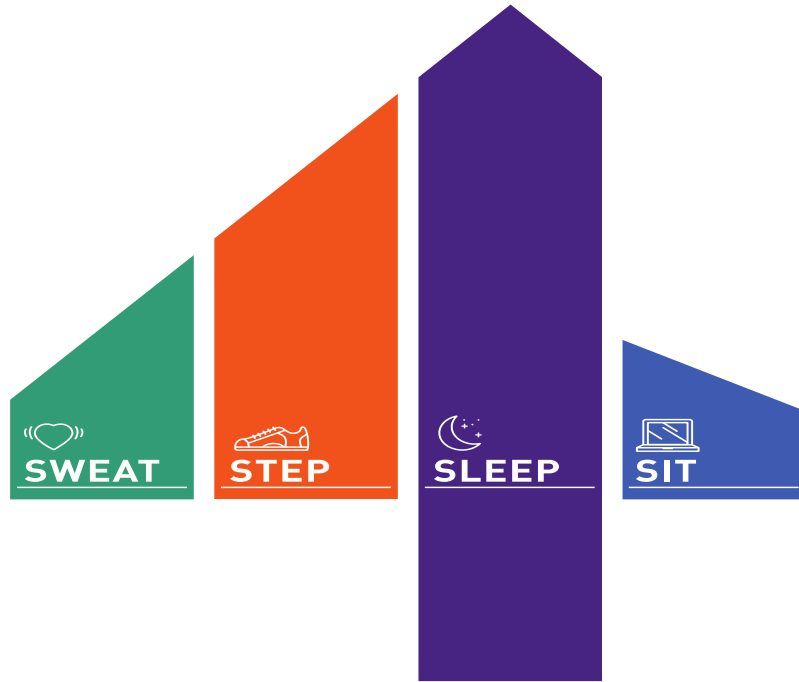
**Comparisons from
around the world
show physical activity
needs to be the norm,
not the exception**

READ THE GLOBAL MATRIX 2.0

www.activehealthykids.org

Global Matrix 3.0

- 49 countries participated
- Release on November 27, 2018, in Adelaide, Australia
- Special issue of *Journal of Physical Activity and Health* to publish findings
- Active Play considered the most important indicator by many countries, and the one experiencing the greatest transition, yet it is consistently the indicator with the most “INC” grades



Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep

Launched June 2016

Distribution of Movement Behaviours

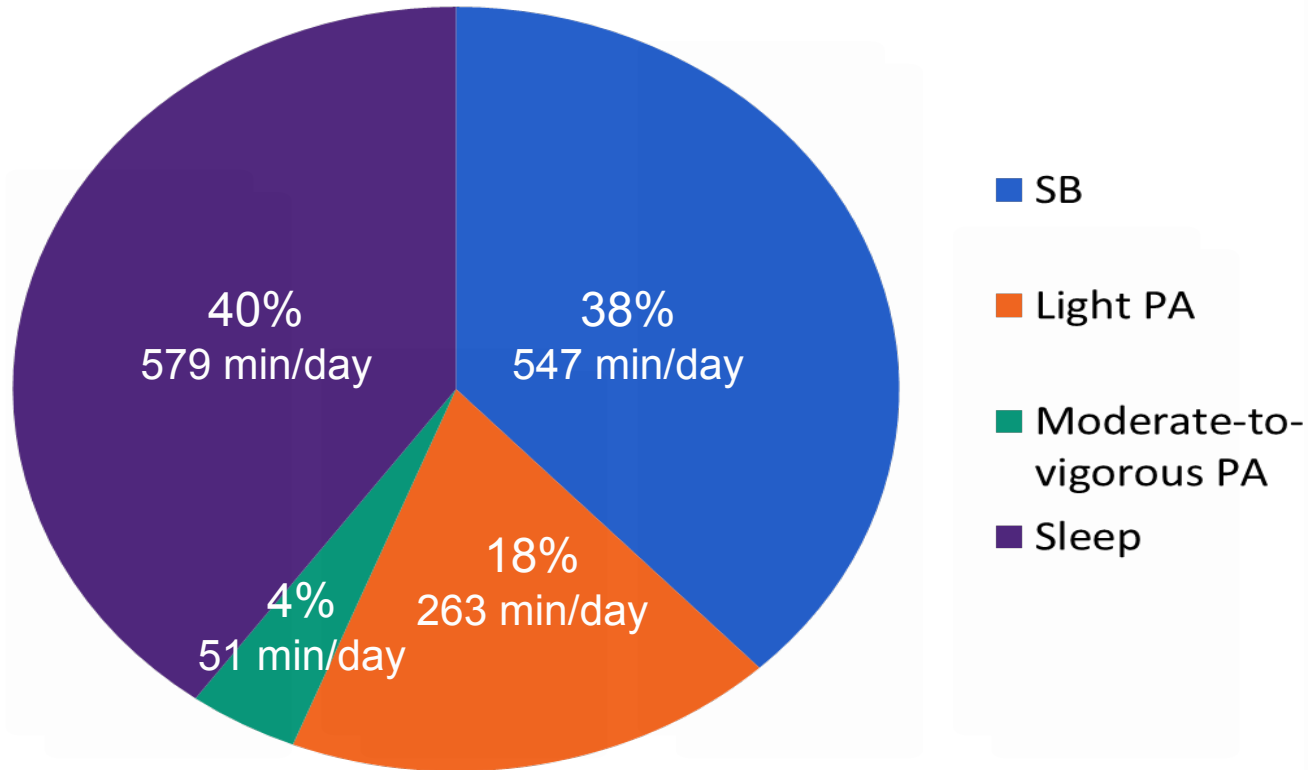


Table 1

Average daily physical activity, screen time and sleep, by sex and age group

Table 2

Percentages meeting specific time recommendations of 24-Hour Movement Guidelines for Children and Youth, by sex and age group, household population aged 5 to 17, Canada, 2009-to-2011 and 2012-to-2013 combined

Recommendations met	Ages 5 to 17			Ages 5 to 11			Ages 12 to 17		
	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls
	Percentage			Percentage			Percentage		
None	10.7	9.6	11.9	4.2 [†]	4.1	4.4	17.1	15.0	19.4
Sleep duration	75.3	77.2	73.3	82.6 [†]	82.7	82.4	68.1	71.7	64.3
Physical activity	36.0	46.8	24.6 [†]	47.6 [†]	59.6	35.0 [†]	24.4	34.1	14.1 [†]
Screen time	49.3	46.7	52.0	70.6 [†]	70.1	71.2	28.1	23.6	32.8 [†]
Sleep duration and physical activity	28.1	37.4	18.2 [†]	40.5 [†]	50.9	29.6 [†]	15.7	24.2	6.8 [†]
Sleep duration and screen time	40.0	39.1	41.0	59.5 [†]	59.1	60.0	20.6	19.3	21.9
Physical activity and screen time	20.7	26.6	14.4 [†]	34.6 [†]	43.8	25.0 [†]	6.8	9.7	3.8
All three	17.5	22.9	11.8 [†]	29.6 [†]	37.3	21.6 [†]	5.5	8.7	2.0

[†] significantly different from boys in same age range ($p < 0.05$)

[‡] significantly different from ages 12 to 17 ($p < 0.05$)

Notes: Based on respondents with 4 or more valid days of accelerometer data. For 2012-to-2013 data, active video games were excluded from screen time.

Source: 2009-to-2011 and 2012-to-2013 Canadian Health Measures Survey (combined).

[†] significantly different from ages 12 to 17 ($p < 0.05$)

Source: 2009-to-2011 and 2012-to-2013 Canadian Health Measures Survey (combined).

GUIDELINES

For optimal health benefits, children and youth (aged 5–17 years) should achieve high levels of physical activity, low levels of sedentary behaviour, and sufficient sleep each day.

A healthy 24 hours includes:



Preserving sufficient sleep, trading indoor time for outdoor time, and replacing sedentary behaviours and light physical activity with additional moderate to vigorous physical activity can provide greater health benefits.

SWEAT

MODERATE TO VIGOROUS PHYSICAL ACTIVITY

An accumulation of at least 60 minutes per day of moderate to vigorous physical activity involving a variety of aerobic activities. Vigorous physical activities, and muscle and bone strengthening activities should each be incorporated at least 3 days per week;

STEP

LIGHT PHYSICAL ACTIVITY

Several hours of a variety of structured and unstructured light physical activities;

SLEEP

SLEEP

Uninterrupted 9 to 11 hours of sleep per night for those aged 5–13 years and 8 to 10 hours per night for those aged 14–17 years, with consistent bed and wake-up times;

SIT

SEDENTARY BEHAVIOUR

No more than 2 hours per day of recreational screen time;
Limited sitting for extended periods.



**A Common Vision for Increasing
Physical Activity and Reducing
Sedentary Living in Canada**



**LET'S
GET
MOVING**

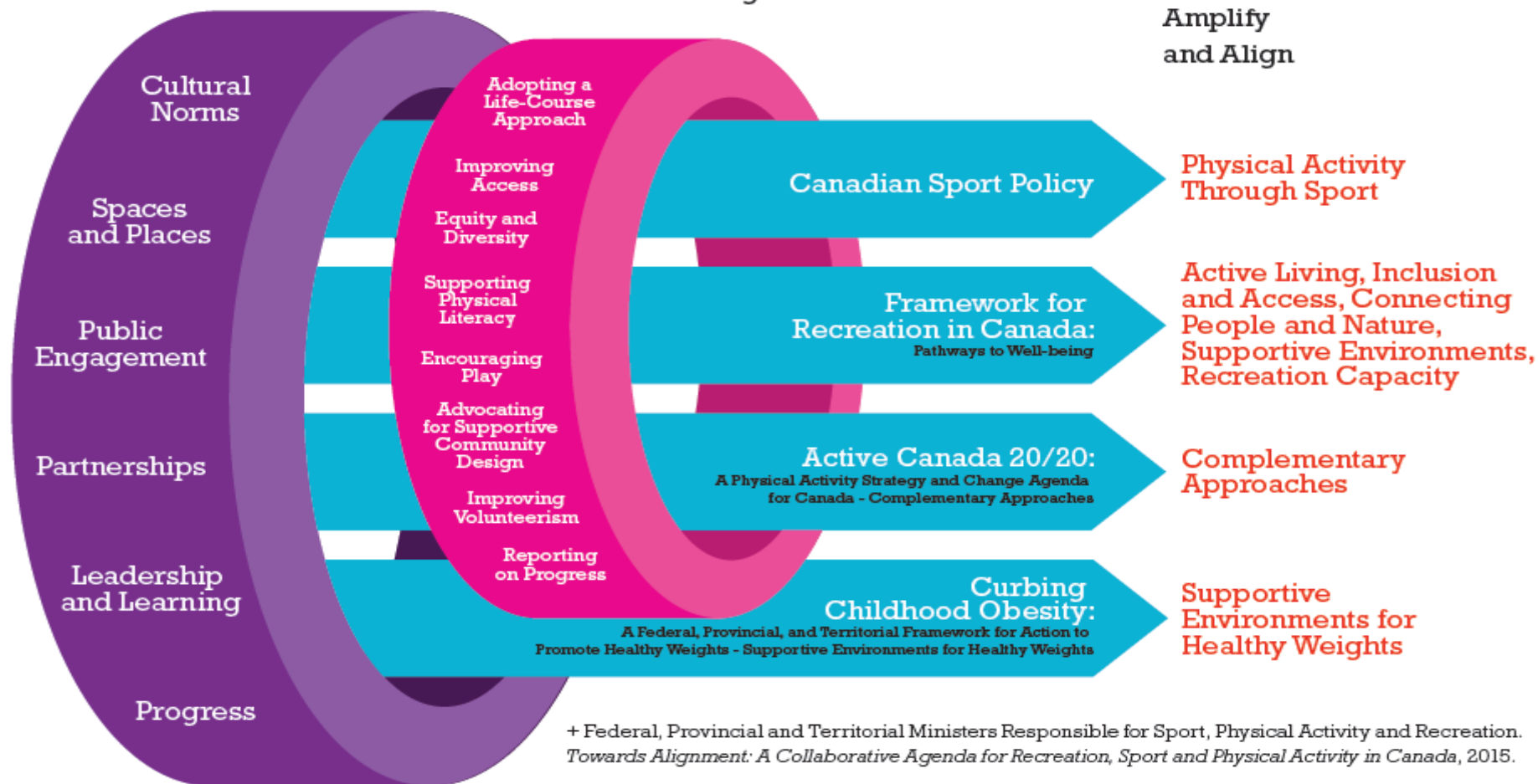
May 31, 2018

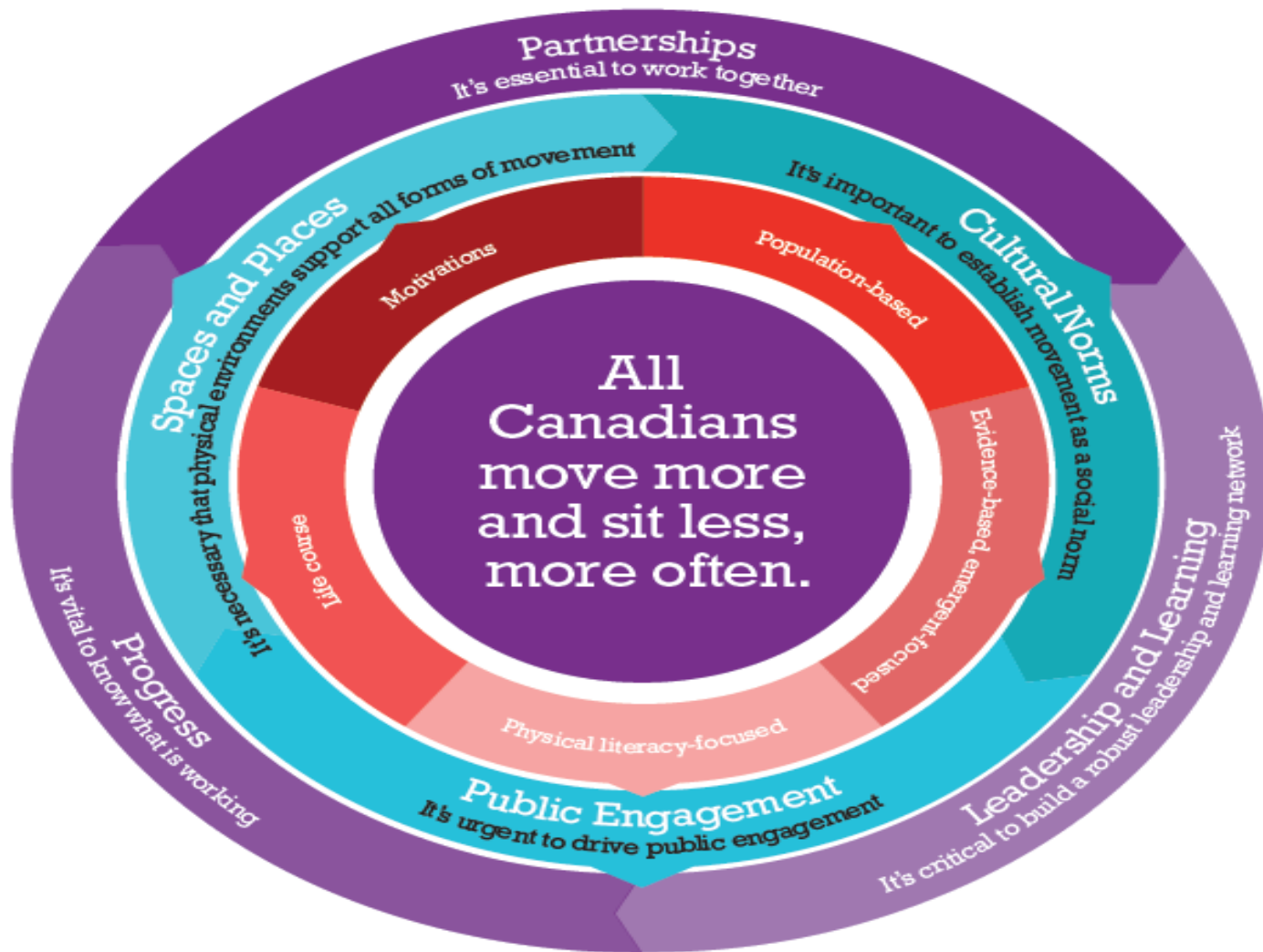
Common Vision

Areas of Focus

Areas of Convergence+

*Amplify
and Align*





FACTORS THAT INCREASE PHYSICAL ACTIVITY IN KIDS

Parents' activity level

60 minutes of a parent's physical activity = **+15 minutes** to a child's average daily physical activity.⁴



Active lessons, leagues, and team sports

60 minutes of participation in organized activities = **+10 minutes** to a child's average daily physical activity.⁴



Time outdoors

60 minutes outdoors = **+7 minutes** to a child's average daily physical activity.⁵



MORE ACTIVE PEOPLE FOR A HEALTHIER WORLD



Vision

**More active people
for a healthier world.**



Mission

**To ensure that all
people have access
to safe and enabling environments
and to diverse opportunities to
be physically active in their daily
lives, as a means of improving
individual and community
health and contributing to the
social, cultural and economic
development of all nations.**



Target

**A 15% relative
reduction in the
global prevalence of physical
inactivity in adults and in
adolescents by 2030.**







Getting back to the basics
**“In 1900 people were paid to be
physically active,
in 2000 people need to pay to be
physically active.”**

Dr. Frank Booth



Some ideas to prevent obesity

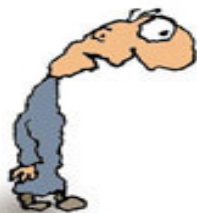
- Reduce time reference from an hour to a minute
- Reduce activity reference from 200 kcal to 2 kcal
- Reduce focus on only one movement behaviour
- Reduce auto-dependency
- Reduce reward (food, awards, prizes) dependency
- Reduce institutional approaches and dependencies
- Reduce nature-deficit disorder
- Reduce screen time
- Reduce indoor time
- Reduce chair time



Concluding remarks

- We have been working hard, and making progress, but much more to be done
- Focus on healthy active living, not obesity per se
- Move focus up on the health continuum – promote wellness
- Primary prevention must become a higher priority
- Magic bullets and gadgets are unlikely solutions
- Back to basics approach remains robust
- Physical activity opportunities must be pervasive
- The whole day matters – 24-hour movement paradigm
- Understand the impact of larger societal trends
 - *e.g., physical activity transition, indoor time, screen time, sleep*

what are
you doing?



I'm using
my device...



What is
your device?



My device is
the sky.



Does your device have
many applications?



Yes. It has sun,
moon, clouds
and birds.



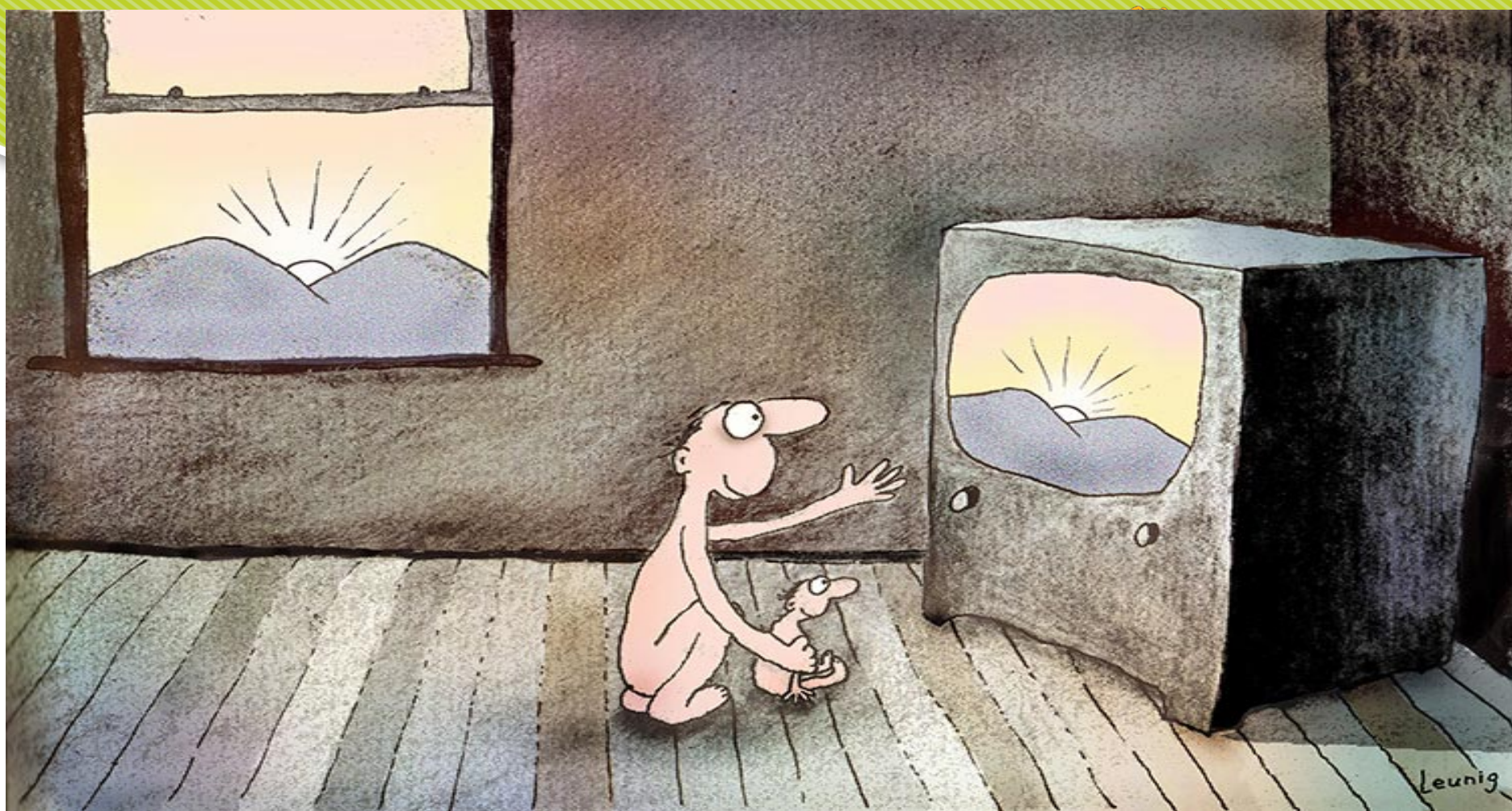
And do you have
to recharge your device
very often?



I don't ever have
to recharge my device.
It recharges me.



Leunig



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