



# Blue Zones & the complex interactions between physical activity & sedentary behavior



Faculty of Medicine & Life Sciences, Hasselt University  
BIOMED | SMRc Sports Medicine Research Center

Prof. dr. Bert Op 't Eijnde

# Context, exercise physiology

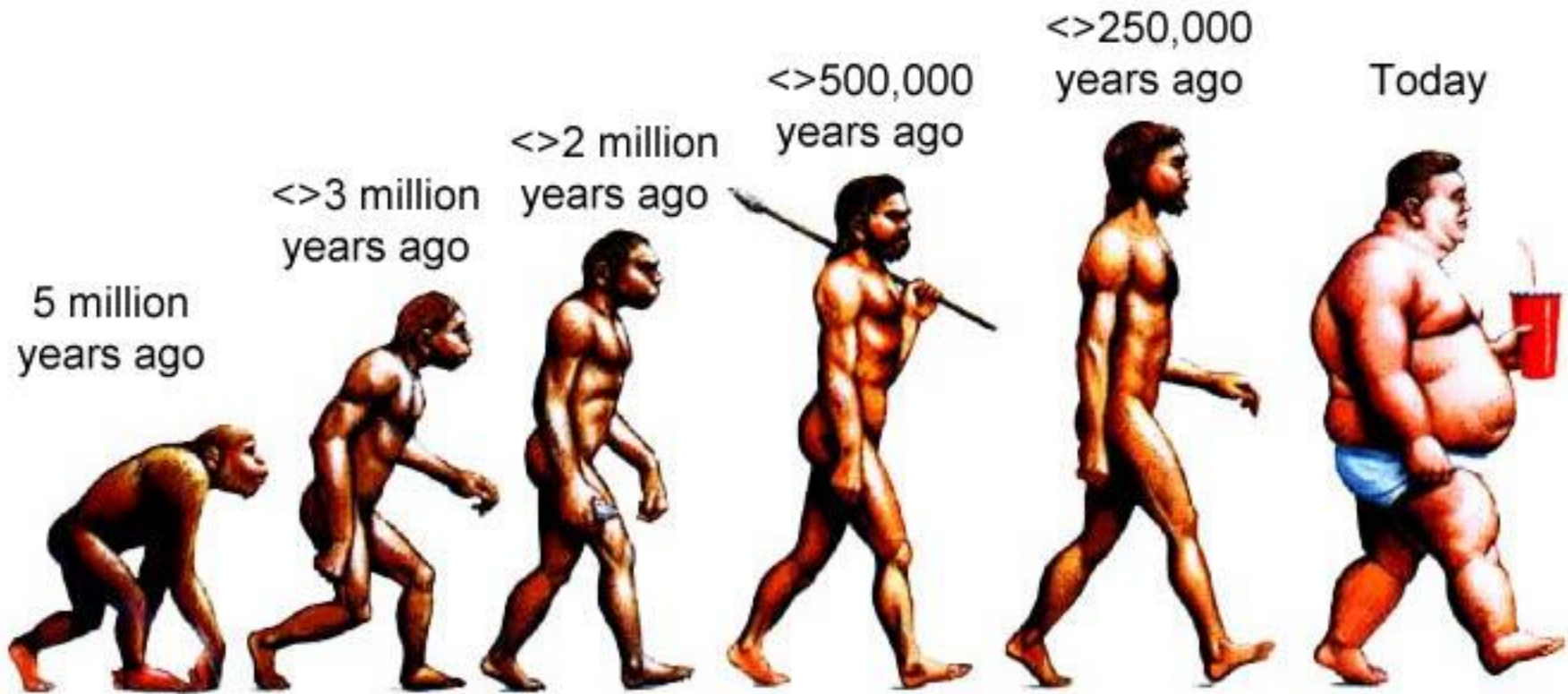




Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Bad news! **healthy lifestyle?**

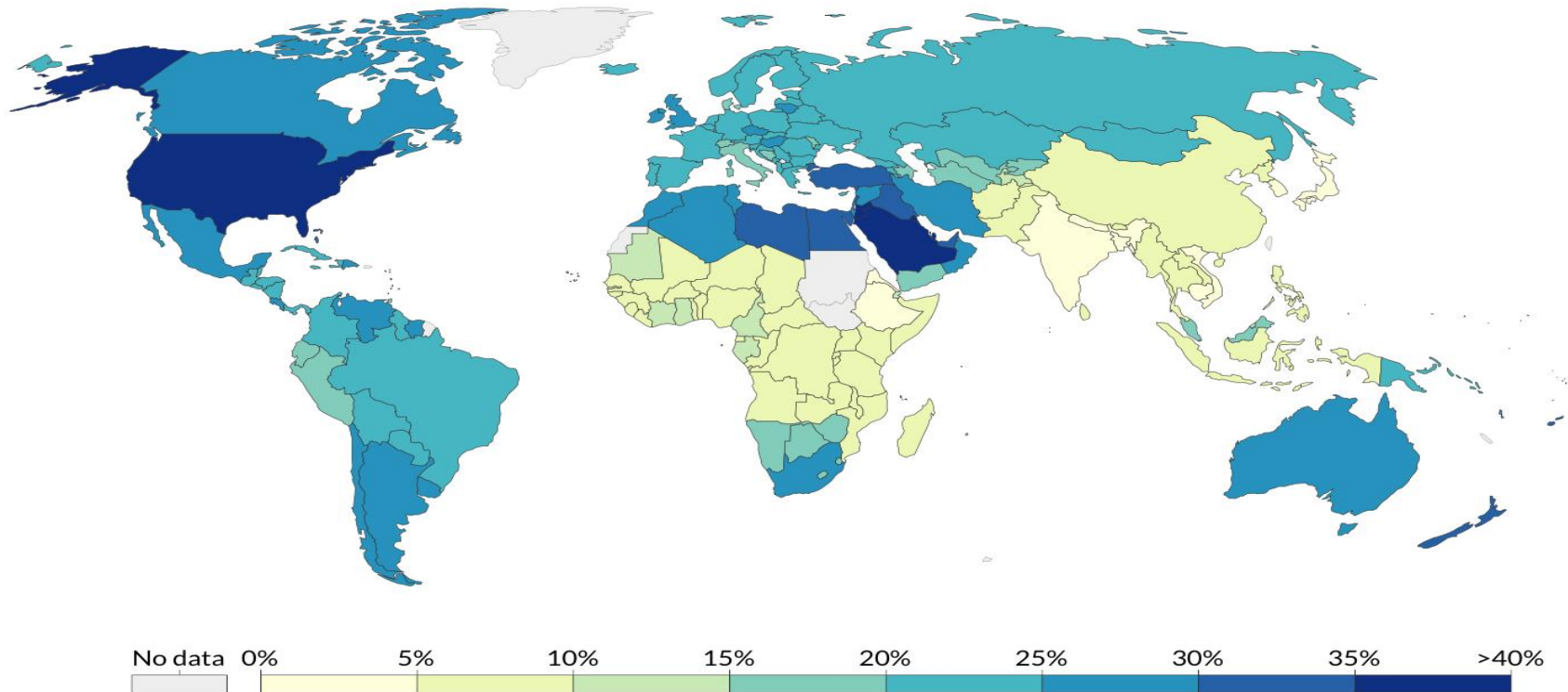


# Bad news! **healthy lifestyle?**

## Share of adults that are obese, 2016

Obesity is defined as having a body-mass index (BMI) equal to or greater than 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World  
in Data



Source: WHO, Global Health Observatory

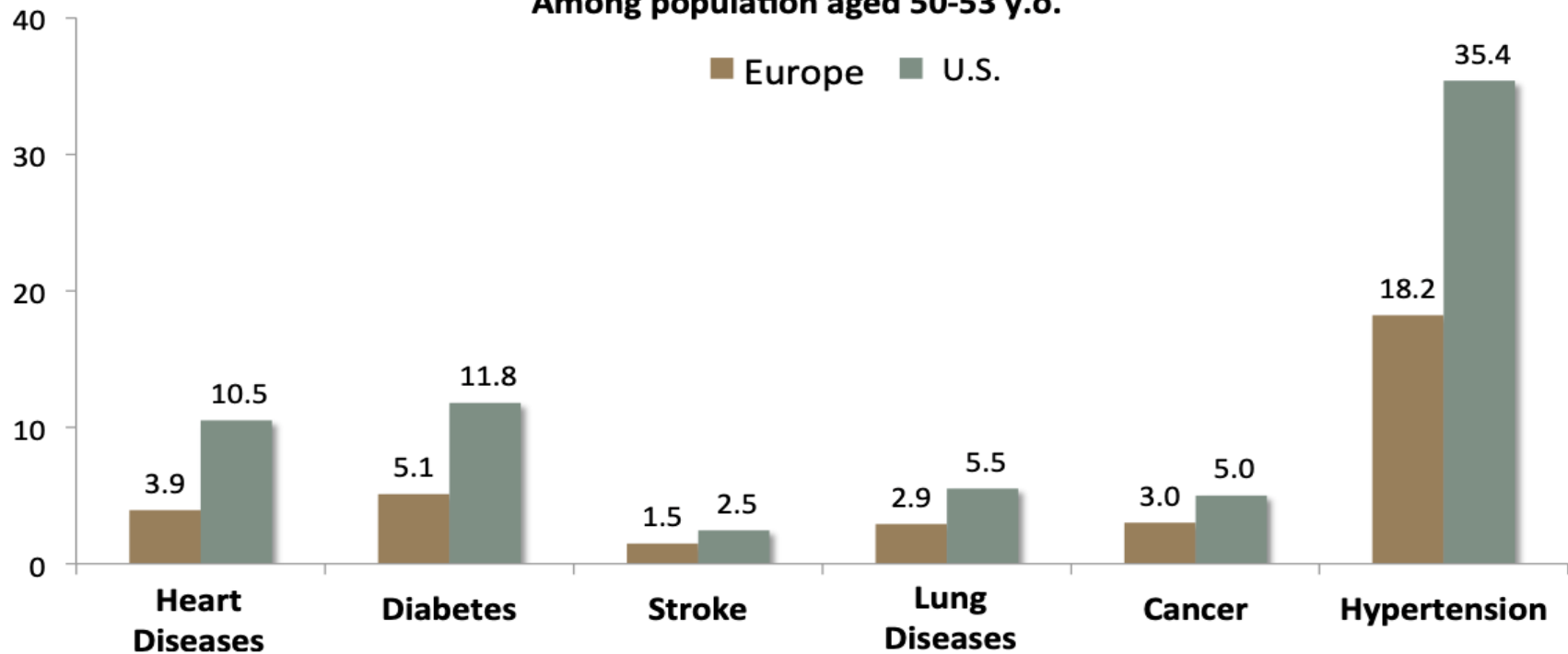
CC BY

Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Bad news! **healthy lifestyle?**

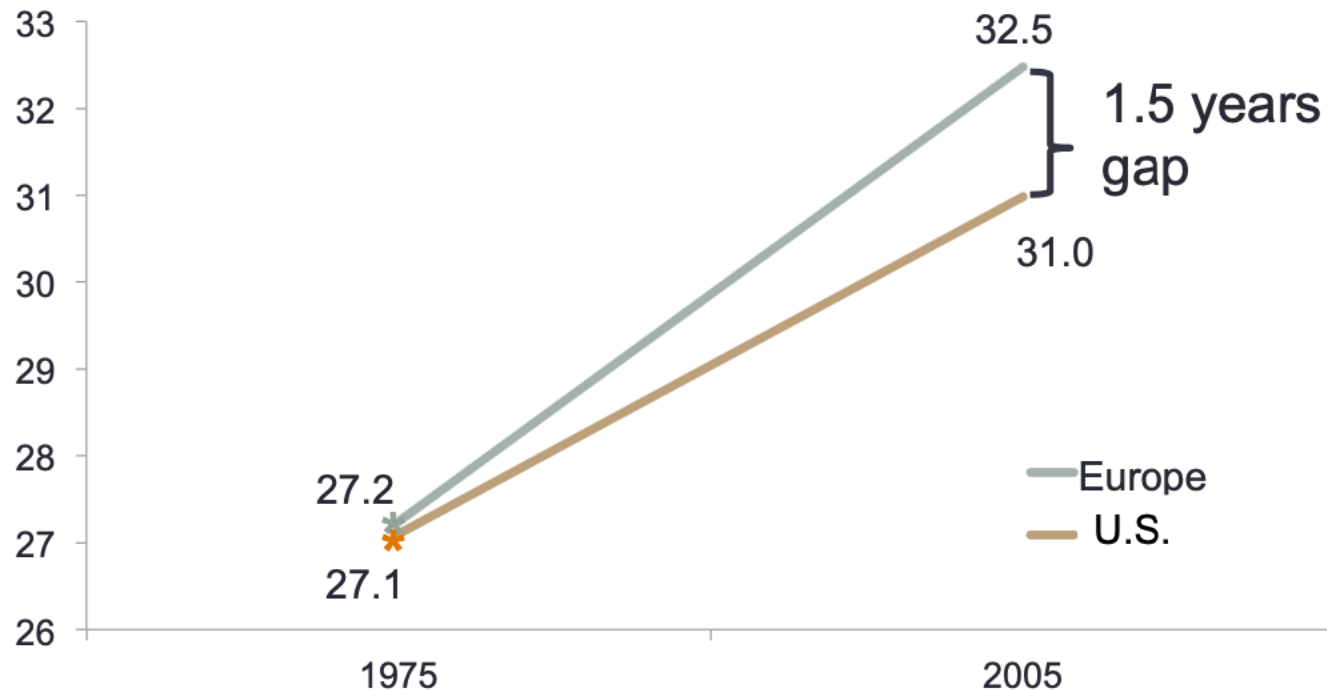
**Prevalence of Disease (%)**  
Among population aged 50-53 y.o.



Notes: Comparing populations aged 50-53 in the U.S. Health and Retirement Study of 2004 and in the Survey of Health, Ageing and Retirement (SHARE) of 2004 (Denmark, France, Germany, Greece, Italy, The Netherlands, Spain, Sweden). Data from Austria and Switzerland not included because of lack of appropriate population weights and of low response rate and small sample, respectively. Sample weights used. Source: Michaud et al. (2011)

# Bad news! **healthy lifestyle?**

## Remaining Life Years at Age 50



Notes: Data come from the Human Mortality Database period life tables for 1975 and 2005. European countries are Denmark, France, Italy, The Netherlands, Spain and Sweden. Weighted average using population size at age 50. Source: Michaud et al. (2011)

*Michaud et al, Soc Sci Med, 2011*

# Bad news! **healthy lifestyle?**



## Nutrition



## inactivity



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Good news! Sport & exercise!



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Good news! Sport & exercise! Immediate effects!

TABLE 1. Mean values (SD) for blood pressure and state anxiety following 30 min of leg ergometry or weight training

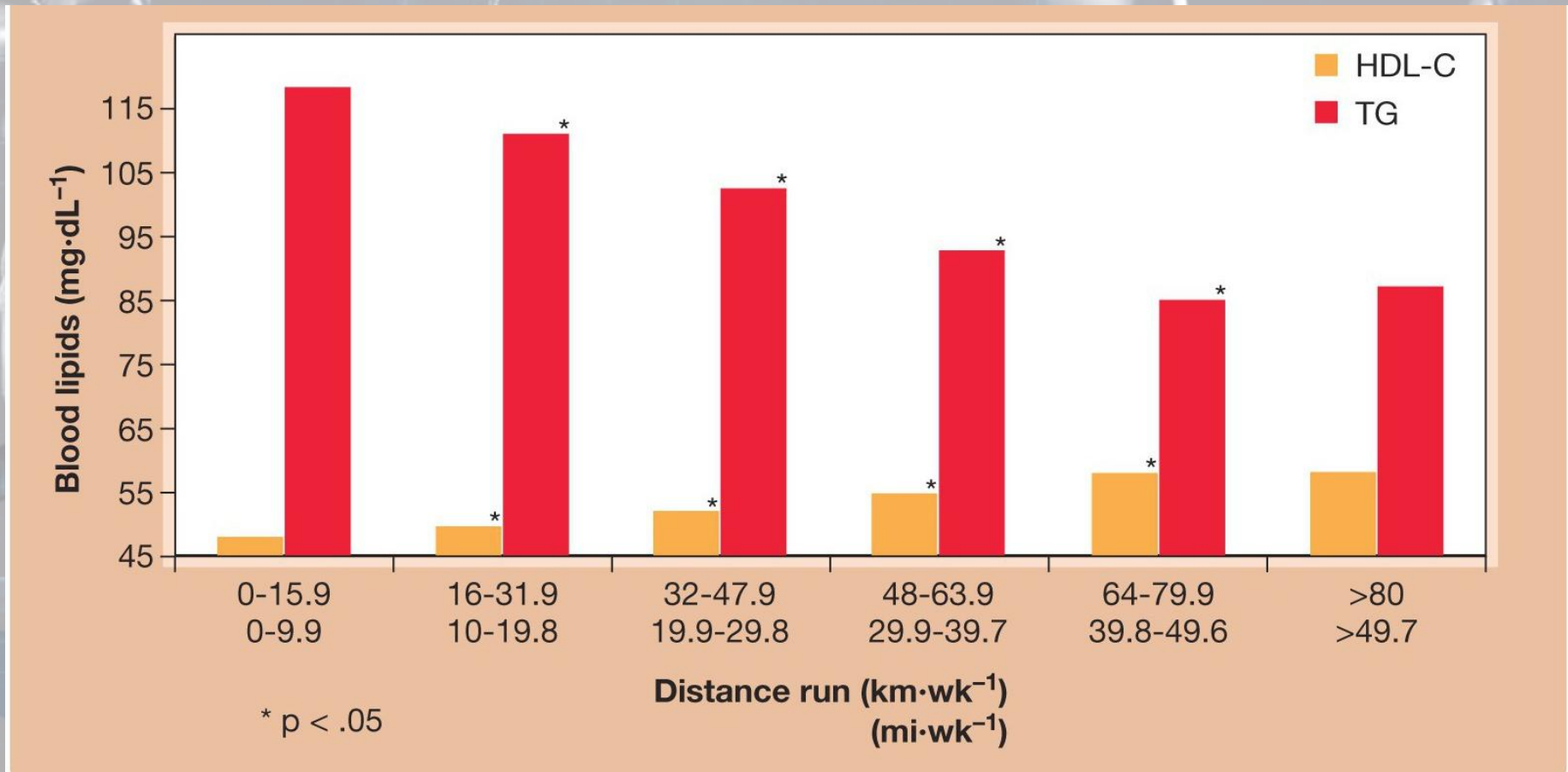
	Baseline	Post Exercise (min)		
		0	20	60
Systolic blood pressure				
Leg ergometry	129.4 (16.3)	159.2* (5.3)	125.0 (26.8)	122.9# (15.3)
Weight training	129.6 (14.3)	145.3* (5.7)	125.4 (29.0)	127.2 (16.0)
Diastolic blood pressure				
Leg ergometry	73.6 (10.7)	77.5 (9.0)	72.5 (9.7)	71.0 (8.1)
Weight training	72.2 (7.7)	75.9 (14.8)	70.7 (10.0)	69.8 (8.8)
State anxiety				
Leg ergometry	35.3 (8.8)	34.8 (6.0)	33.5 (8.1)	31.5# (6.6)
Weight training	34.0 (7.1)	38.2* (5.8)	34.1 (6.7)	32.1 (6.7)

\*  $P < 0.05$  above baseline.

#  $P < 0.05$  below baseline.

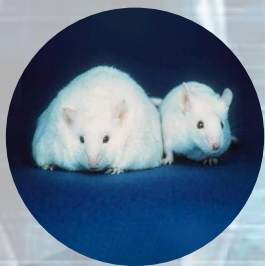
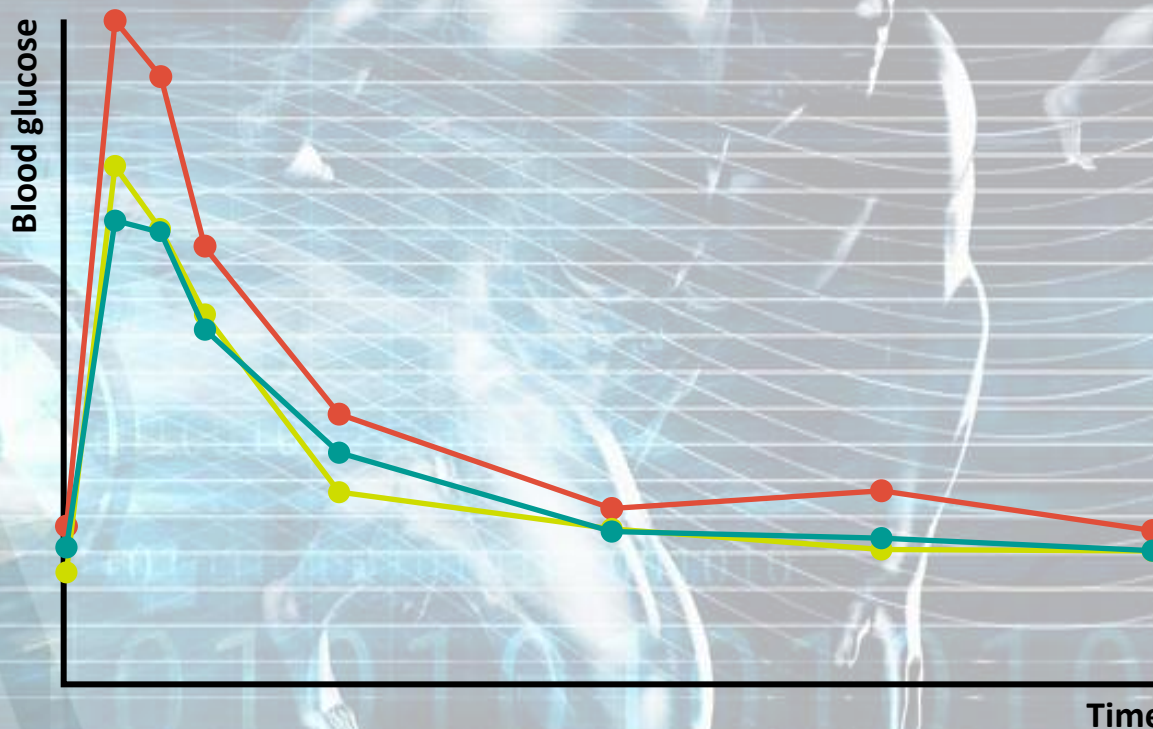


# Good news! Sport & exercise! Immediate effects!



Willimans PT et al. Arch In Med, 1997

# Good news! Sport & exercise! Physical activity can be medicine!



Optimize your Performance, Fitness & Health  
Exercise is Medicine

Eijnde BO et al. Int J Mol Med, 2006

# Good news! Sport & exercise! Physical activity can be medicine!

*Scand J Med Sci Sports* 2015; (Suppl. 3) 25: 1–72  
doi: 10.1111/sms.12581

© 2015 The Authors. Scandinavian Journal of Medicine &  
Science in Sports published by John Wiley & Sons Ltd

SCANDINAVIAN JOURNAL OF  
MEDICINE & SCIENCE  
IN SPORTS

## Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases

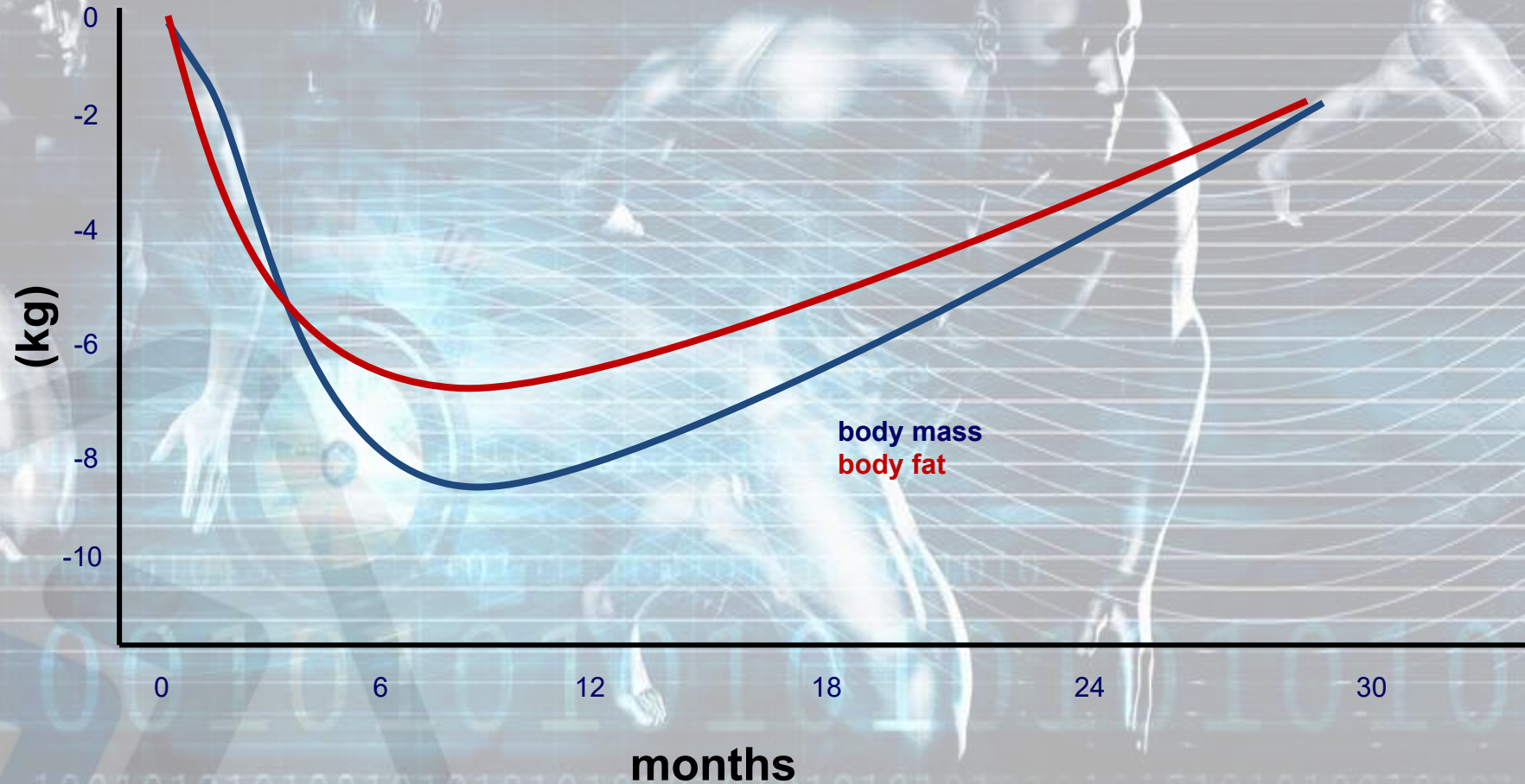
B. K. Pedersen<sup>1</sup>, B. Saltin<sup>2</sup>

<sup>1</sup>The Centre of Inflammation and Metabolism and The Center for Physical Activity Research, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark, <sup>2</sup>The Copenhagen Muscle Research Centre, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

Corresponding author: Bente Klarlund Pedersen, Rigshospitalet Section 7641, Blegdamsvej 9, DK-2100, Copenhagen, Denmark.



# Bad news, long term adherence is poor!



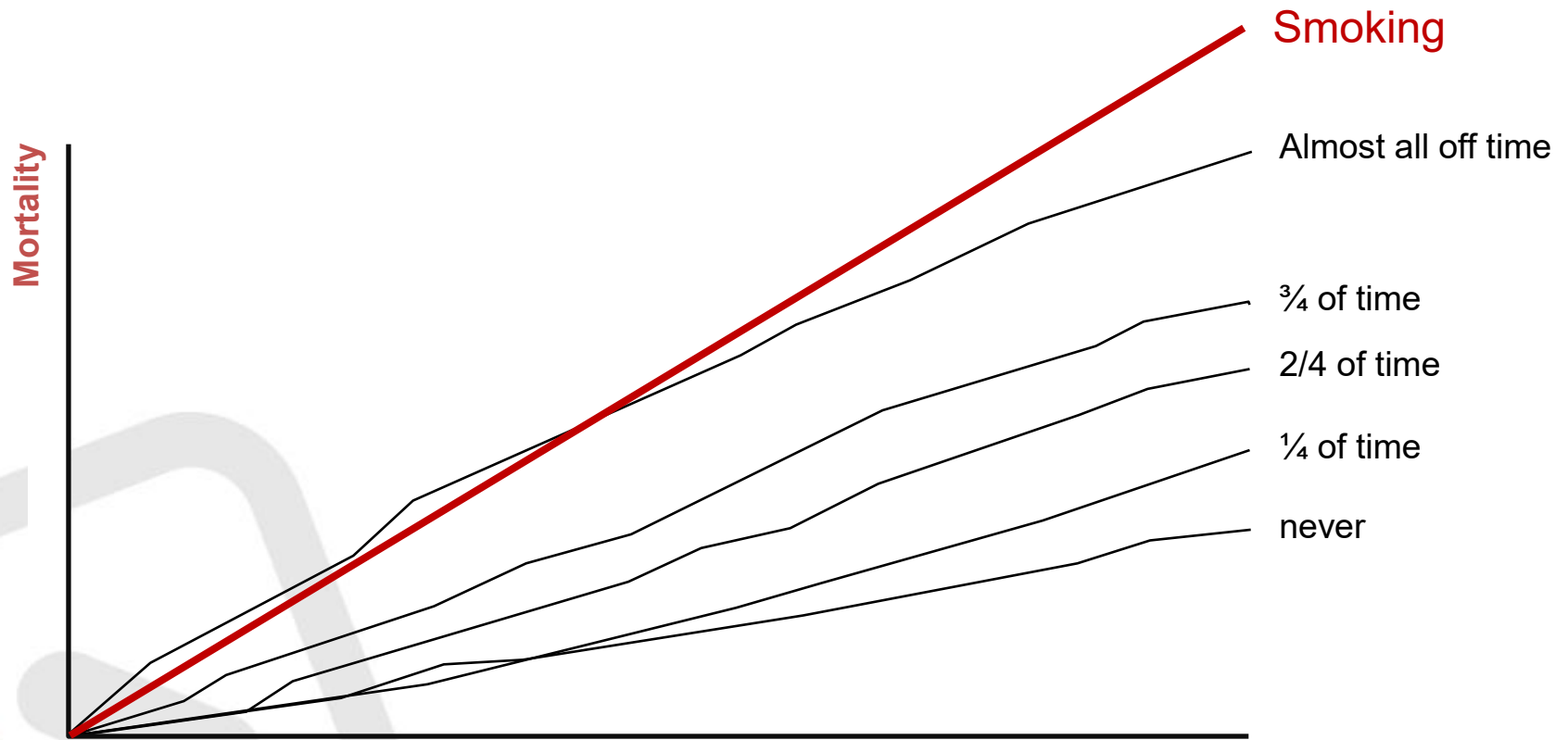
Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Bad news, **sitting!**



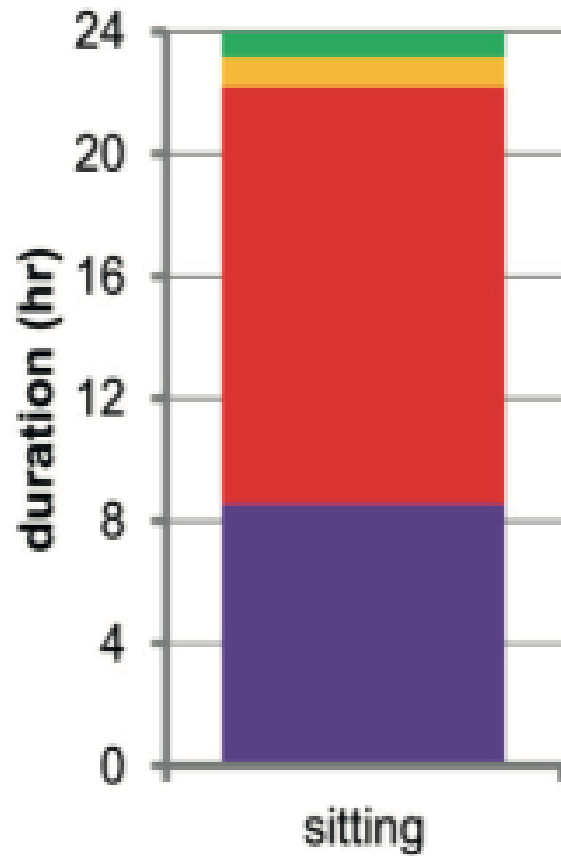
# Bad news, sitting!



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

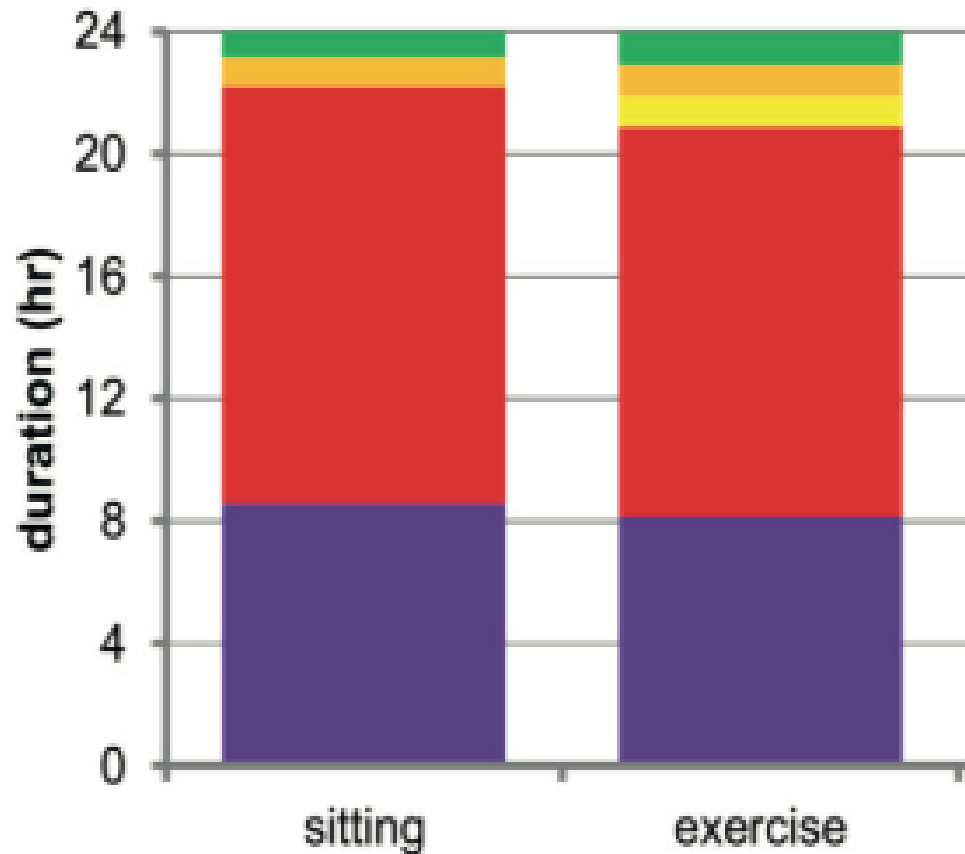
# Bad news, sitting!



- sitting
- sleeping

Duvivier BMFM et al. PLoS One, 2013

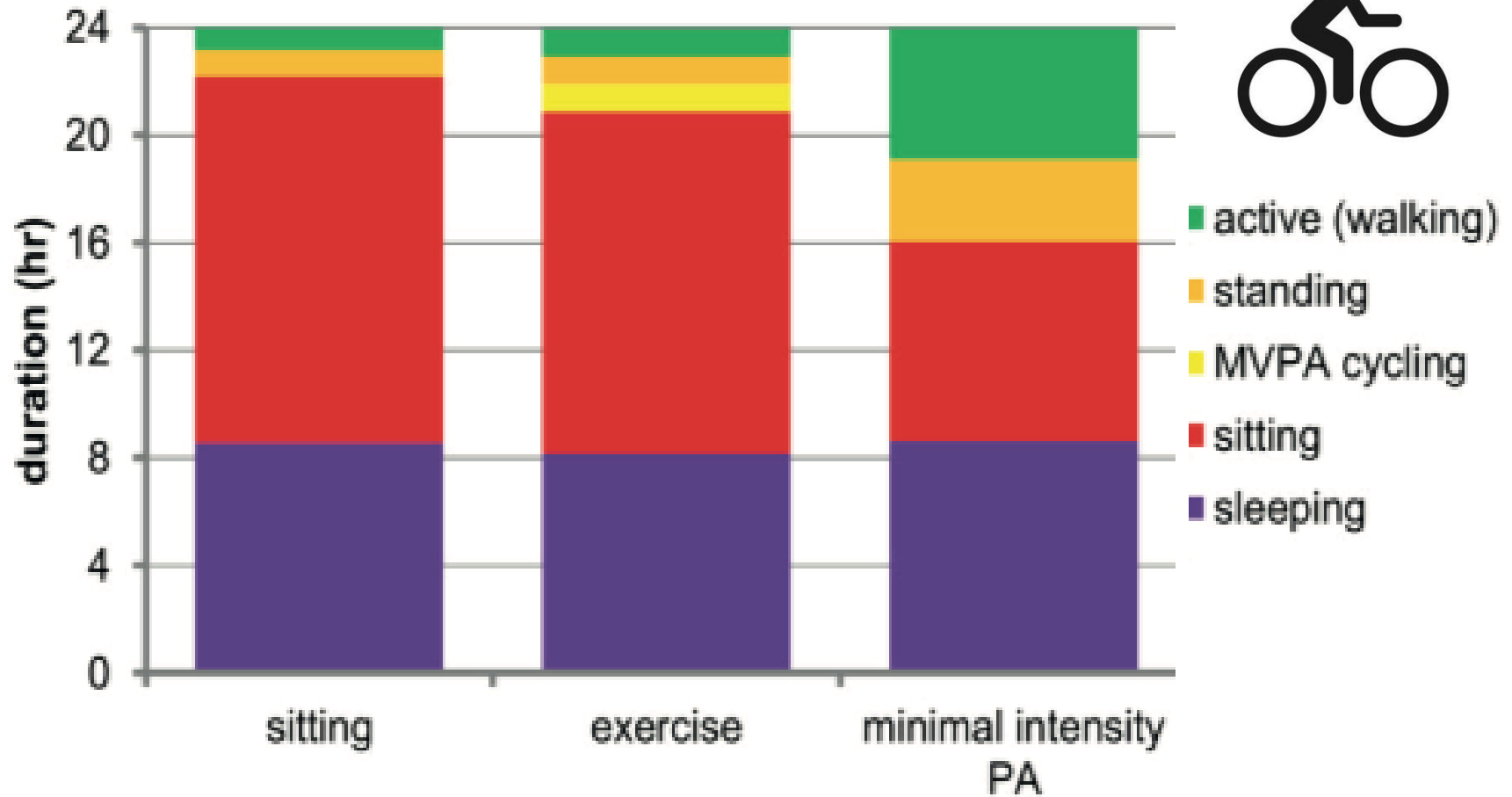
# Bad news, sitting!



- active (walking)
- standing
- MVPA cycling
- sitting
- sleeping

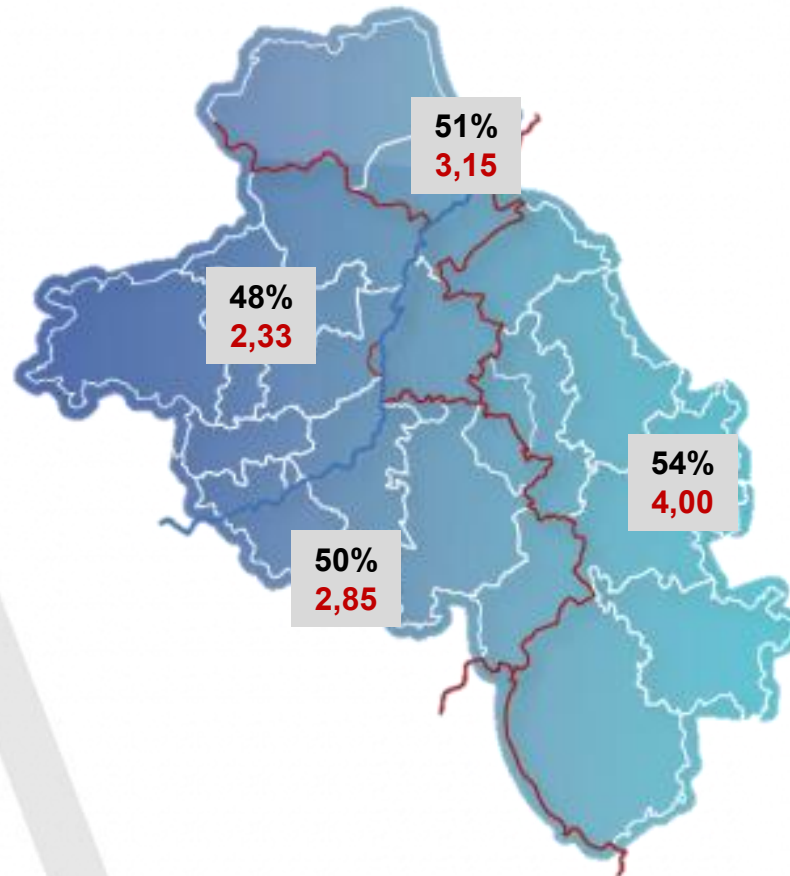
Duvivier BMFM et al. PLoS One, 2013

# Bad news, sitting!



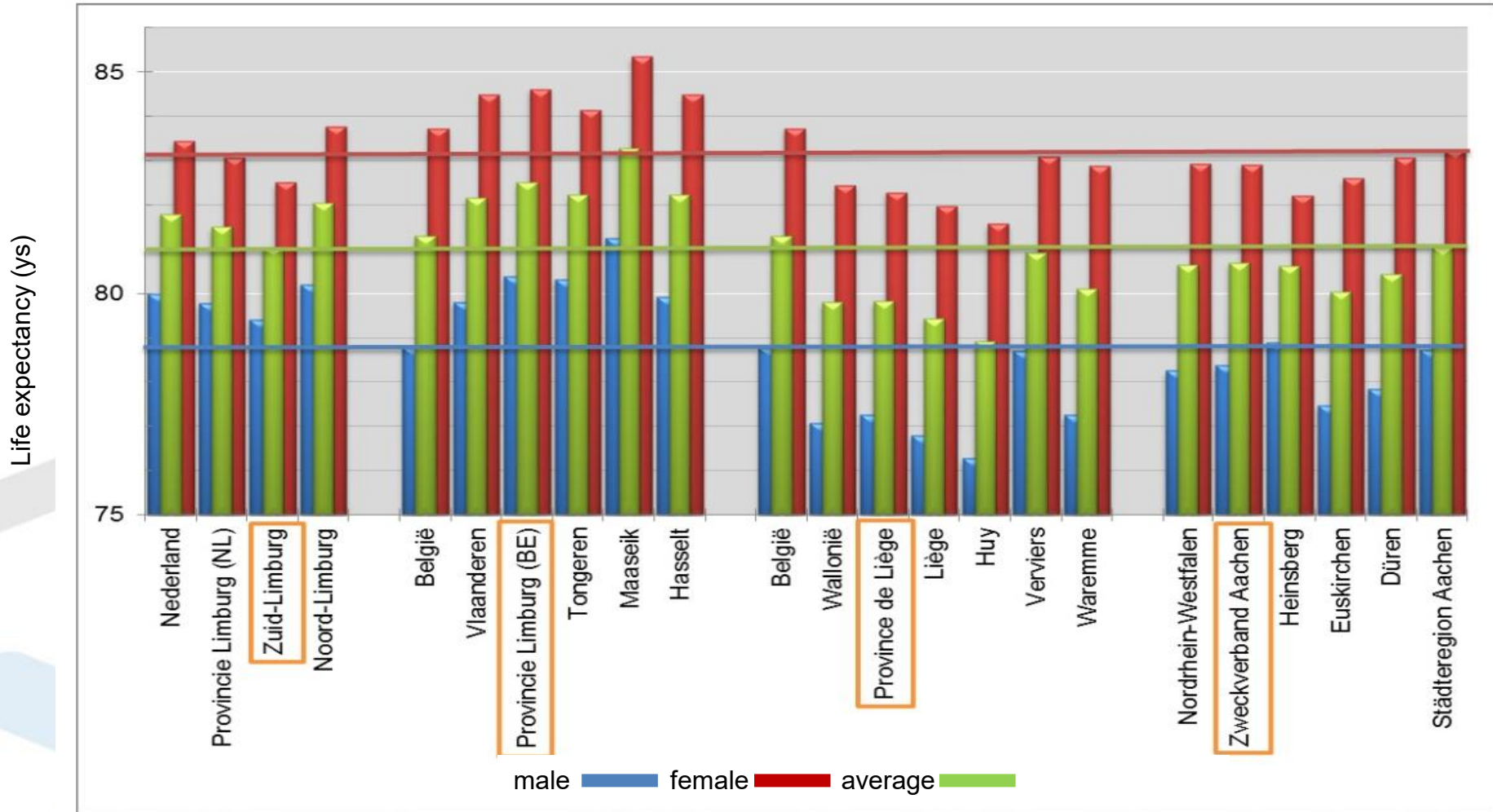
Duvivier BMFM et al. PLoS One, 2013

# Bad news, INTERREGIO Meuse-Rhine



Population percentage BMI >25  
Mortality per 1000 citizens due to cardiovascular disease

# Bad news, INTERREGIO Meuse-Rhine



# Why?



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine



# Why, evolutionary context (Hadza research)



97-98%

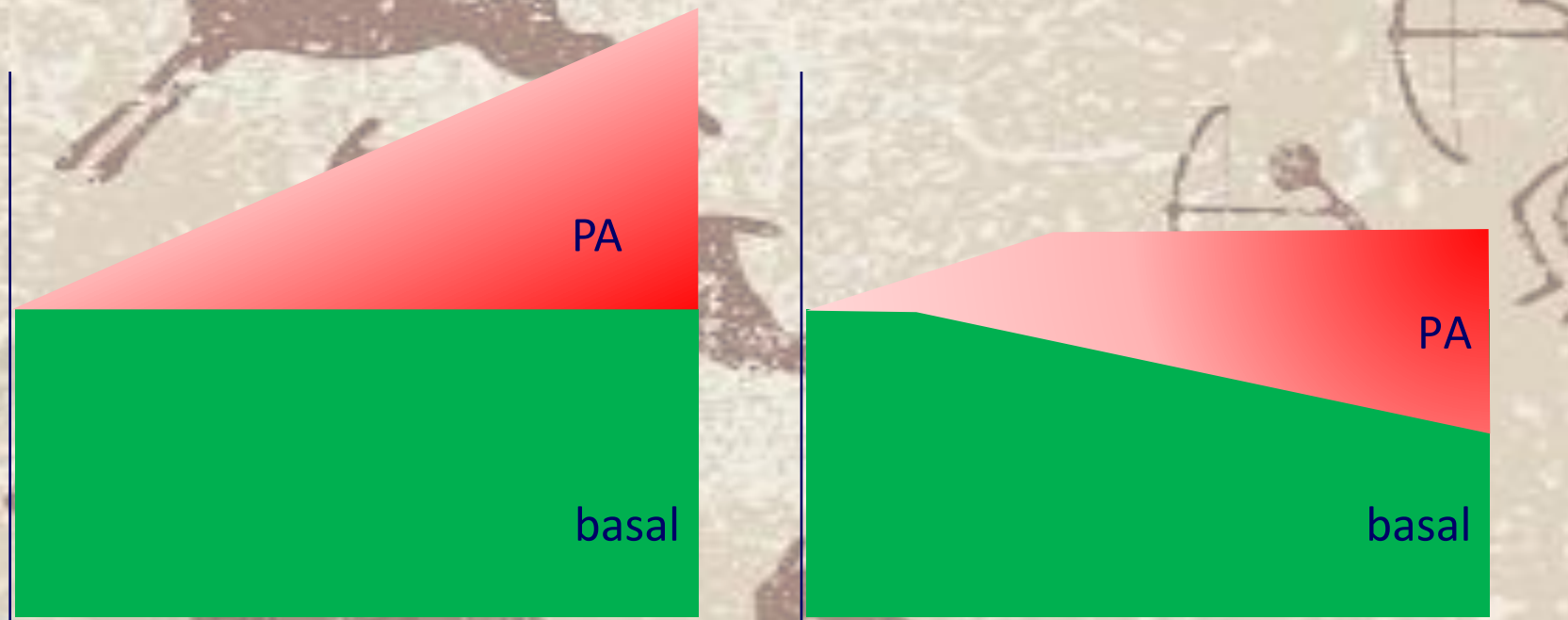
2-3%

0.5%

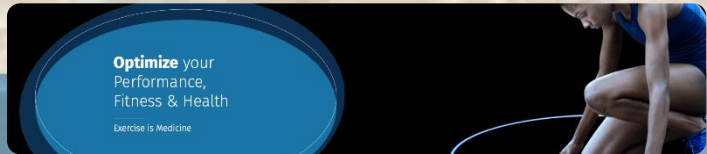
Pontzer H et al. *Am. J. Hum. Biol.*, 2015



# Why, evolutionary context (energy paradox)



Physical Activity (PA)



# Why, evolutionary context (prone to injury)

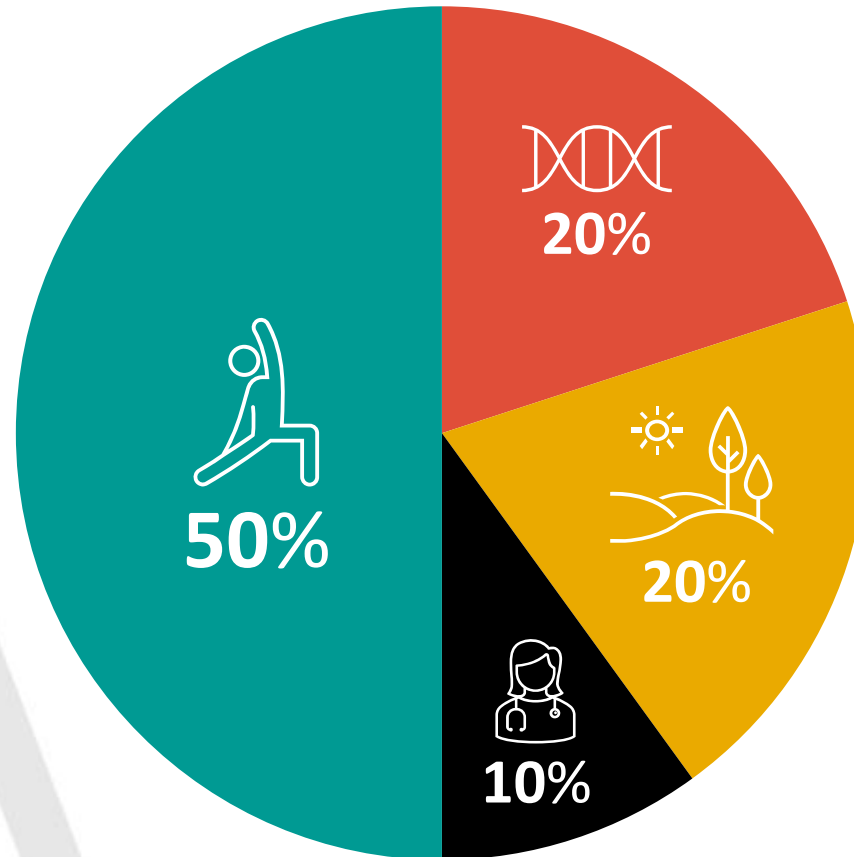


Optimize your  
Performance,  
Fitness & Health

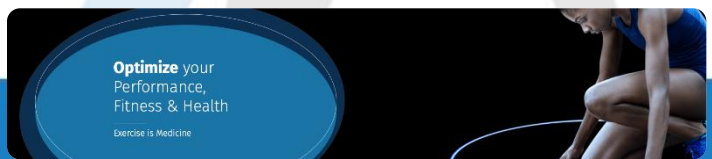
Exercise is Medicine



**Good news!** If it's lifestyle related, it's preventable!



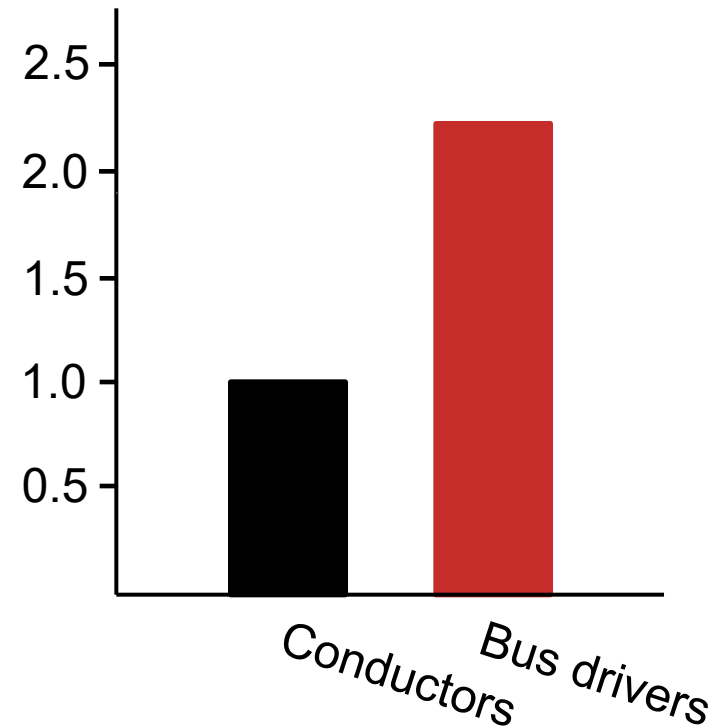
Factors that determine chronic disease



**Good news!** it's preventable & does not require much effort!



**Myocardial infarct / 1000**



*Morris JN et al. Lancet, 1953*

# Good news! Physical activity during daily life! Interrupt sitting!



Type activiteit



Lang stilzitten



Licht  
intensief  
bewegen



Matig/hoog  
intensief  
bewegen



An

An zit lang stil  
én ze beweegt  
te weinig



Adil

Adil beweegt  
voldoende (30'/dag)  
maar hij zit wel lang stil



Jan

Jan zit niet lang stil  
én hij beweegt  
voldoende (30'/dag).

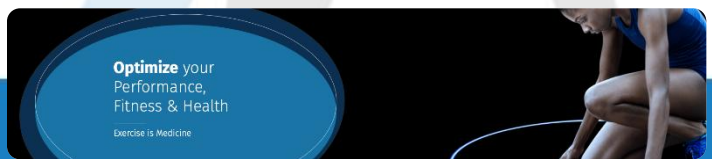
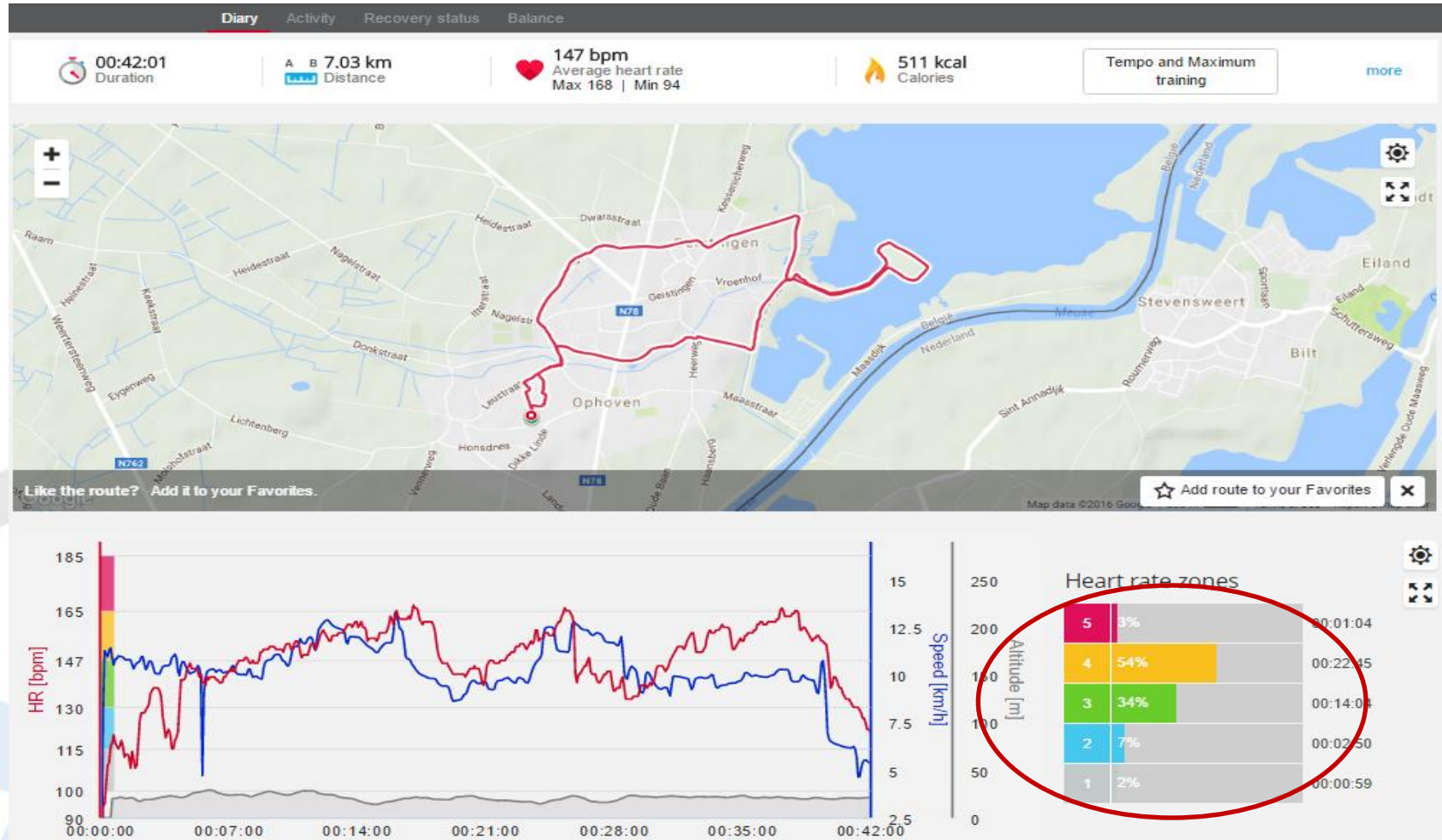
# Good news, quantify yourself!



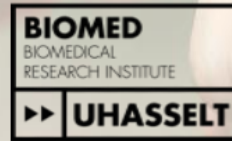
Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Good news, quantify yourself!



# Good news, Limburg



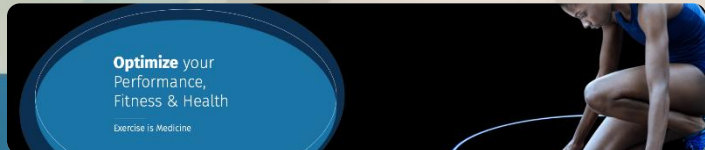
Interreg



Co-funded by  
the European Union



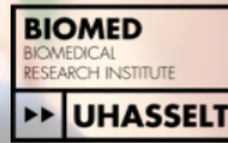
Meuse – Rhine (NL – BE – DE)



# Good news, Limburg



Mobile Health Unit | LCRC

JESSA  
ZIEKENHUIS

recrutement/inclusion  
n=7000→581

baseline  
(1w) n=581

Data  
analyses

intervention (8w) n=517

Data  
analyses



	Baseline period (7d)	Intervention period (8w)
# subjects	581	517 (dropout 57)
# steps/d/person	8050 (range 2821-18766)	10660 (range 5789-27342)
Sitting behavior (h/d)	12	11
PA high intensity (min/d)	25	29
PA mod intensity (min/d)	20	28
PA low intensity (min/d)	196	231

Eijnde BO et al. preliminary data, 2024

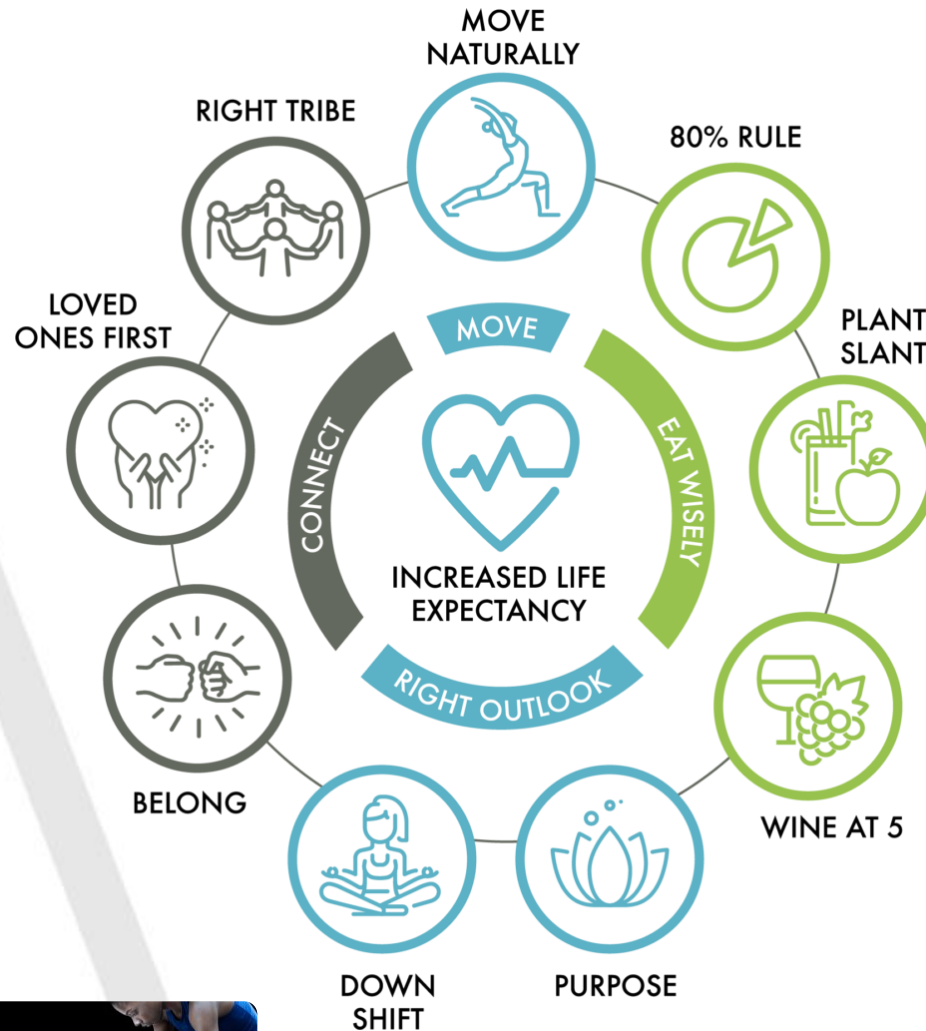
# Good news, Blue Zones



# Blue zones



# Blue zones



# Blue zones 2.0, Singapore (+20y life expectancy since 1965)!



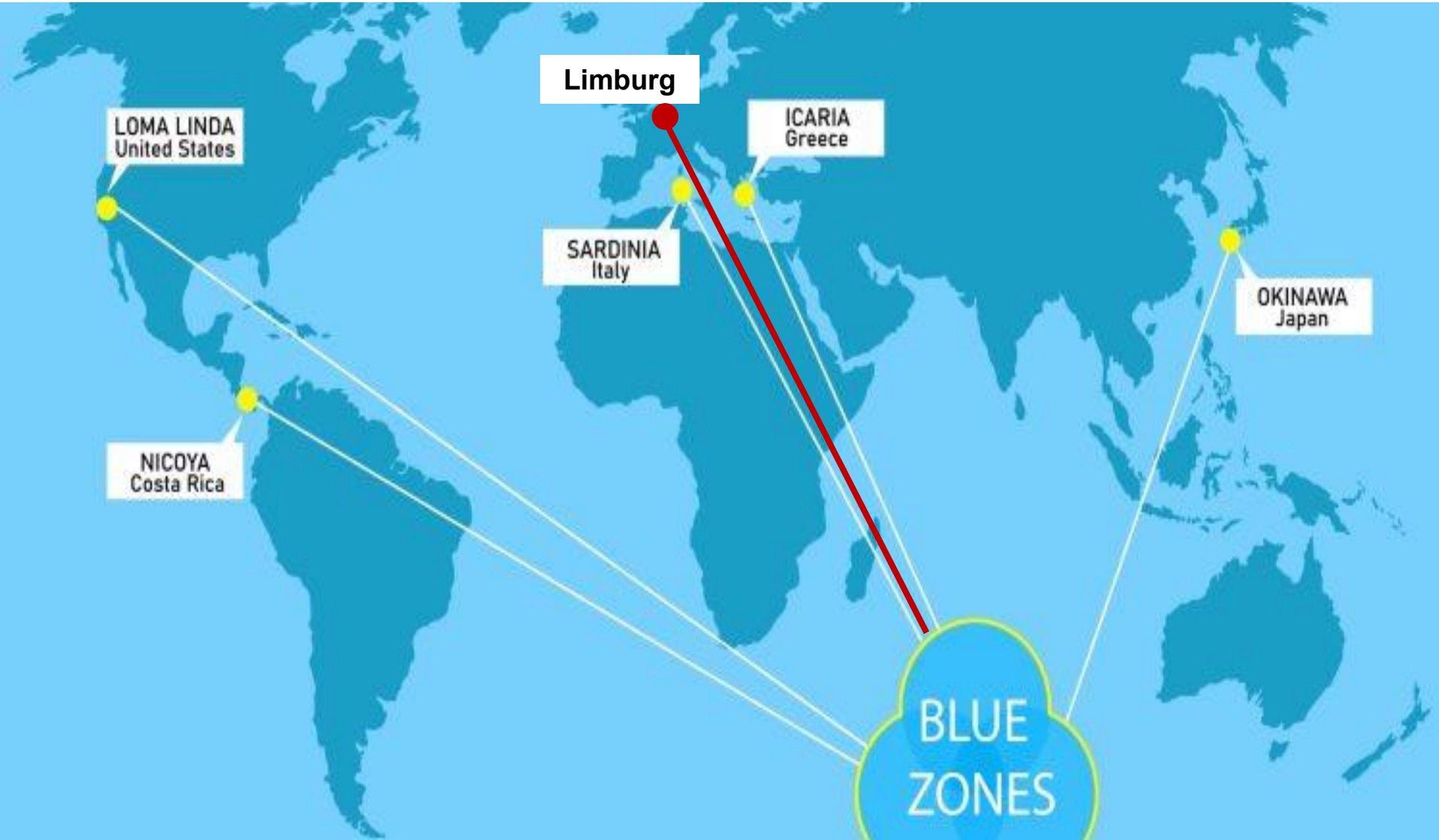
# Blue zones 2.0, Singapore, an engineered longevity hotspot!



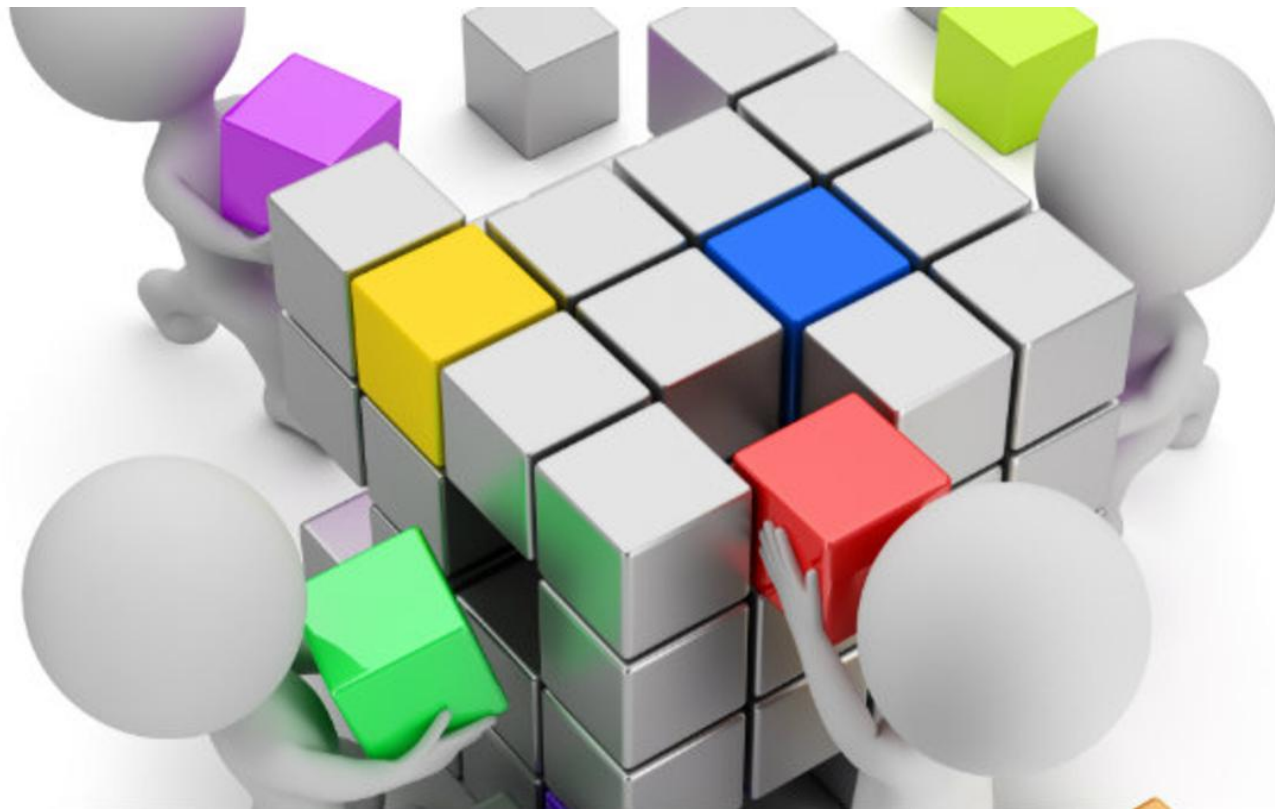
# Blue zones 2.0, Singapore, an engineered longevity hotspot!



# Blue zones 3.0, longevity hotspot Limburg?



# Blue zones 3.0, integrated healthy lifestyle longevity approach using chronic disease prevention, regional DNA, smart urban planning, build environment & **social interactions (community)**



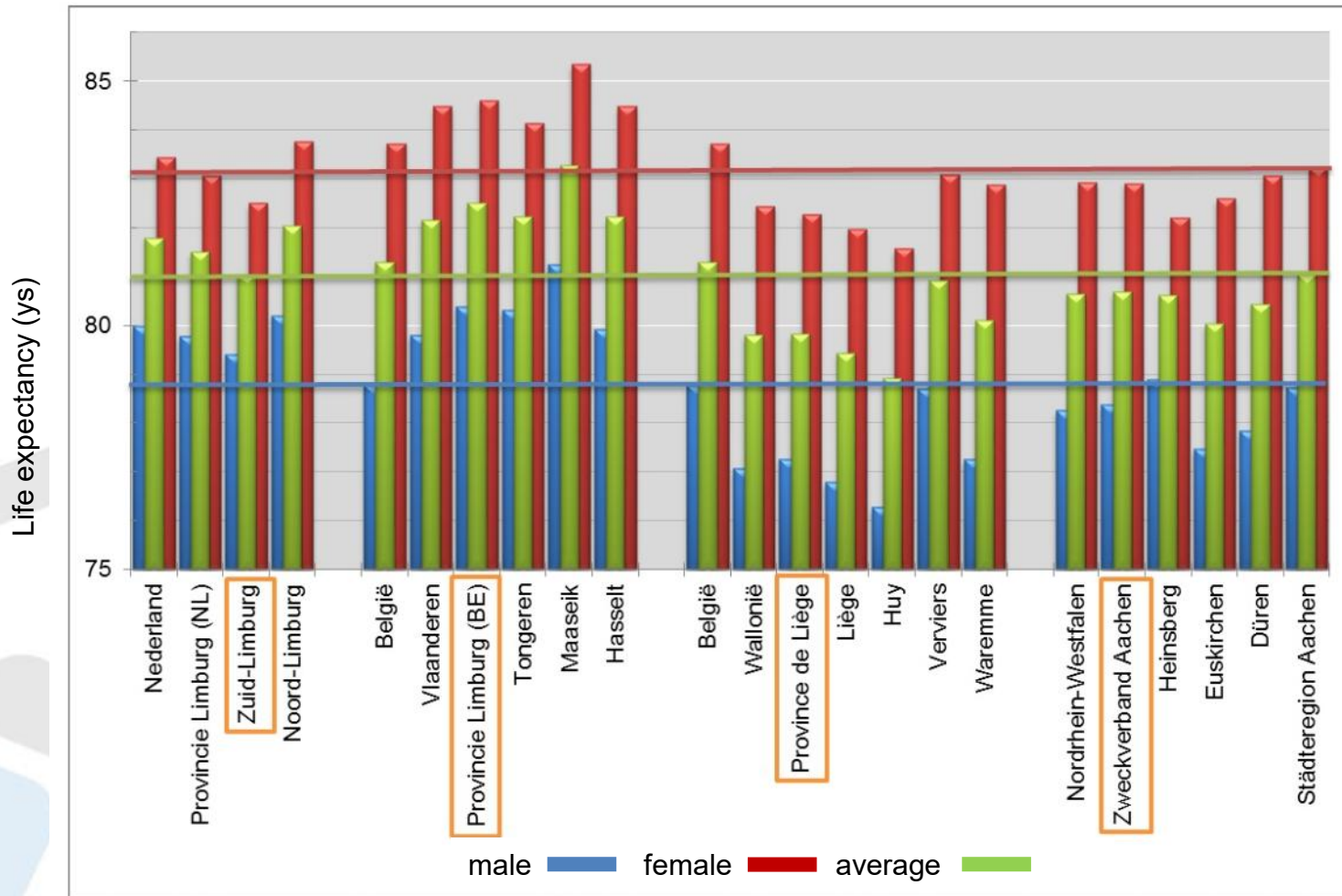
# Blue zones 3.0, healthy lifestyle impact, example disease prevention



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Blue zones 3.0, healthy lifestyle impact, example regional DNA



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

GGD, 2018

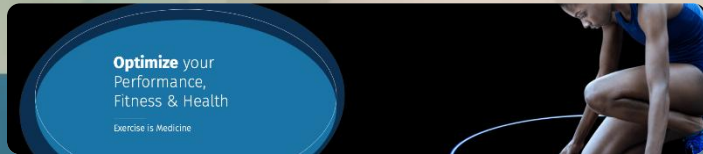
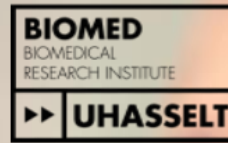
# Blue zones 3.0, healthy lifestyle impact, example regional DNA



# Blue zones 3.0, healthy lifestyle impact, example regional DNA



Mobile Health Unit | LCRC



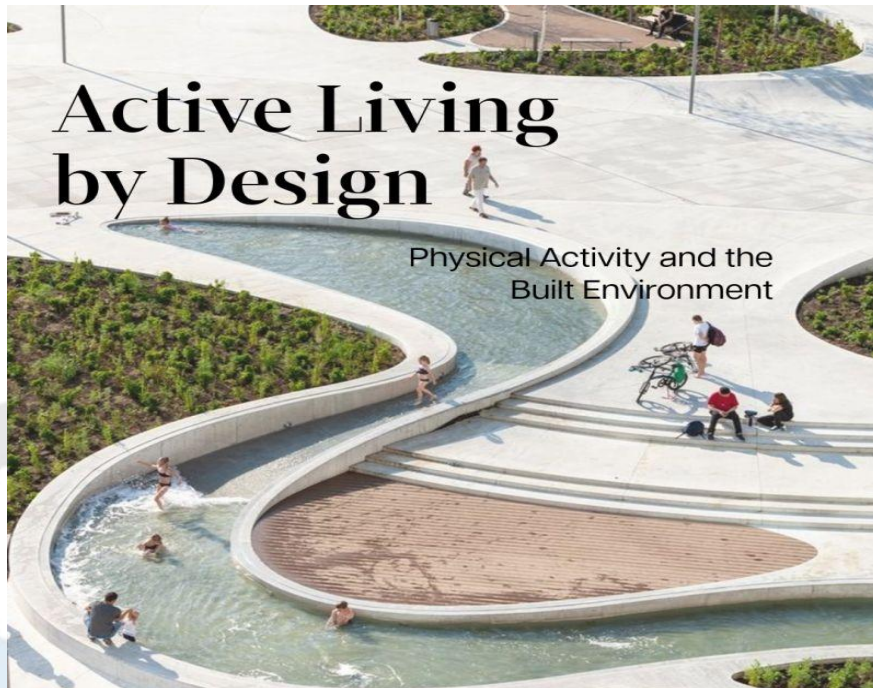
# Blue zones 3.0, healthy lifestyle impact, example smart urban planning and build environment



# Blue zones 3.0, healthy lifestyle impact, example smart urban planning and build environment



# Blue zones 3.0, healthy lifestyle impact, example smart urban planning and build environment



# Blue zones 3.0, healthy lifestyle impact, example smart urban planning and build environment



Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine

# Blue zones 3.0, healthy lifestyle impact, example smart urban planning and build environment



# Blue zones 3.0, healthy lifestyle impact, **example social interactions and community**

Social interaction in Blue Zones is a, if not the, fundamental pillar of longevity, where daily, deep-rooted connections with family and community reduce stress and foster health. These, often multigenerational, networks include e.g. community feeling, social support, intergenerational living & shared values



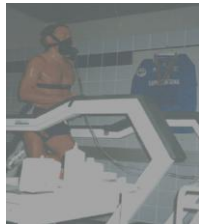
# Limburg, living blue, integrated REGIONAL (healthy lifestyle) approach

## 'living blue' in Limburg!



# Contact

[bert.opteijnde@uhasselt.be](mailto:bert.opteijnde@uhasselt.be) | [uhasselt.be](http://uhasselt.be) | [adlon.be](http://adlon.be)



Faculty of Medicine & Life Sciences  
BIOMED | SMRc Sports Medicine Research Center

Prof. dr. Bert Op 't Eijnde

Optimize your  
Performance,  
Fitness & Health

Exercise is Medicine