Natuur op verwijzing, 4 oktober ‘18

Gezonde lucht, gezonde ruimte, gezonde mensen

Tim Nawrot; email: tim.nawrot@uhasselt.be

UHASSELT
KNOWLEDGE IN ACTION

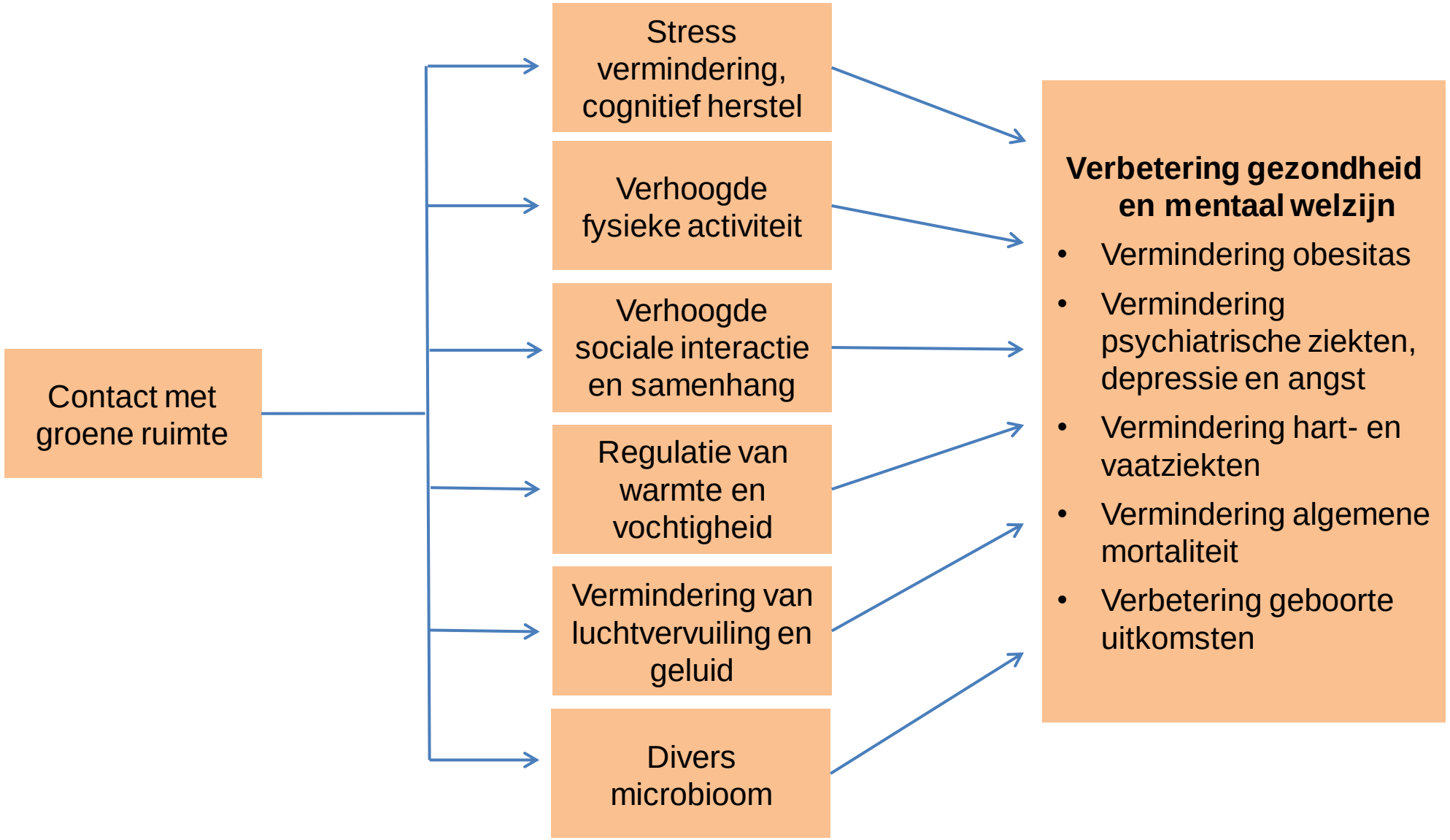
KATHOLIEKE UNIVERSITEIT LEUVEN

Eredoctoraat voor Piet Oudolf

The internationally acclaimed landscape designer Piet Oudolf has been awarded an honorary degree by the **University of Sheffield** (July 18th, ‘18).

Oudolf rejected tired, conventional landscape planting in favour of a looser, naturalistic look

Hoe kan groene ruimte bijdragen aan gezondheid?

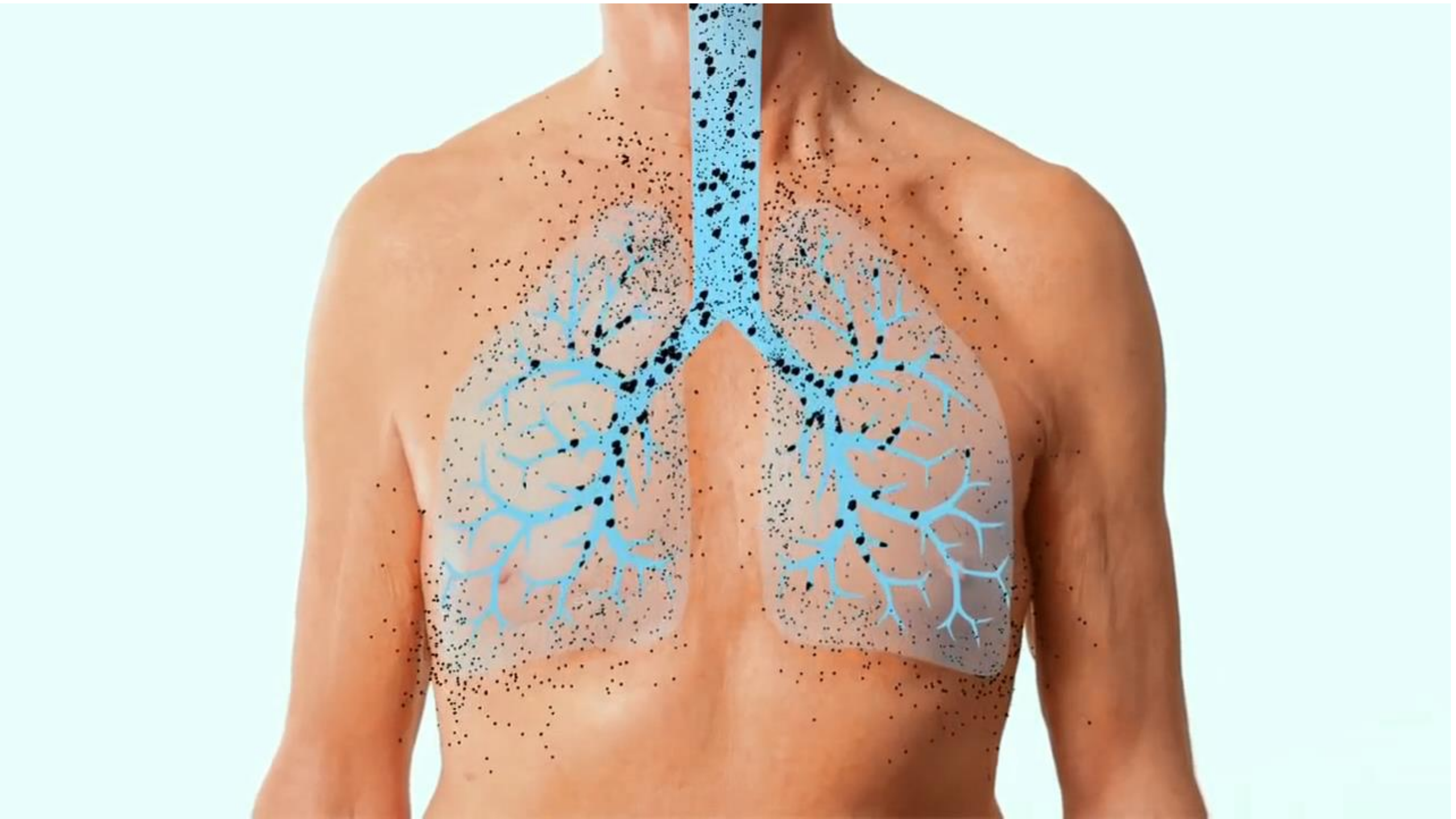


Inhoud

Gezonde ruimte:

- Blootstelling
- Mentale gezondheid en bloeddruk

- Sterfte en moleculaire veroudering



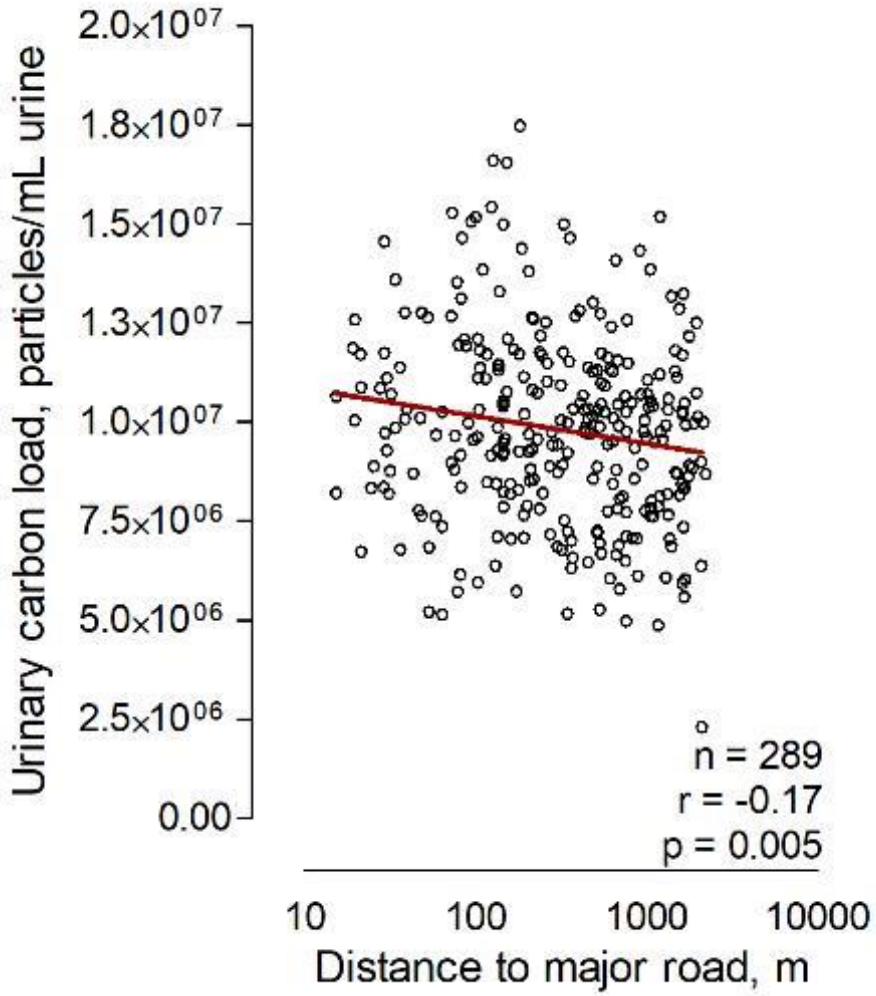
Children's Urinary Environmental Carbon Load

A Novel Marker Reflecting Residential Ambient Air Pollution Exposure?

Nelly D. Saenen[1*], Hannelore Bové[2,3*], Christian Steuwe[3], Maarten B. J. Roeffaers[3], Eline B. Provost[1], Wouter Lefebvre[4], Charlotte Vanpoucke[5], Marcel Ameloot[2], and Tim S. Nawrot[1,6]

Am J Respir Crit Care Med Vol 196, Iss 7, pp 873–881, Oct 1, 2017

Methods: We detected urinary car
9–12 yr) using white-light generatio
illumination. Children's residential
were estimated based on a high-res
interpolation method.



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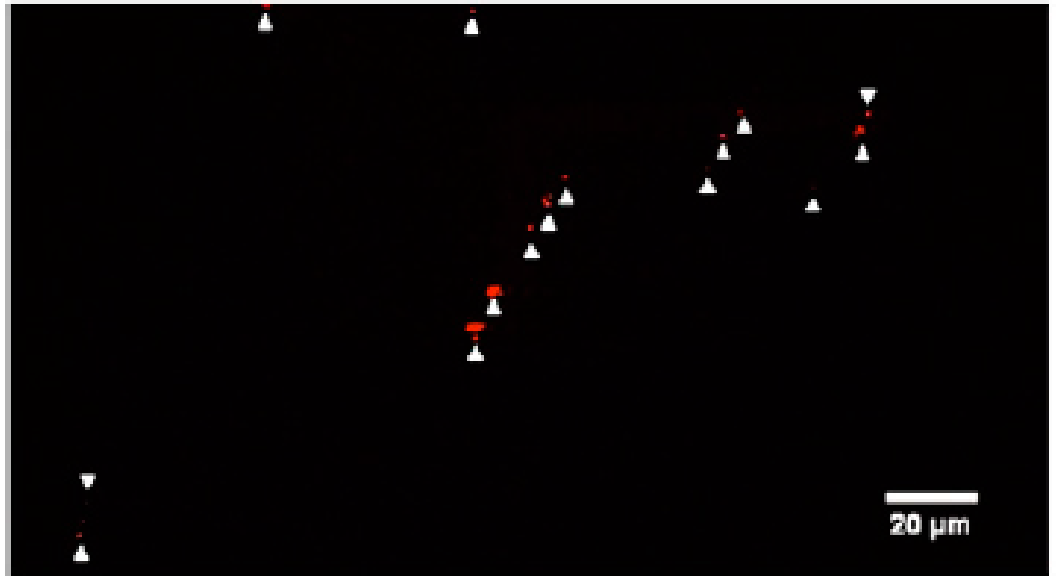
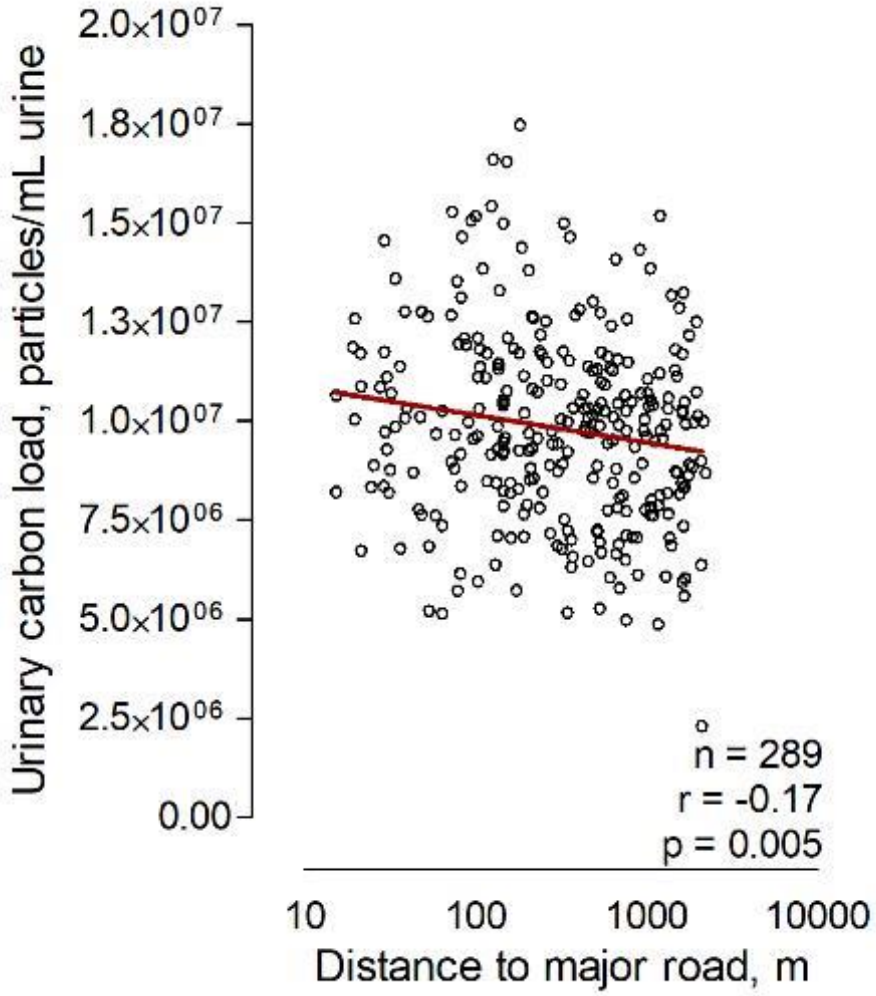


Figure 2. Black carbon particles in urine. Black carbon particles and aggregates (*arrowheads*) visualized by femtosecond pulsed laser excitation at 810 nm and observation at 400–410 nm.



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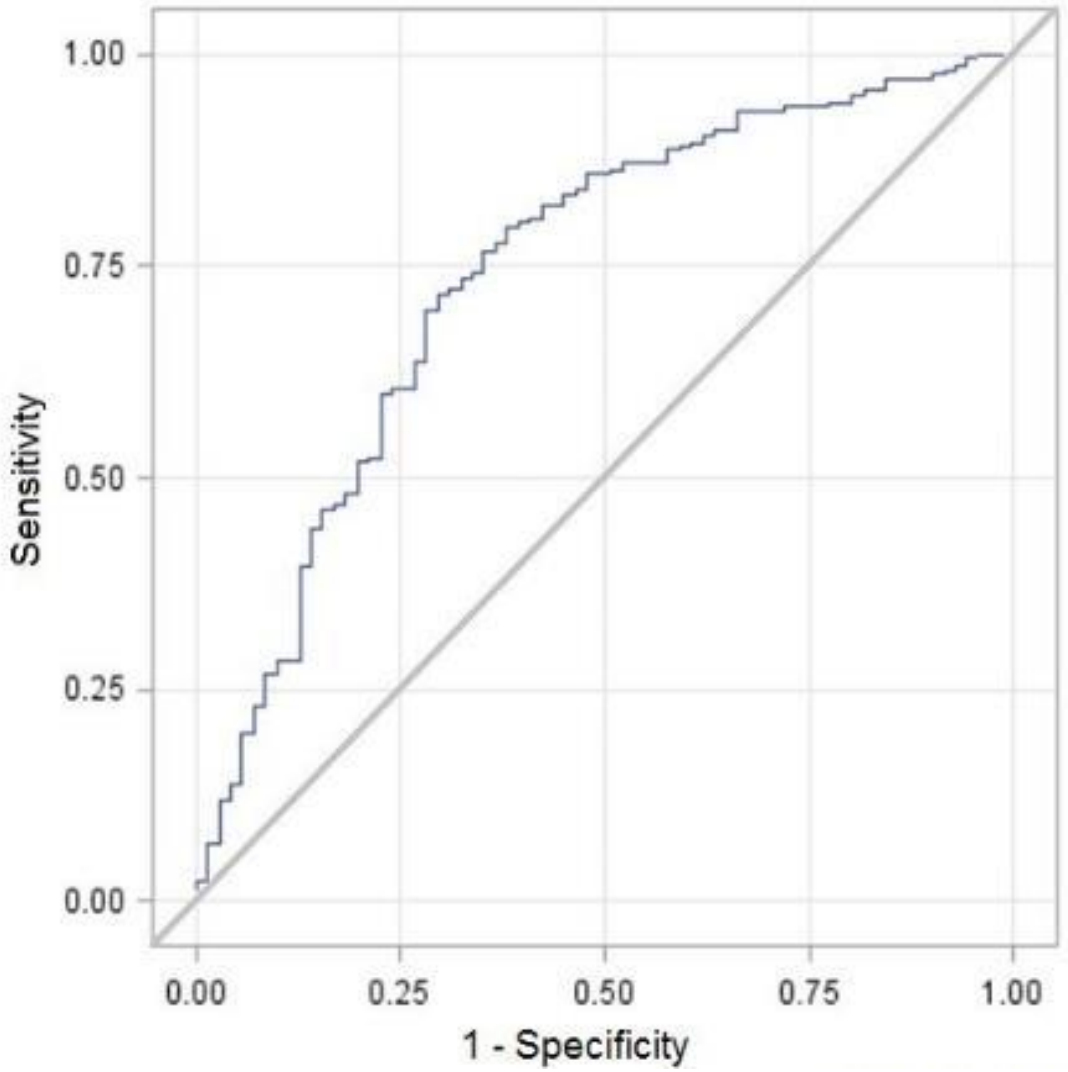
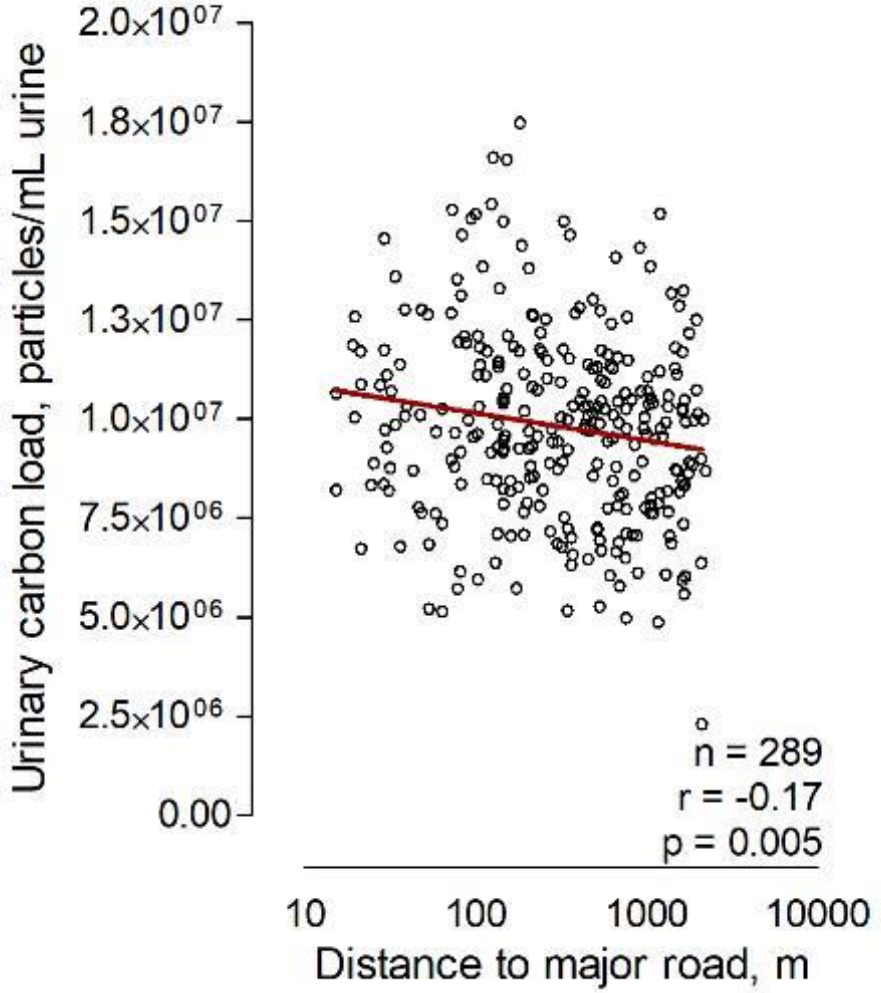




Inhoud

Gezonde ruimte:

- Blootstelling

- **Mentale gezondheid en bloeddruk**

- Sterfte en moleculaire veroudering

Groene ruimte en cognitieve ontwikkeling

BREATHE project
(Barcelona, Spanje)

- 2623 kinderen van 36 scholen
- 7-10 jaar
- Cognitieve functie: computertest
  → 4 keer om de 3 maanden
  - *Geheugen*
  - *Aandacht*
- Groene ruimte: fotosynthetisch actieve vegetatie rondom woning en school

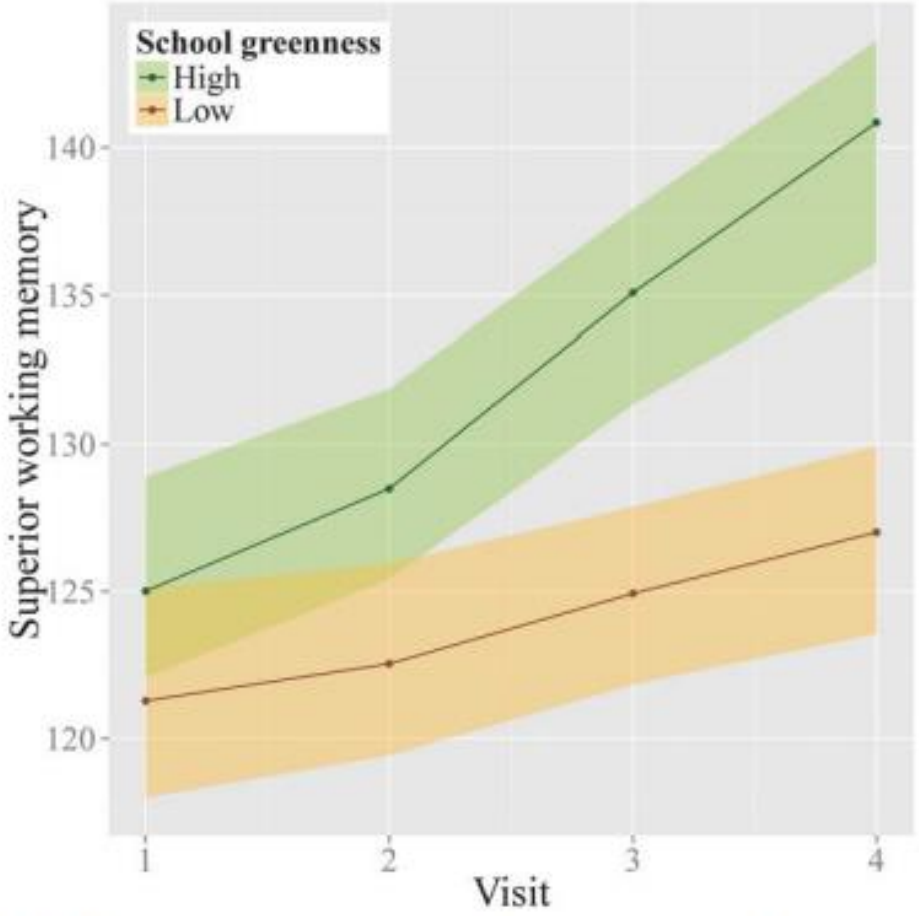


Fig. 1. Twelve-month progress (with 95% confidence bands) in superior working memory for participants with the first (low greenness) and third (high greenness) tertiles of greenness within the school boundaries.

Dadvand et al. PNAS 2016

Natural environments and suicide mortality in the Netherlands: a cross-sectional, ecological study

Marco Helbich, Derek de Beurs, Mei-Po Kwan, Rory C O'Connor, Peter P Groenewegen

	Model 1	Model 2
Green space (*vs* low)		
Mid	0·831 (0·762–0·907)	0·919 (0·846–0·998)
High	0·760 (0·681–0·849)	0·879 (0·779–0·991)
Blue space (*vs* low)		
Mid	1·033 (0·961–1·111)	0·990 (0·927–1·057)
High	0·996 (0·908–1·093)	0·937 (0·861–1·019)
Coastal proximity (*vs* low)		
Mid	0·951 (0·878–1·029)	0·965 (0·898–1·035)
High	0·964 (0·838–1·107)	0·932 (0·823–1·052)
Covariates		
Urbanicity (*vs* rural): urban	..	0·947 (0·887–1·012)
Male	..	0·978 (0·950–1·008)
Divorced	..	1·032 (0·985–1·081)
Unemployed	..	1·043 (1·001–1·086)
Housing prices	..	1·001 (0·963–1·039)
Availability of general practitioners	..	1·034 (0·995–1·074)
Orthodox Protestant	..	0·922 (0·890–0·954)

Data are relative risk estimates (95% CrI). Continuous covariates were standardised. Relative risk estimates were obtained from the posterior distributions together with the 95% CrIs. If the 95% CrI does not include 1, a covariate is considered to be significant. We mapped the unexplained residual spatial variation in suicide risk per municipality relative to the nationwide risk. CrI=credibility interval.

Table: **Results of the regression models with different adjustment levels**

Helbich *et al.* Lancet Planetary Health 2018

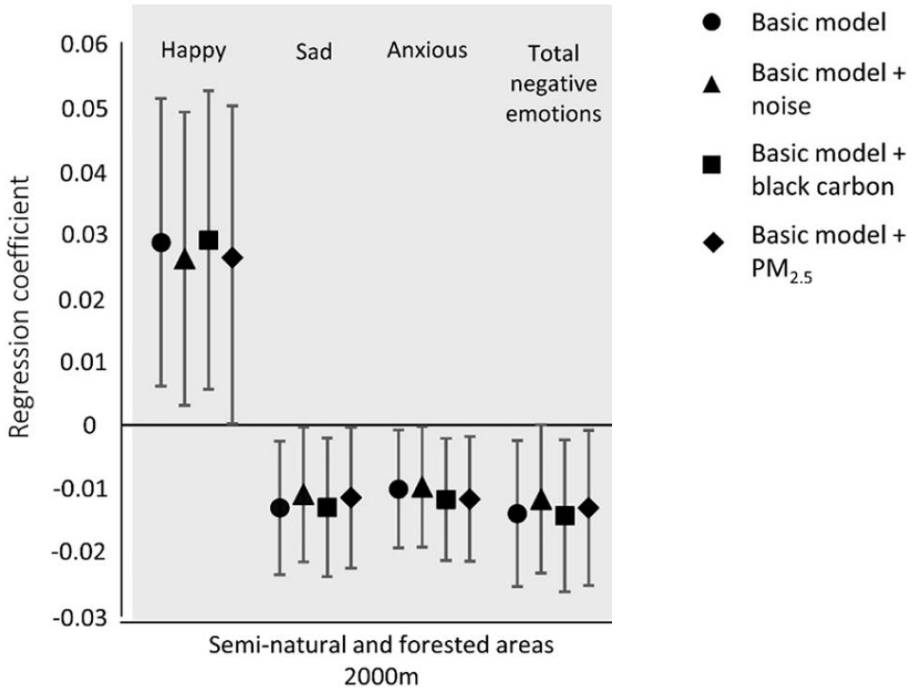
Contents lists available at ScienceDirect

Environment International

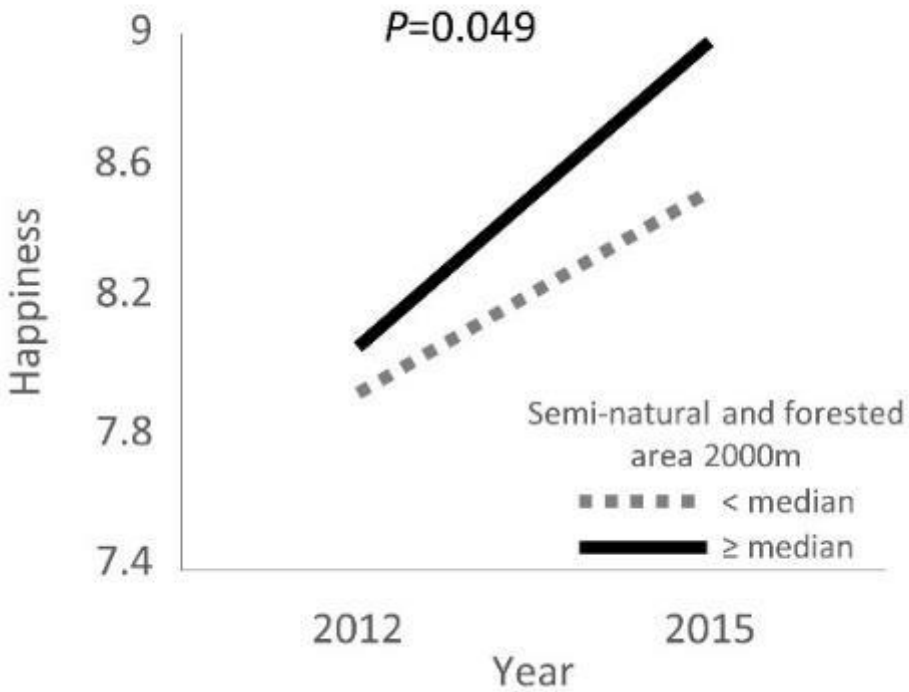
journal homepage: www.elsevier.com/locate/envint

Residential landscape as a predictor of psychosocial stress in the life course from childhood to adolescence

Carola J.C. Van Aart[a,*], Nathalie Michels[a], Isabelle Sioen[a,b], Annelies De Decker[a], Esmee M. Bijnens[c], Bram G. Janssen[c], Stefaan De Henauw[a,d], Tim S. Nawrot[c,e]



Adjusted for age, sex, and socioeconomic status at individual level



Van Aart *et al.* Environ Int 2017

Residential greenness and prevalence of major depressive disorders: a cross-sectional, observational, associational study of 94 879 adult UK Biobank participants

Chinmoy Sarkar, Chris Webster, John Gallacher

Findings Of 122 993 participants with data on major depressive disorder, the study analytical sample comprised 94 879 (77·1%) participants recruited across ten UK Biobank assessment centres between April 29, 2009, and Oct 1, 2010. A protective effect of greenness on depression was consistently observed, with 4·0% lower odds of major depressive disorder per interquartile increment in Normalised Difference Vegetation Index greenness (odds ratio 0·960, 95% CI 0·93–0·99; p=0·0044). Interaction analyses indicated that the beneficial effects of greenness were more pronounced among women, participants younger than 60 years, and participants residing in areas with low neighbourhood socioeconomic status or high urbanicity.

Adjusted for age, sex, indicators of SES both individual and neighbourhood, longterm residential air pollution

Sarkar *et al.* Lancet Planetary Health 2018

Blood pressure in young adulthood and residential greenness in the early-life environment of twins

Esmée M Bijnens[1,2], Tim S Nawrot[1,3*], Ruth JF Loos[4], Marij Gielen[2], Robert Vlietinck[5], Catherine Derom[5,6] and Maurice P Zeegers[2,7]

Background: Previous research shows that, besides risk factors in adult life, the early-life environment can influence blood pressure and hypertension in adults. However, the effects of residential traffic exposure and residential greenness in the early-life on blood pressure in young adulthood are currently unknown.

Methods: Ambulatory (24-h) blood pressures of 278 twins (132 pairs) of the East Flanders Prospective Twins Study were obtained at the age of 18 to 25 years. Prenatal and adulthood residential addresses were geocoded and used to assign prenatal and postnatal traffic and greenness indicators. Mixed modelling was performed to investigate blood pressure in association with greenness while adjusting for potential confounding factors.

Adjusted for sex, gestational age, birth weight, birth year, zygosity–chorionicity group, maternal age, age, smoking, physical activity, BMI, 24 h sodium and potassium, gamma-glutamyl transferase, indicators of socioeconomic status (maternal education and neighbourhood household income), smoking during pregnancy and noise exposure during the night. In

Blood pressure in young adulthood and residential greenness in the early-life environment of twins

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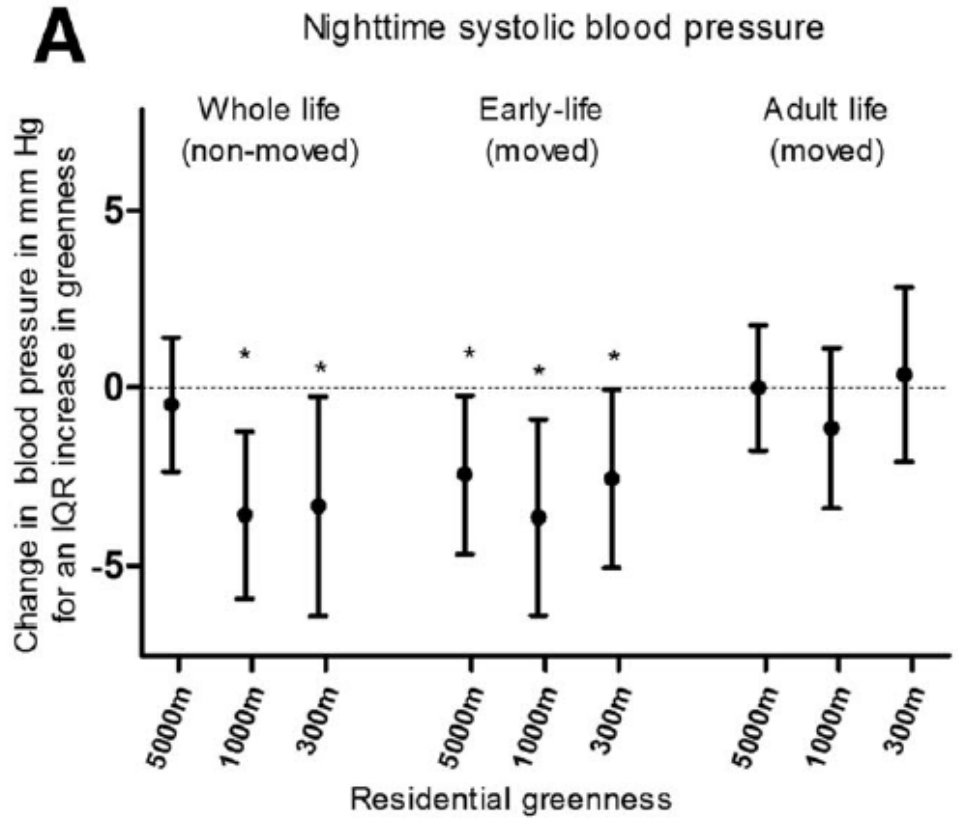

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Inhoud

Gezonde ruimte:

- Blootstelling 
- Mentale gezondheid en bloeddruk 
- **Sterfte en moleculaire veroudering** 

Effect of exposure to natural environment on health inequalities: an observational population study

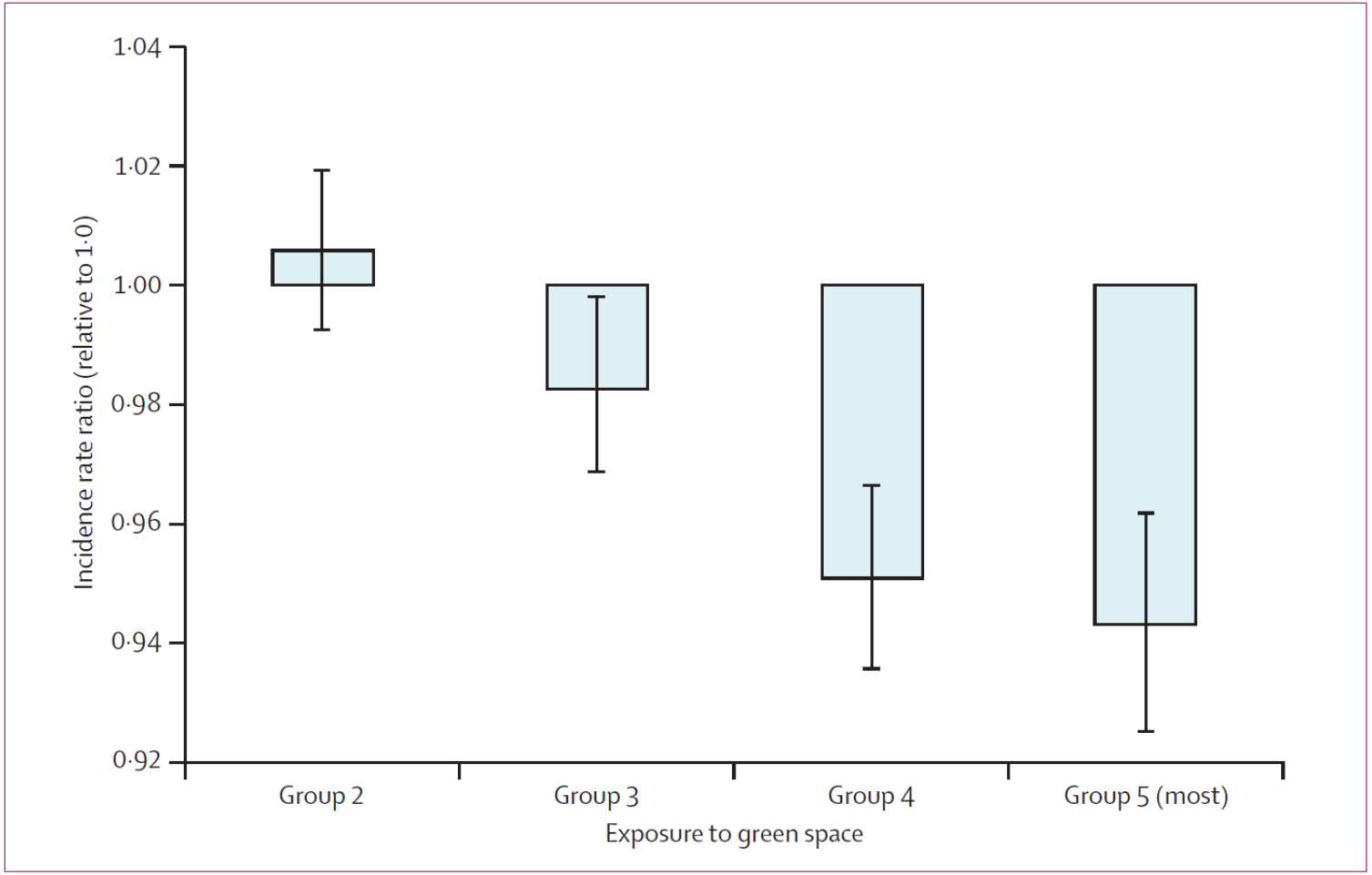
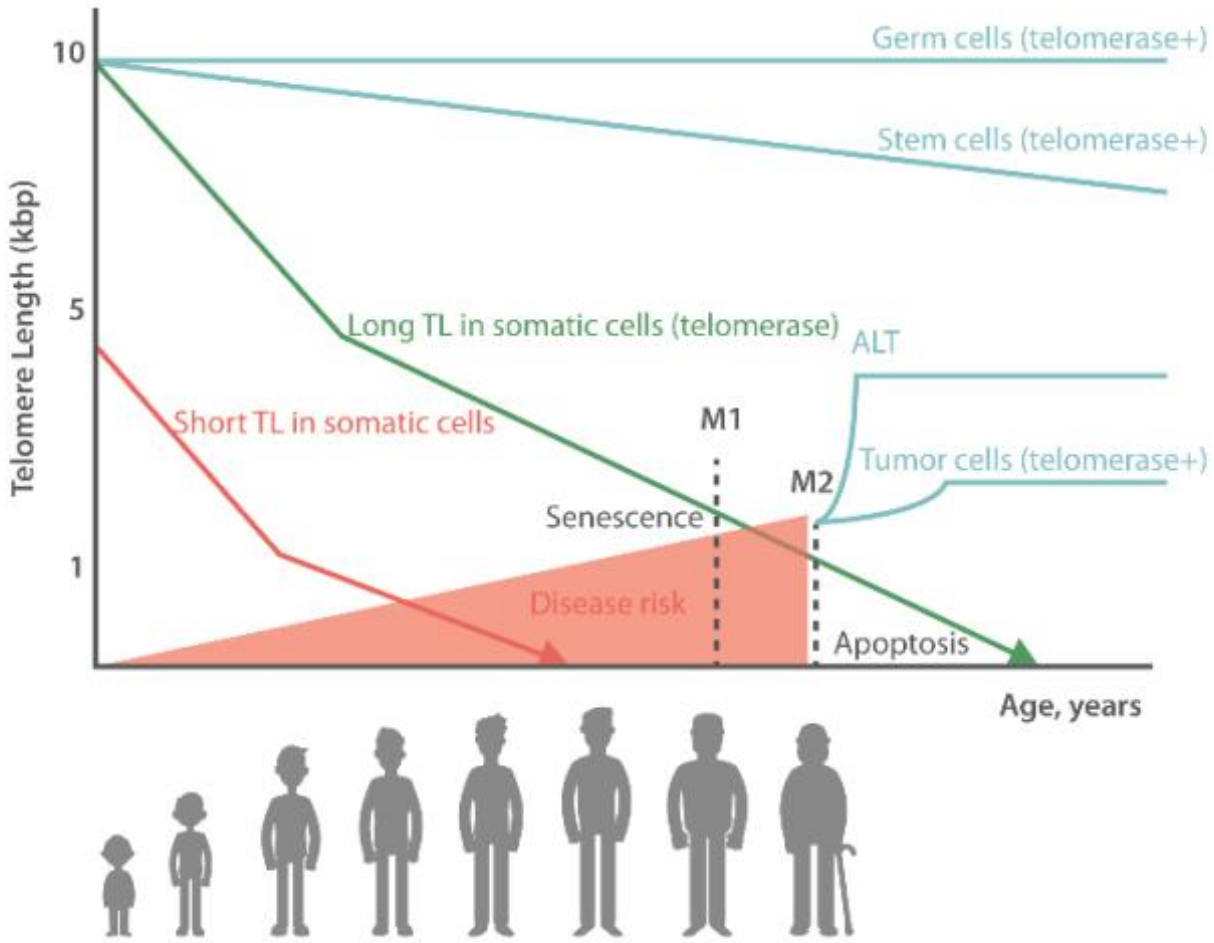


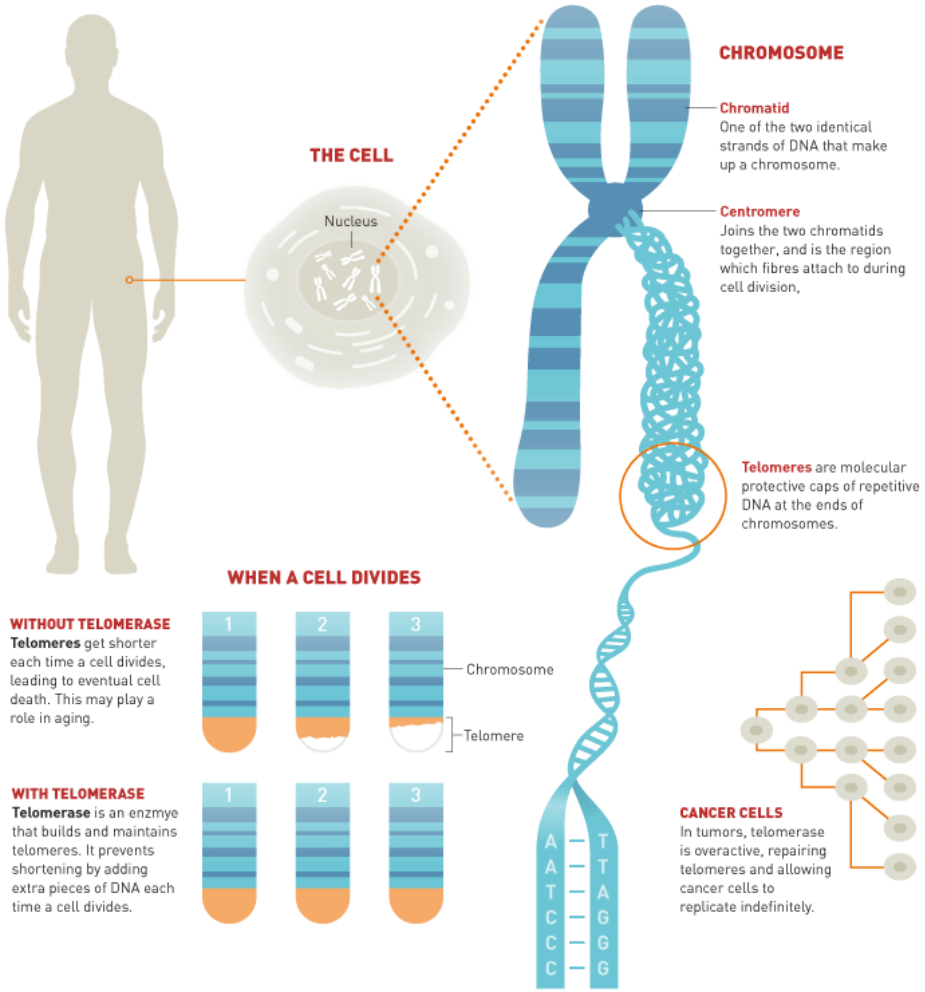
Figure 1: **Incidence rate ratios for all-cause mortality in groups of exposure to green space, relative to group 1 (least exposure to green space)**

Error bars indicate 95% CIs.

Mitchell et al. Lancet 2008

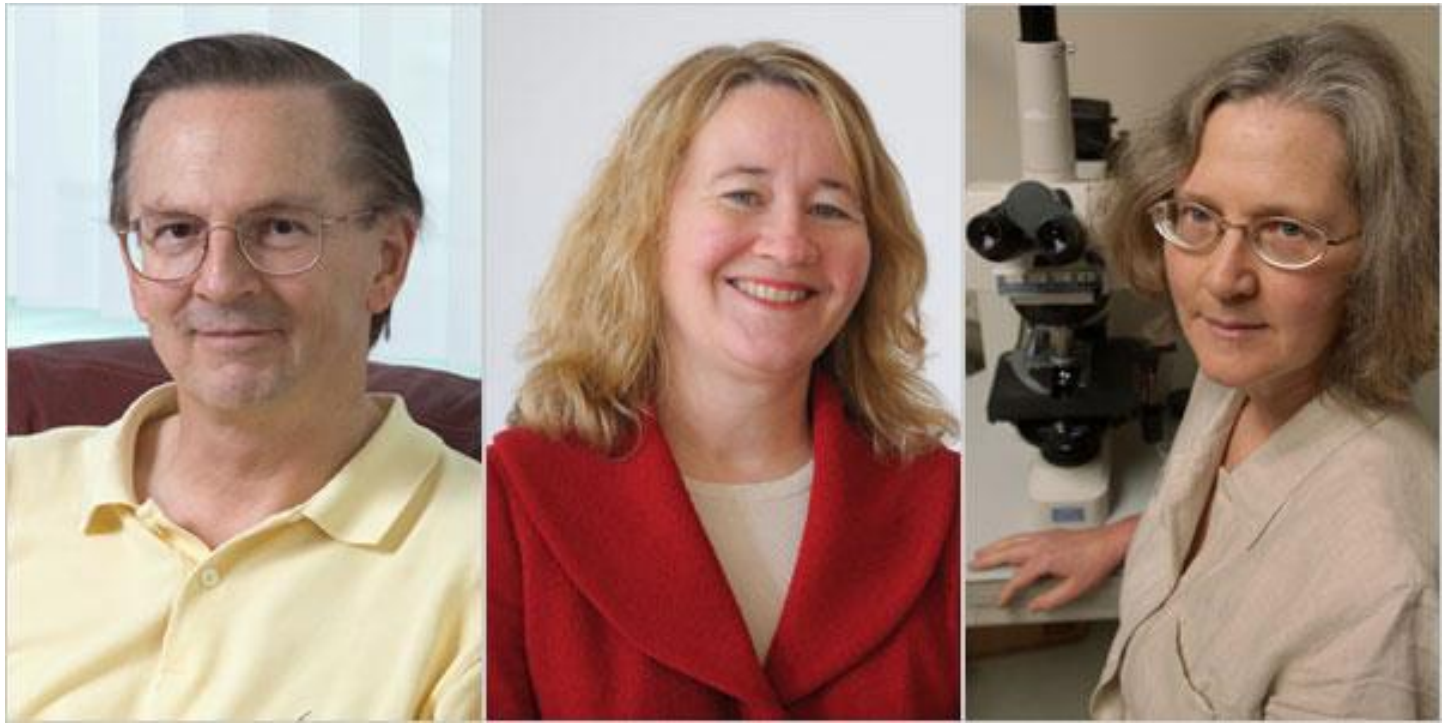
Telomere biology over the life span





Martens *et al.* submitted

Nobel prize for medicine in 2009



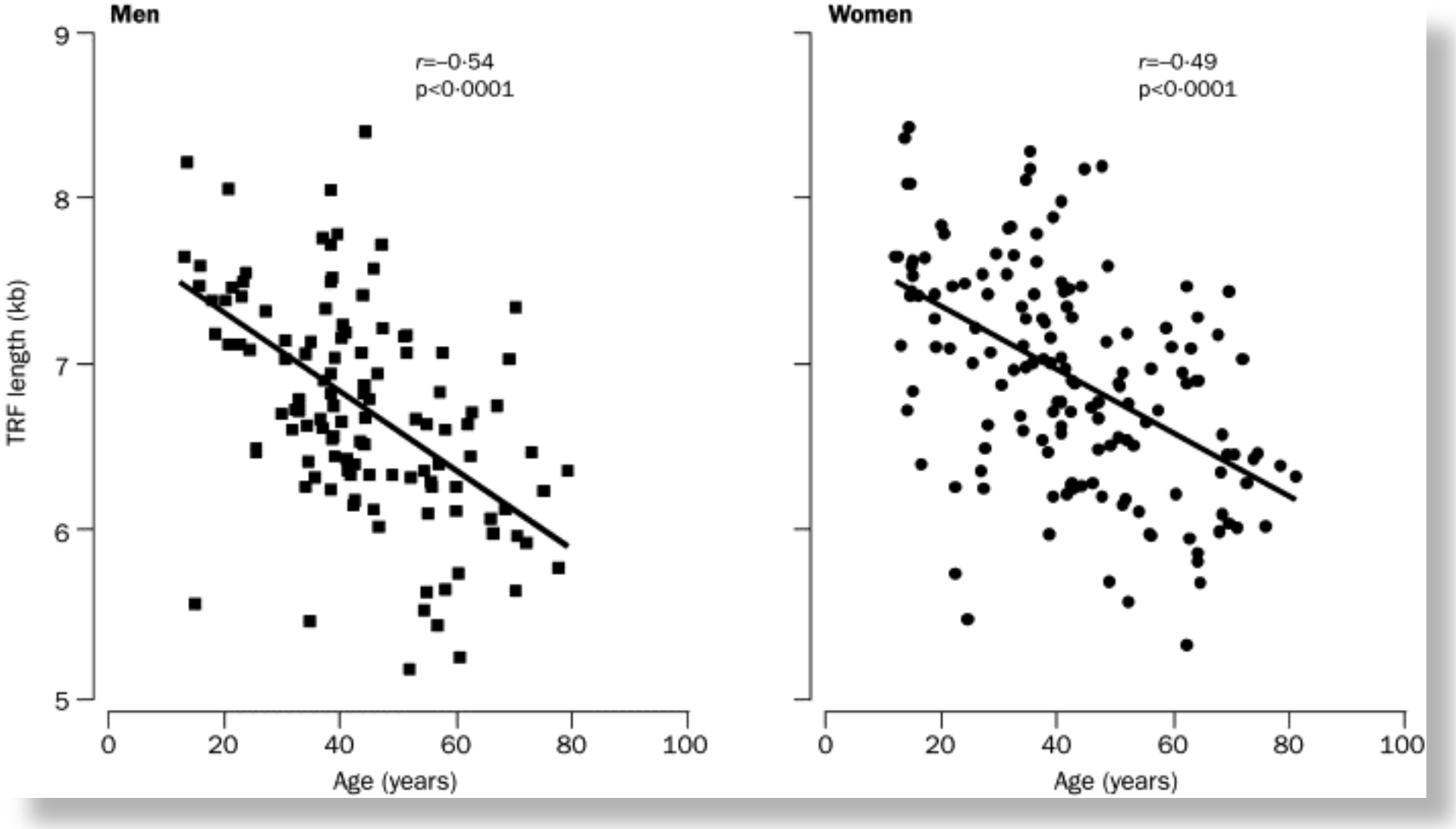
Jack Szostak Carol Greider Elizabeth Blackburn

For the discovery of **"how chromosomes are protected by telomeres and the enzyme telomerase**"

- Nobel assembly press release -

Associated Press, European Pressphoto Agency, Associated Press

Telomere length and ageing

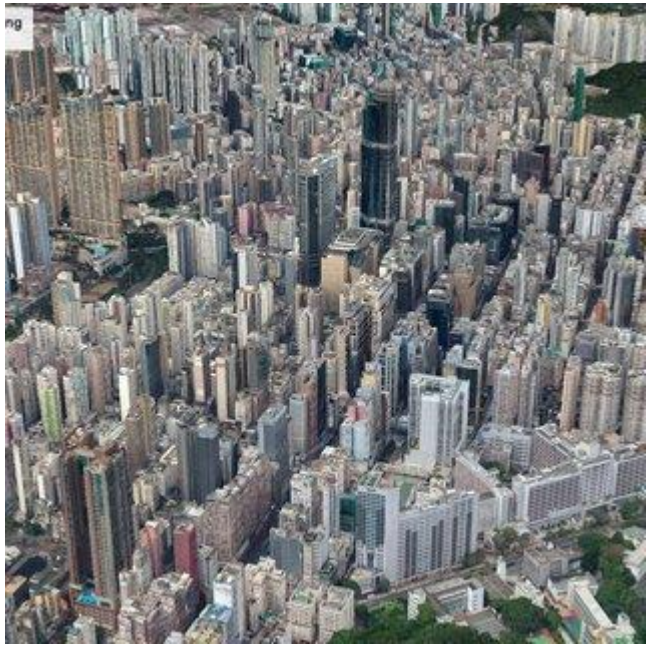


Nawrot et al., Lancet, 2004

Green space, pshychological restoration and telomere length

*Jean Woo, Nelson Tang, Eddie Suen, Jason Leung, Moses Wong
jeanwoowong@cuhk.edu.hk
Chinese University of Hong Kong, Shatin, New Territories, Hong Kong SAR

Lancet, 2009



	Telomere length				Odds ratio (95% CI)
	1st quartile (shortest; n=243)	2nd quartile (n=245)	3rd quartile (n=244)	4th quartile (longest; n=244)	
Shatin	31 (12·8%)	43 (17·6%)	39 (16·0%)	68 (27·9%)	1
Kowloon City	21 (8·6%)	17 (6·9%)	18 (7·4%)	14 (5·7%)	0·50 (0·30–0·83)
Wong Tai Sin	19 (7·8%)	20 (8·2%)	31 (12·7%)	14 (5·7%)	0·59 (0·37–0·94)
Sham Shui Po	31 (12·8%)	22 (9·0%)	21 (8·6%)	15 (6·2%)	0·38 (0·24–0·60)
Yau Tsim Mong	22 (9·1%)	21 (8·6%)	21 (8·6%)	16 (6·6%)	0·48 (0·29–0·78)

Table: **Association between telomere length and region of residence in Hong Kong**

Air pollution and molecular core axis of ageing

Estimates given for 5 µg/m³ ↑ in $PM_{2.5}$

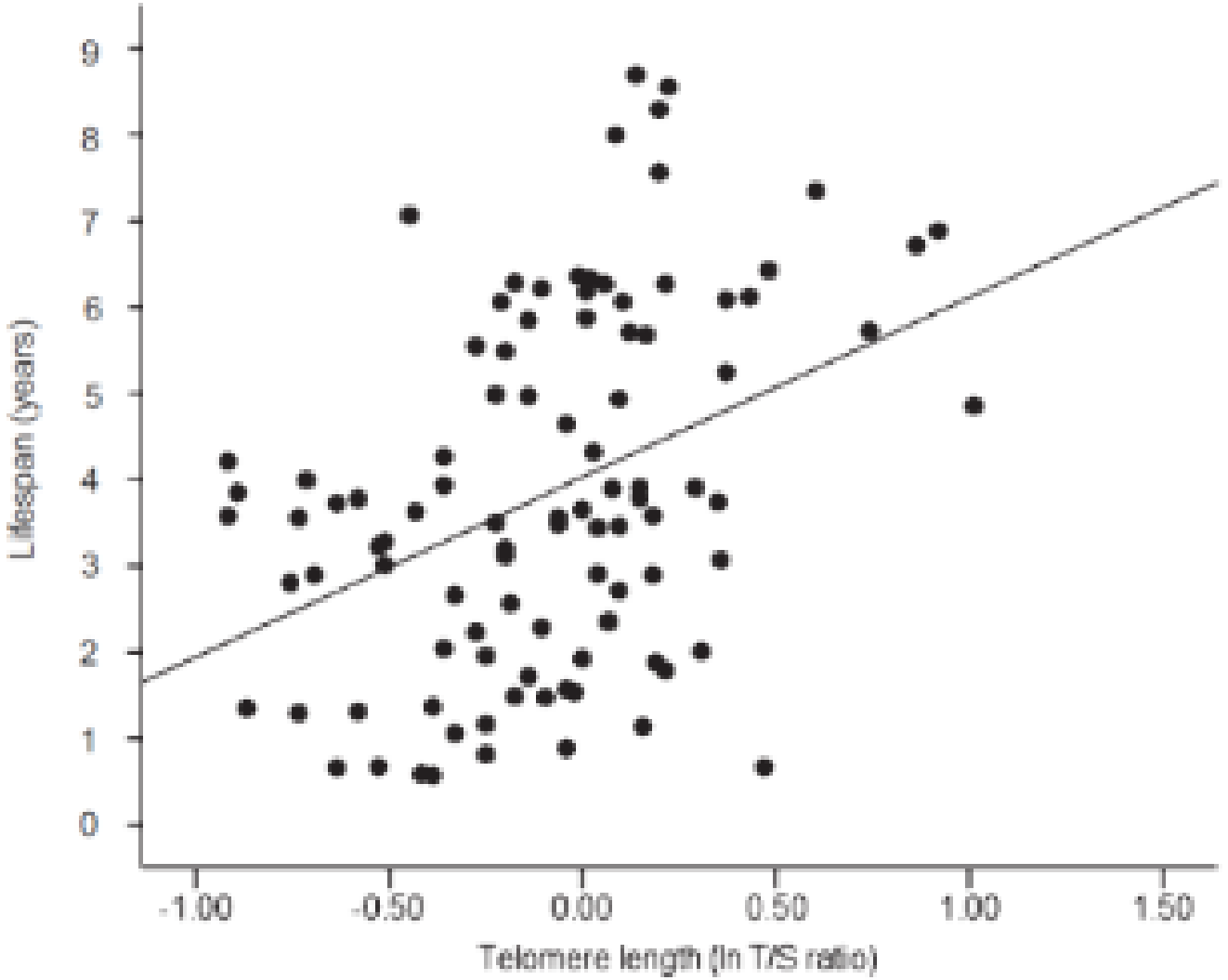
	% change	95% CI	p-value
Telomere length	-16.1%	-26.0 to -7.4	0.0005
MtDNA content	-25.7%	-35.2 to -16.2	<0.0001
SITR1	-17.4%	-30.0 to -5.1	0.006

Adjusted for gender, age, body mass index, socio-economic status and statin use

- 182 elderly, average age (SD): 71 (4.6) years
- $PM_{2.5}$ range 15-23 µg/m³

Pieters N, *et al., Environ Health Perspect,* 2016

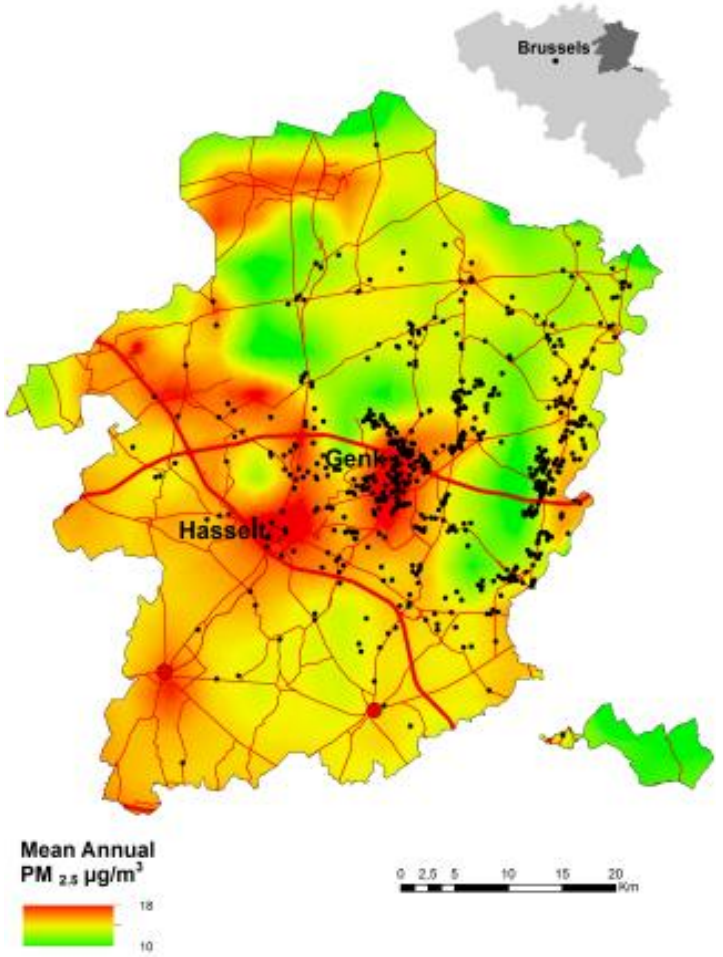
Telomeerlengte vroeg in het leven en belang voor levensverwachting



Heidinger B *et al.* PNAS 2012

ENVIRonAGE birth cohort

ENVIR*ON*AGE ENVIRonmental influence ON early AGEing:
environmental pollution – nutrition – lifestvle – and their interactions with genes



European Research Council

Opening new horizons

Janssen BG *et al.*, Cohort profile ENVIR*ON*AGE, *Int J Epidemiology*, 2017

ENVIRonAGE birth cohort

ENVIR*ON*AGE ENVIRonmental influence ON early AGEing:
environmental pollution – nutrition – lifestyle – and their interactions with genes

Mother-child pairs recruited

Birth — Follow-up — 4 years — 6 years

Collection of maternal blood and urine, placental tissue and cord blood; Questionnaire

Cardiovascular phenotyping: **Micro- & macrovasculature**; Cognitive performance; Questionnaire

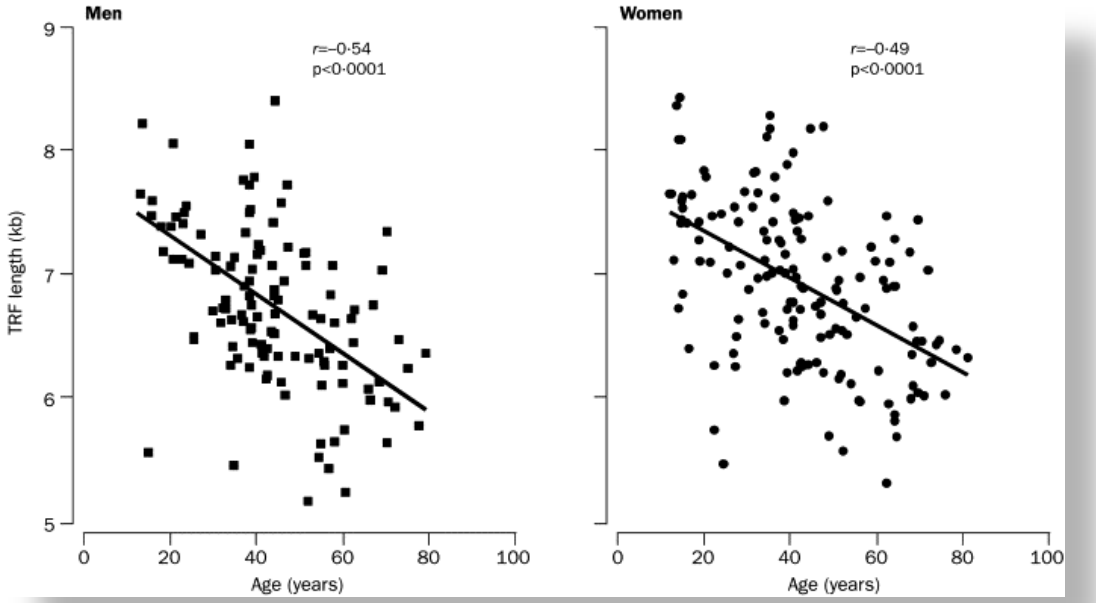
Exposure ⟷ **Biomolecular markers** ⟷ **Endpoints**

European Research Council

Opening new horizons

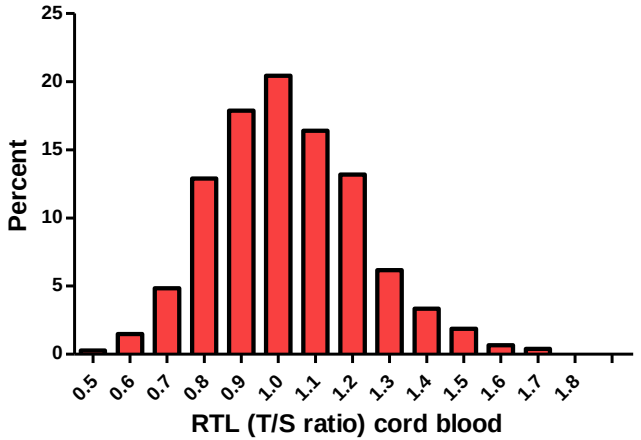
Janssen BG *et al.*, Cohort profile ENVIR*ON*AGE, *Int J Epidemiology*, 2017

Is telomere length variable at birth?

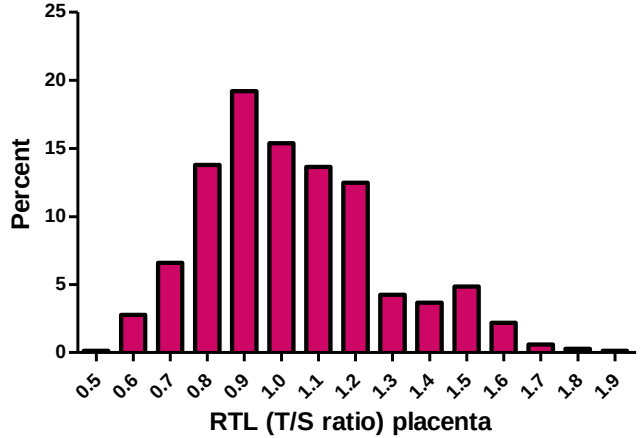


Nawrot et al., Lancet, 2004

NEWBORNS (ENVIR*ON*AGE)



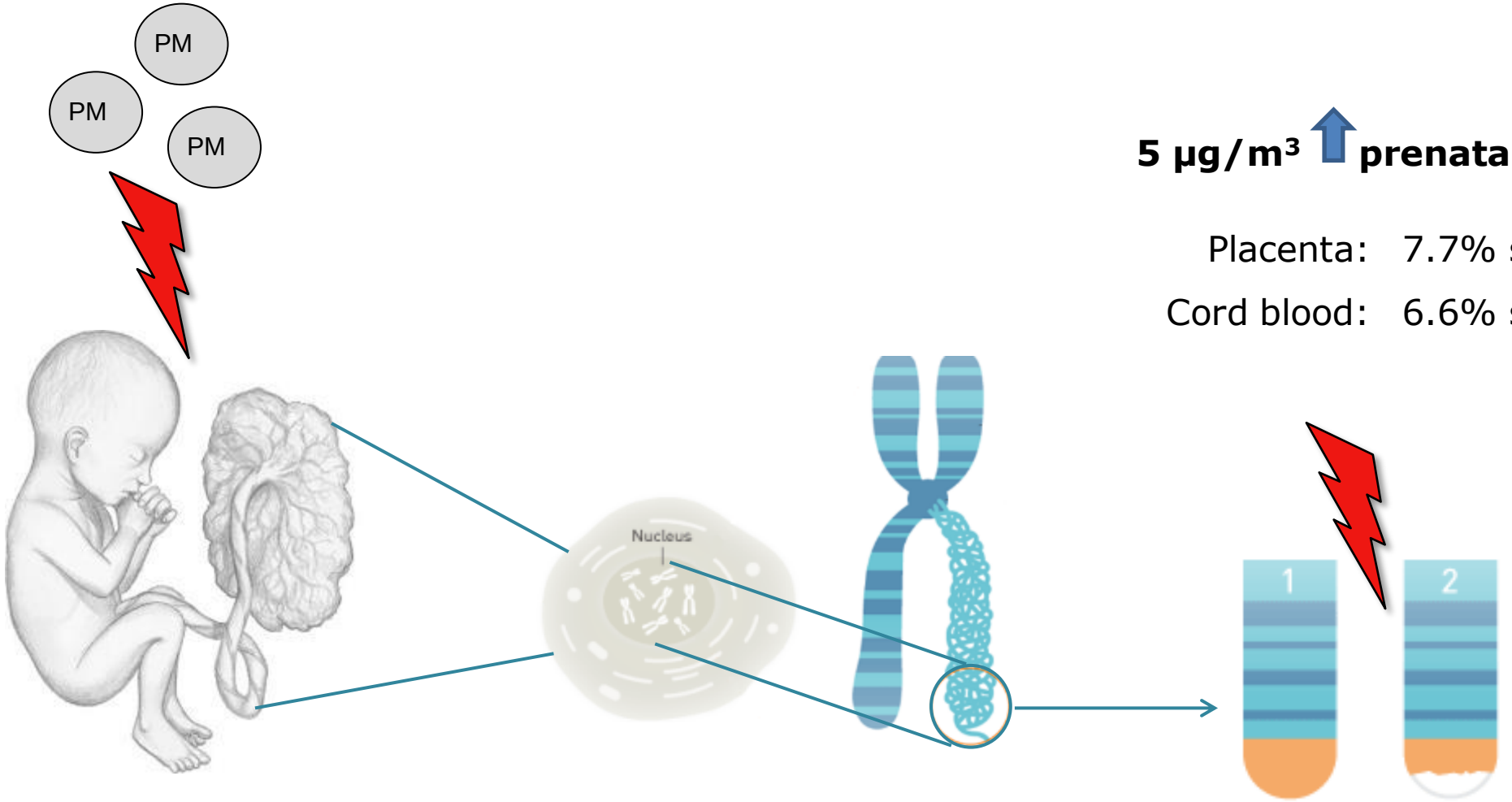
n=734



n=693

Martens et al. JAMA Pediatrics 2017

Prenatal air pollution exposure and telomere length at birth



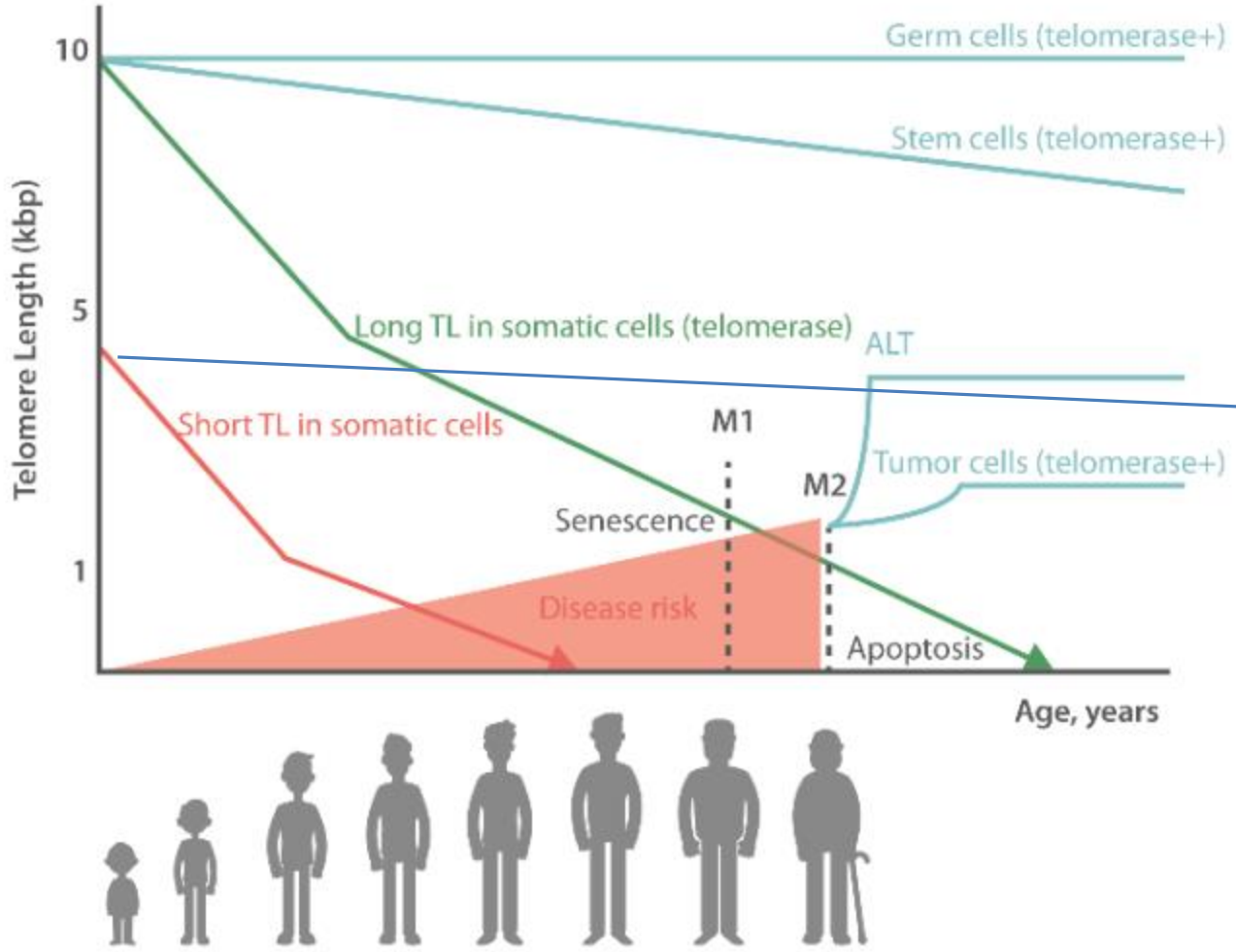
5 µg/m³ ↑ prenatal $PM_{2.5}$

Placenta: 7.7% shorter

Cord blood: 6.6% shorter

Martens D et al. JAMA Pediat 2017

Significance



6.6% shorter TL leads to a loss of approximately **650 bp** in cord blood telomere length for IQR in air pollution.

Based on longitudinal studies, an **annual loss between 46 bp is estimated in adult leukocytes**,

indicating that prenatal exposure (IQR increase) is equivalent to a loss of **14 telomeric year equivalence in adulthood**.

Conclusies

Slimme **ruimtelijke planning:**

- essentieel **element in duurzame gezondheid**

- Effecten zijn meetbaar op **cellulair niveau** maar ook op vlak van meetbare gezondheidseindpunten zoals **mentale gezondheid, bloeddruk**, ect.

- Effecten zijn aantoonbaar over de **gehele levensloop**