## Progresos, desafios y oportunidades para la promoción de actividad física desde de Lancet 2016

Primera cumbre de programas gubernamentales de actividad física de las Américas

Rodrigo S Reis, PhD

**Prevention Research Center** 

Washington University in St Louis, USA

September 6, Hotel Tequendama, Bogota, Colombia

## THE LANCET

Physical Activity - July, 2012



"In view of the prevalence, global reach, and health effect of physical inactivity, the issue should be appropriately described as pandemic, with far-reaching health, economic, environmental, and social consequences."

## THE LANCET

#### Physical Activity 2016: Progress and Challenges



"We urge all sectors of government and society to take immediate, bold actions to help make active living a more desired, affordable, and accessible choice for all population groups."

A Series by The Lancet

#### #PhysAct2016

**Physical Activity** 

# More of the same is not enough

## More of the same is not enough

 Physical activity is important not only for health

Physical activity is a basic human right
 – Not an obligation, actually a choice

• Accountability is an essential concept







Magnitude







#### Consequences



Way forward

Interventions

- 1. GLOBAL PHYSICAL ACTIVITY LEVELS: SURVEILLANCE PROGRESS, PITFALLS, AND PROSPECTS
- 2. CORRELATES OF PHYSICAL ACTIVITY: WHY ARE SOME PEOPLE PHYSICALLY ACTIVE AND OTHERS NOT?
- **3.** EFFECT OF PHYSICAL INACTIVITY ON MAJOR NON-COMMUNICABLE DISEASES WORLDWIDE: AN META-ANALYSIS OF BURDEN OF DISEASE AND LIFE EXPECTANCY
- 4. EVIDENCE-BASED INTERVENTION IN PHYSICAL ACTIVITY: LESSONS FROM AROUND THE WORLD
- 5. The implications of megatrends in information and communication technology and transportation for changes in global physical activity
- 6. THE PANDEMIC OF PHYSICAL INACTIVITY: GLOBAL ACTION FOR PUBLIC HEALTH

## Key messages

## THE LANCET

www.thelancet.co

• High prevalence of inactivity worldwide

- 1/3 adults (122 countries)
- 4/5 adolescents (105 countries)
- 5.3 million deaths per year
  - Same as smoking
  - More than obesity
- Scarcity of evidence on PA correlates & determinants from LMICs



"In view of the prevalence, global reach, and health effect of physical inactivity, the issue should be appropriately described as pandemic, with far-reaching health, economic, environmental, and social consequences."

#### • Pandemic

#### **Physical Activity**

Physical Activity - July, 2012

"Governments, policy makers and the research community should help to build societies in which the choice of being physical active is not only <u>healthy</u>, but also <u>convenient</u>, <u>enjoyable</u>, <u>safe</u>, <u>affordable</u> and <u>valued</u>"



- 1. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women
- 2. THE ECONOMIC BURDEN OF PHYSICAL INACTIVITY: A GLOBAL ANALYSIS OF MAJORNON-COMMUNICABLE DISEASES
- 3. PHYSICAL ACTIVITY 2016: PROGRESS AND CHALLENGES: PROGRESS IN PHYSICAL ACTIVITY OVER THE OLYMPIC QUADRENNIUM
- 4. Scaling up physical activity interventions worldwide: stepping up to larger and smarter approaches to get people moving

- DOES PHYSICAL ACTIVITY ATTENUATE, OR EVEN ELIMINATE, THE DETRIMENTAL ASSOCIATION OF SITTING TIME WITH MORTALITY? A HARMONISED META-ANALYSIS OF DATA FROM MORE THAN 1 MILLION MEN AND WOMEN
- 2. THE ECONOMIC BURDEN OF PHYSICAL INACTIVITY: A GLOBAL ANALYSIS OF MAJORNON-COMMUNICABLE DISEASES
- 3. Physical Activity 2016: Progress and Challenges: Progress in Physical Activity over the Olympic quadrennium
- 4. SCALING UP PHYSICAL ACTIVITY INTERVENTIONS WORLDWIDE: STEPPING UP TO LARGER AND SMARTER APPROACHES TO GET PEOPLE MOVING

## Goal

- To summarise progress in the topics covered in the first series
  - Surveillance
  - Health consequences
  - Correlates and determinants
  - Interventions
  - Policy

## THE LANCET

#### Physical Activity 2016: Progress and Challenges



"We urge all sectors of government and society to take immediate, bold actions to help make active living a more desired, affordable, and accessible choice for all population groups."

A Series by The Lancet

#### #PhysAct2016

## Surveillance



Figure 1: Physical activity data availability for school-going adolescents (aged 11–17 years) and adults (aged ≥18 years) Data are from WHO Global Health Observatory, 2015.

Adults: 122 countries (2012), 146 (2016) Adolescents: 105 countries (2012), 120 (2016) No changes in prevalence over the 4-years period

## Health consequences (mental health)

				Risk Ratio	Risk Ratio
Study or Subgroup	log[Risk Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95% Cl
Fabrigoule et al (1995)	-1.8326	0.5935	1.4%	0.16 [0.05, 0.51]	
Abbott et al (2004)	-0.6707	0.263	4.7%	0.51 [0.31, 0.86]	
Bowen (2012)	-0.5358	0.124	8.2%	0.59 [0.46, 0.75]	-
Gureje et al (2011)	-0.7736	0.3474	3.3%	0.46 [0.23, 0.91]	<b>-</b>
Chang et al (2010)	-0.3026	0.3808	2.9%	0.74 [0.35, 1.56]	
Kim et al (2011)	-0.9676	0.2789	4.4%	0.38 [0.22, 0.66]	_ <b></b>
Larson et al (2006)	-0.4418	0.1568	7.2%	0.64 [0.47, 0.87]	
De Bruijn et al (2013)	-0.2485	0.0408	10.1%	0.78 [0.72, 0.84]	•
Laurin et al (2001) - Female	-1.1028	0.3029	4.0%	0.33 [0.18, 0.60]	
Laurin et al (2001) - Male	-0.4133	0.2848	4.3%	0.66 [0.38, 1.16]	
Morgan et al (2014) - Leisure	0.03	0.2555	4.8%	1.03 [0.62, 1.70]	
Morgan et al (2014) - Vocation	-0.046	0.3158	3.7%	0.96 [0.51, 1.77]	<b>_</b> _
Podewils et al (2005)	-0.2239	0.1228	8.2%	0.80 [0.63, 1.02]	
Ravaglia et al (2008)	-0.7691	0.2627	4.7%	0.46 [0.28, 0.78]	_ <b></b>
Rovio et al (2005)	-0.5725	0.2995	4.0%	0.56 [0.31, 1.01]	
Rovio et al (2007) - Transport	-0.152	0.7487	0.9%	0.86 [0.20, 3.73]	
Rovio et al (2007) - Vocation	0.4691	0.333	3.5%	1.60 [0.83, 3.07]	+
Scarmeas et al (2009)	-0.542	0.1372	7.8%	0.58 [0.44, 0.76]	
Taafe et al (2008) - high function	0.2469	0.3303	3.5%	1.28 [0.67, 2.45]	_ <b>+</b> •
Taafe et al (2008) - low function	-0.734	0.2936	4.1%	0.48 [0.27, 0.85]	
Taafe et al (2008) - moderate function	-0.2485	0.3945	2.8%	0.78 [0.36, 1.69]	
Yoshitake et al (1995)	-1.7148	0.5605	1.6%	0.18 [0.06, 0.54]	
Total (95% CI)			100.0%	0.63 [0.55, 0.74]	◆
Heterogeneity: Tau <sup>2</sup> = 0.06; Chi <sup>2</sup> = 55.08, df = 21 (P < 0.0001); l <sup>2</sup> = 62%					
Test for overall effect: Z = 5.96 (P < 0.00)	001)	/			0.01 0.1 1 10 100

#PhysAct2016

#### PAF: 3.8%; ~300,000 cases every year

## Correlates and interventions (LMICs)

- + studies on correlates and determinants from LMICs
  - 7.2 per year (up to 2012) to 32.8 per year (2012 onwards)
  - Urban residents less active
  - Virtually all studies from upper-middle income countries
- 15 intervention studies from LMICs identified since 2012
  - Promising interventions from Iran, Brazil and Colombia

Policy

• LPAS 1

• GoPA!

- UN Declaration
- 10% reduction target by 2025



## Physical Activity Country Cards http://www.globalphysicalactivityobservatory.com



Name

#PhysAct2016

"Progress on physical activity has been far from proportionate to the documented burden of disease from physical inactivity in countries of all income levels"

- DOES PHYSICAL ACTIVITY ATTENUATE, OR EVEN ELIMINATE, THE DETRIMENTAL ASSOCIATION OF SITTING TIME WITH MORTALITY? A HARMONISED META-ANALYSIS OF DATA FROM MORE THAN 1 MILLION MEN AND WOMEN
- 2. THE ECONOMIC BURDEN OF PHYSICAL INACTIVITY: A GLOBAL ANALYSIS OF MAJORNON-COMMUNICABLE DISEASES
- 3. PHYSICAL ACTIVITY 2016: PROGRESS AND CHALLENGES: PROGRESS IN PHYSICAL ACTIVITY OVER THE OLYMPIC QUADRENNIUM
- 4. SCALING UP PHYSICAL ACTIVITY INTERVENTIONS WORLDWIDE: STEPPING UP TO LARGER AND SMARTER APPROACHES TO GET PEOPLE MOVING

## The burden of physical inactivity

- <u>M</u>orbidity!
- <u>Mortality!</u>
- <u>Money?</u>



#PhysAct2016



## **Objectives**

- Provide the first estimate for the economic burden of physical inactivity for each country and at the global level
- Understand "who pays?"
- Estimate lifetime disease burden and compare its distribution with the economic burden

#### #PhysAct2016



## Types of costs

#### **Direct/health-care costs**



#### **Indirect costs**

- Productivity losses due to
  - <u>Pre-mature deaths</u>
  - Disability
  - Absenteeism
  - Presenteeism
- Informal care
- Transportation
- Other costs

#### THE LANCET

## Steps 1-2

	Unadjusted RR	Adjusted RR
CHD <sup>1</sup>	1.33 (1.18-1.49)	1.16 (1.04-1.30)
Stroke <sup>2</sup>	1.42 (1.26-1.60)	1.18 (1.08-1.28)
Breast cancer <sup>1</sup>	1.34 (1.25-1.43)	1.33 (1.26-1.42)
Colon cancer <sup>1</sup>	1.38 (1.31-1.45)	1.32 (1.23-1.39)
T2 diabetes <sup>1</sup>	1.63 (1.27-2.11)	1.20 (1.10-1.33)
All-cause mortality <sup>1</sup>	1.47 (1.38-1.57)	1.28 (1.21-1.36)

<sup>1</sup>Lee IM, Shiroma EJ, Lobelo F et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012;380(9838):219-29. <sup>2</sup>Wendel-Vos GC, Schuit AJ, Feskens EJ, et al. Physical activity and stroke. A meta-analysis of observational data. *Int J Epidemiol* 2004; 33(4): 787-98.





Physical activity prevalence WHO Global Health Observatory (2015) for 146 countries Based on updated WHO PA recommendations:

- Moderate PA: 150 min/week
- Vigorous PA: 75 min/week
- Equivalent combinations

#### Panel 2: Formulae for calculation of population attributable fraction (PAF)

Formula 1, using unadjusted relative risk:

$$AF(\%) = \frac{P_s(RR_{mag}-1)}{P_s(RR_{mag}-1)+1} \times 100$$

Where P, is the proportion of inactive people in the source population, and RR<sub>unel</sub> is the relative risk of disease, comparing inactive with active people, unadjusted for confounding factors.

Formula 2, using adjusted relative risk:

$$PAF(\%) = \frac{P_e(RR_{sel}-1)}{RR_{sel}} \times 100$$

Where P<sub>n</sub> is the proportion of inactive people among cases, and RR<sub>sel</sub> is the relative risk of disease, comparing inactive with active people, adjusted for confounding factors.



#### THE LANCET

## Steps 5-6

#### Total number of cases

- Global Burden of Disease (GBD) Study 2013 data
- Prevalence of type 2 diabetes and colon cancer calculated using adjustment factors

#### Cost per case of disease

- International Diabetes
   Federation (IDF)
- Two EU studies:
  - Luengo-Fernandez et al. 2013
  - Leal et al. 2012
- Extrapolate costs to other countries

## Who pays?

#### Health-care cost





## PublicPrivate/third partyHouseholds

#### THE LANCET

#### First global estimate:

- Physical inactivity cost the world \$67.5 billion INT in 2013
  - \$53.8 billion in healthcare cost (0.64% total expenditure)
    - Public: 31.2 billion
    - Private: 12.9 billion
    - Household: 9.7 billion
  - \$13.7 billion in productivity losses
- Physical inactivity responsible for 13.4 million DALYs

#### THE LANCET

#### **Country-specific estimates**

When converted into local currencies in 2013, physical inactivity cost

- US: <u>\$27.8 billion USD</u> (\$24.7 bi direct + \$3.1 bi indirect)
- UK: <u>£1.7 billion GBP</u> (£1.3 bi direct + £400 mi indirect)
- **Brazil**: <u>R\$3.3 billion BRL</u> (R\$2.6 bi direct + R\$602 mi indirect)
- Australia: <u>\$805 million AUD</u> (\$640 mi direct + \$165 mi indirect)





#### THE LANCET

### Conclusions

- Physical inactivity pandemic is costly (even when conservatively estimated)
- Likely to get more costly
- Global inequalities
- Action is urgently needed

#### #PhysAct2016



Physical Activity 2016: Progress and Challenges



"We urge all sectors of government and society to take immediate, bold actions to help make active living a more desired, affordable, and accessible choice for all population groups."

A Series by The Lancet

#### THE LANCET

- 1. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women
- 2. THE ECONOMIC BURDEN OF PHYSICAL INACTIVITY: A GLOBAL ANALYSIS OF MAJORNON-COMMUNICABLE DISEASES
- 3. PHYSICAL ACTIVITY 2016: PROGRESS AND CHALLENGES: PROGRESS IN PHYSICAL ACTIVITY OVER THE OLYMPIC QUADRENNIUM
- 4. SCALING UP PHYSICAL ACTIVITY INTERVENTIONS WORLDWIDE: STEPPING UP TO LARGER AND SMARTER APPROACHES TO GET PEOPLE MOVING

### Introduction

- High amounts of time spent sedentary have been associated with increased risks for several chronic conditions and mortality
- It is unclear whether physical activity attenuates or even eliminates the detrimental effects of prolonged sitting



Even if you're fit and active, that desk job is seriously bad



## **Systematic Review**

- Six databases inception to October 2014 (updated October 10<sup>th</sup> 2015)
- Prospective cohort studies that have individual level exposure (PA and sitting/TV-viewing) and outcome data (all-cause mortality)
- Effect estimates (HR, OR, RR with 95% CI)
- PRISMA guidelines
- Review protocol PROSPERO

#### THE LANCET

## **Study Selection**



#### THE LANCET

## Results

- Sitting, PA and all-cause mortality:
- 13 studies (N=1,005,791) followed between 2 and 18 years, during which 84609 (8.4%) died
- 9 studies CVD mortality (N=849,108; 24,481 deaths)
- 8 studies cancer mortality (N=777,744; 30,137 deaths)
- TV-viewing time, PA and all-cause mortality:
- 6 studies (N=465,450; 43,740 deaths)

#### THE LANCET

## **Results:** *Combined associations* – **Physical Activity, Sitting and Mortality**



THE LANCET

## **Results:** *Combined associations* – **Physical Activity, TV and Mortality**



THE LANCET

## **Results:** *Stratified associations* – Physical Activity, Sitting and Mortality

	<4 h/day of	4–<6 h/day of	6–8 h/day of	>8 h/day of sitting
	sitting time	sitting time	sitting time	time
≤2·5 MET-h per	1 (ref)	1·08 (1·04-1·12)	1·09 (1·05–1·14)	1·27 (1·22–1·32)
week	(N=76 212; 6646)	(N=48613; 5224)	(N=66839; 5820)	(N=60730; 6018)
16 MET-h per week	1 (ref)	1·04 (1·00–1·07)	1.06 (1.02–1.10)	1·12 (1·07–1·17)
	(N=77 651; 7221)	(N=73 444; 7873)	(N=51263; 5322)	(N=60 838; 5012)
30 MET-h per week	1 (ref)	1·05 (1·01–1·10)	1.03 (0.98–1.08)	1·10 (1·04-1·16)
	(N=75365; 5387)	(N=63 959; 5489)	(N=48 292; 3504)	(N=52 576; 3487)
>35·5 MET-h per	1 (ref)	1.00 (0.96–1.04)	1.01 (0.97-1.06)	1·04 (0·98–1·10)
week	(N=90762; 6208)	(N=65 976; 5268)	(N=49715; 3565)	(N=43 856; 2717)

#### THE LANCET

## **Results:** *Stratified associations* – Physical Activity, TV and Mortality

	<1 h/day of	1–2 h/day of	3–4 h/day of	≥5 h/day of
	TV-viewing time	TV-viewing time	TV-viewing time	TV-viewing time
≤2·5 MET-h per	1 (ref)	1·00 (0·94–1·08)	1·10 (1·02–1·18)	1·44 (1·34–1·56)
week	(N=10 609; 1064)	(N=33 411; 3382)	(N=40 688; 4702)	(N=22 779; 3533)
16 MET-h per week	1 (ref)	1·00 (0·93–1·08)	1·08 (1·01–1·15)	1·29 (1·19–1·39)
	(N=12 280; 984)	(N=45 493; 4098)	(N=51917; 5576)	(N=21365; 2870)
30 MET-h per week	1 (ref)	1·08 (0·98–1·18)	1·17 (1·07–1·27)	1·41 (1·28–1·56)
	(N=11232; 613)	(N=39 807; 2589)	(N=43 699; 3675)	(N=17563; 1925)
>35·5 MET-h per	1 (ref)	0·96 (0·88–1·04)	(0·93–1·10)	1·15 (1·05–1·27)
week	(N=12 478; 752)	(N=40 642; 2738)	(N=44 018; 3551)	(N=17 469; 1688)

#### THE LANCET

## **Public Health Relevance**

- The association between sitting time and mortality is eliminated in the most active 25%
- The risk of death is substantially lower already in the second quartile of PA (≈30 min of MVPA) compared with the 'inactive', lowest quartile regardless of sitting time
- More than 3 hours/d of TV viewing appears is associated with increased risk except in the most active quartile
- 59% increased risk in those who sat for >8 hours/d +
   "inactive" is similar to smoking (65%) and obesity (45%)

#### THE LANCET

## **Discussion – Public Health Relevance**



Physical Activity 2016: Physical Activity, Sitting time and Mortality

#### THE LANCET

## Conclusion (#PhysAct2016)

High levels of moderate intensity physical activity seem to eliminate the increased risk of death associated with high sitting time.

However, this level attenuates, but do not fully eliminate the increased risk associated with high TV-viewing time.If long periods of sitting time each day are unavoidable it is even more important to also be physically active







- DOES PHYSICAL ACTIVITY ATTENUATE, OR EVEN ELIMINATE, THE DETRIMENTAL ASSOCIATION OF SITTING TIME WITH MORTALITY? A HARMONISED META-ANALYSIS OF DATA FROM MORE THAN 1 MILLION MEN AND WOMEN
- 2. THE ECONOMIC BURDEN OF PHYSICAL INACTIVITY: A GLOBAL ANALYSIS OF MAJORNON-COMMUNICABLE DISEASES
- 3. PHYSICAL ACTIVITY 2016: PROGRESS AND CHALLENGES: PROGRESS IN PHYSICAL ACTIVITY OVER THE OLYMPIC QUADRENNIUM
- 4. Scaling up physical activity interventions worldwide: stepping up to larger and smarter approaches to get people moving

### **Lancet Physical Activity Series 1 (2012)**

- 1. Global physical activity levels: surveillance progress, pitfalls, and prospects
- 2. Correlates of physical activity: why are some people physically active and others not?
- 3. Effect of physical inactivity on major non-communicable diseases worldwide: an metaanalysis of burden of disease and life expectancy
- 4. Evidence-based intervention in physical activity: lessons from around the world
- 5. The implications of megatrends in information and communication technology and transportation for changes in global physical activity
- 6. The pandemic of physical inactivity: global action for public health

#hashtag #PhysAct2016

#### THE LANCET

## What can be learnt about scaling up physical activity interventions from the scientific literature?

#hashtag #PhysAct2016



### **Systematic Review**

- Peer-reviewed literature (English); PUBMED & SCOPUS
- Intervention defined as a "set of actions with a coherent objective to bring about change or produce identifiable outcomes."
- Scalability search terms:
  - Vertically e.g., (institutionalization) and horizontally (e.g., dissemination, roll-out) scaled-up interventions
  - Truly scaled-up interventions: those which had 'outgrown research-dependency' and had become 'embedded into a system.
- Abstraction: External validity (EVAT); Seven best investments; ExpanNet.

#### THE LANCET

### Drawing from the knowledge and experience of key researchers and stakeholders from around the world?

#hashtag #PhysAct2016

#### THE LANCET

### **Delphi Method (adapted)**

- Practitioners and researchers from HICs, U-MICs, L-MICs & LICs from the Global Observatory for Physical Activity (GoPA) (n=139)
- Round 1 (n=74)
  - Key factors when deciding to scale up a physical activity intervention & examples of interventions (open-ended)
- Round 2 (n=67)
  - 16 Scalability factors emerged from Round 1
  - Ratings of importance and feasibility on a 10-point scale
- Pattern Matching & Spearman 's rank correlation (country income; research x practice)

#### THE LANCET





#hashtag #PhysAct2016

## Scale-up and effectiveness of strategies: lessons in finding balance



### **Case Studies by Country Income & Effectiveness**

**CATCH (HIC, USA)** •Whole-of-school program

•Horizontal & vertical scalability

•Emerged from: research world

•PA main outcome

•R.E.A.I.M. elements are present

•Effective

•Successful translation to practice (~20 years)

BRT (U-MIC, Brazil)

•Transportation systems

•Horizontal scalability (~150 cities worldwide)

•Emerged from: real world

•PA is a co-benefit

•R.E.A.I.M. elements scarce or inconsistent

•Emerging effectiveness

• Successfully scaled up in some settings (political and infrastructure support) S4D (LICs, Africa) •Sports systems & programs

•Horizontal scalability (some institutionalization)

•Emerged from: real world

•PA is a co-benefit

•R.E.A.I.M. elements scarce (Humanitarian aid; UN support)
•Effectiveness not examined

•Scalability not driven by evidence (though embedded in a system)

#### THE LANCET

## Tying it all together: developing a framework for scaling up physical activity interventions

#hashtag #PhysAct2016







#### **Key Messages**

- Proven efficacy in controlled settings, partnerships beyond the health sector, and early institutionalization.
- 50 + unique physical activity interventions were identified that have been scaled up but not reported in the peer-reviewed literature
- Not every intervention implemented at scale is effective in increasing population physical activity levels, and not every effective, researcher-led intervention is scalable
- Researchers, funding agencies, journals should prioritise studies for assessing the impact of real-world physical activity interventions

#### THE LANCET

#### **Key Messages**

- Action-oriented framework will help researchers to focus on the most important factors in the scale-up process, and will aid policy makers and practitioners in understanding its staged nature
- International organizations (eg, UN, WHO, and World Bank) should provide leadership by setting targets and indicators for countries
- Ministries of health should have a multilevel and Multisectoral plan to increase population physical activity levels
- Sectors outside of health are essential to scaling up (eg, schools, urban planning, transportation, sports and recreation, the environmental sector);

#### THE LANCET

#### **Key Messages**

- Medical and public health practitioners need to highlight and emphasise the benefits beyond health effect (eg, economic benefits, quality of life)
- Policy makers, stakeholders, and city and state planners should focus on scaling up approaches with the highest face validity:
- Greatest progress is likely to occur through interventions that are effective in promoting physical activity, implemented at scale, regularly assessed, and fully embedded in a system

#### THE LANCET



#PhysAct2016

## Progresos, desafios y oportunidades para la promoción de actividad física desde de Lancet 2016

Primera cumbre de programas gubernamentales de actividad física de las Américas

Rodrigo S Reis, PhD

**Prevention Research Center** 

Washington University in St Louis, USA

September 6, Hotel Tequendama, Bogota, Colombia