UMC Utrecht

Exposoom en hart- en vaatziekten

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Wetenschapsdag HVZ kaderartsen
5 juni 2026

https://www.hartenvaatcijfers.nl

HART ENVAAT CIJFERS

Rapportages Over HVC Contact



Artikelen & Jaarcijfers

Ziektebeelden



Behandelresultaten



Risicofactoren



Analysetool



Rapportages

HART ENVAAT CIJFERS

Sitemap

Contact

Exposome-NL

"…to capture the exposome and to understand which, how, in what quantities, and in what circumstances environmental factors have an effect on our health."

www.exposome.nl



exposomeNL

NWO Netherlands Organisation for Scientific Research

Amsterdam UMC Universitair Medische Centra

rijksuniversiteit groningen

Universiteit Leiden

UMC Utrecht

Universiteit Utrecht

Slides worden gedeeld na afloop

Let’s talk about….the exposome

Wat is het exposoom?



Exposoom

Het exposoom concept is voor het eerst beschreven door Christopher Paul Wild

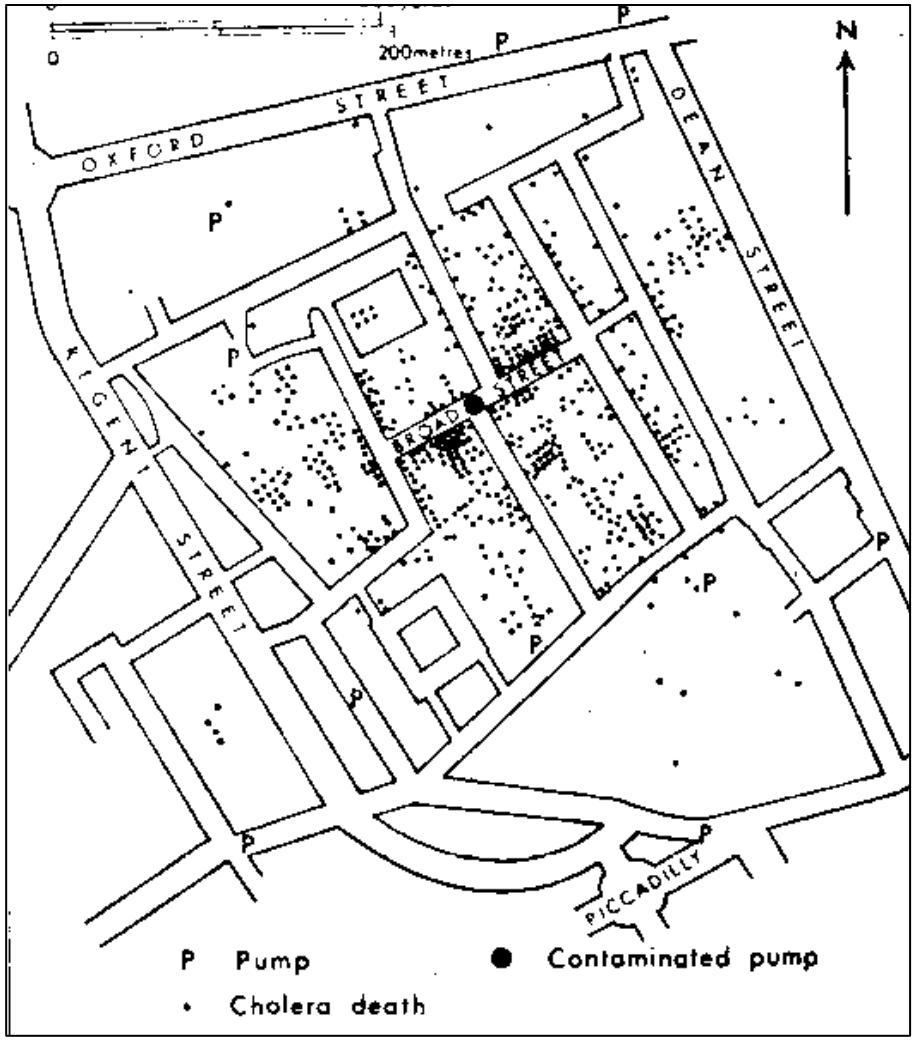
Het exposoom kan worden gedefinieerd als de maat van alle blootstellingen van een individu gedurende zijn leven en hoe deze verband houden met gezondheid en ziekte



Wild. Cancer Epidemiol Biomarkers Prev 2005;14:1847-50.

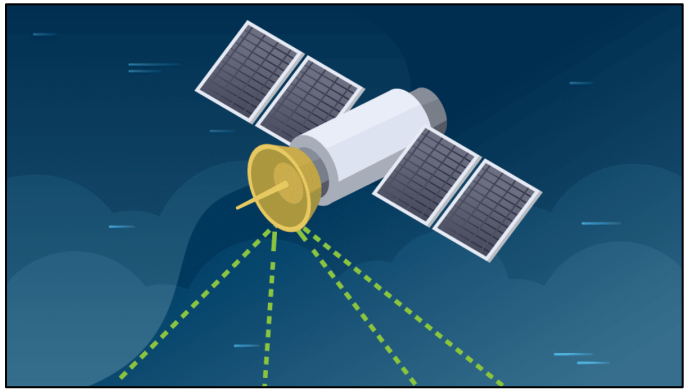
Exposoom en gezondheid: niet nieuw

John Snow in *On the mode of communication of Cholera* (1849):
"I found that nearly all the deaths had taken place within a short distance of the [Broad Street] pump."

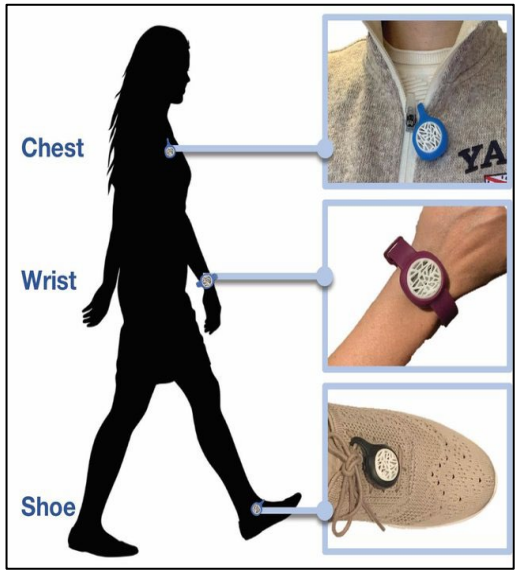


Exposoom en gezondheid: waarom nu? (I)





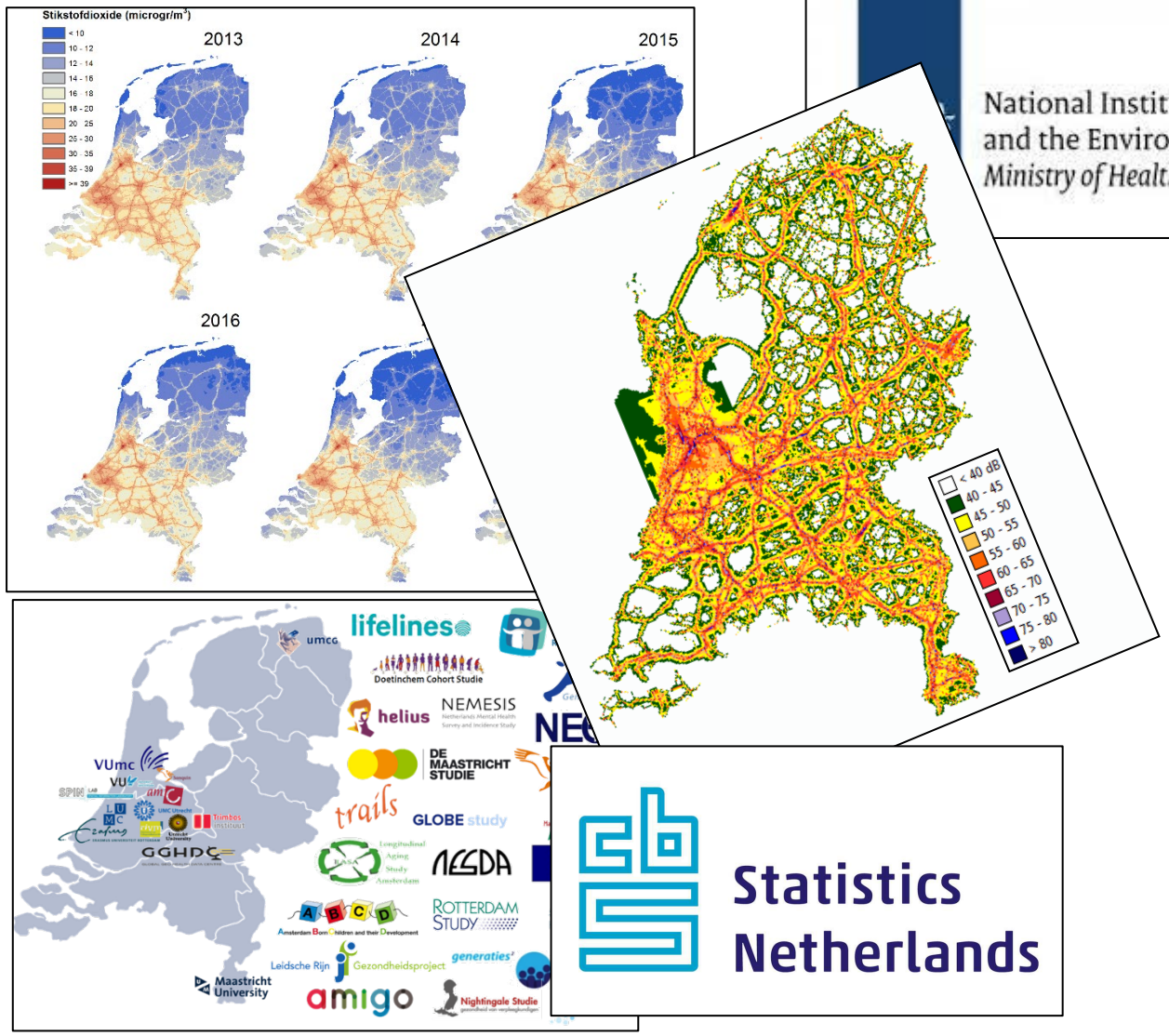




Progress in assessment methods

With all developments in technology, we are increasingly better in measuring the exposome

Exposoom en gezondheid: waarom nu? (II)



Availability of big data

Huge increase in area-level and individual-level data

Exposoom en gezondheid: waarom nu?(III)



Advancement in analyses
Improvements in computer sciences, machinery, spatial data analyses, and computational power enable exposome research

Three broad exposome categories

1. Het algemene externe exposoom

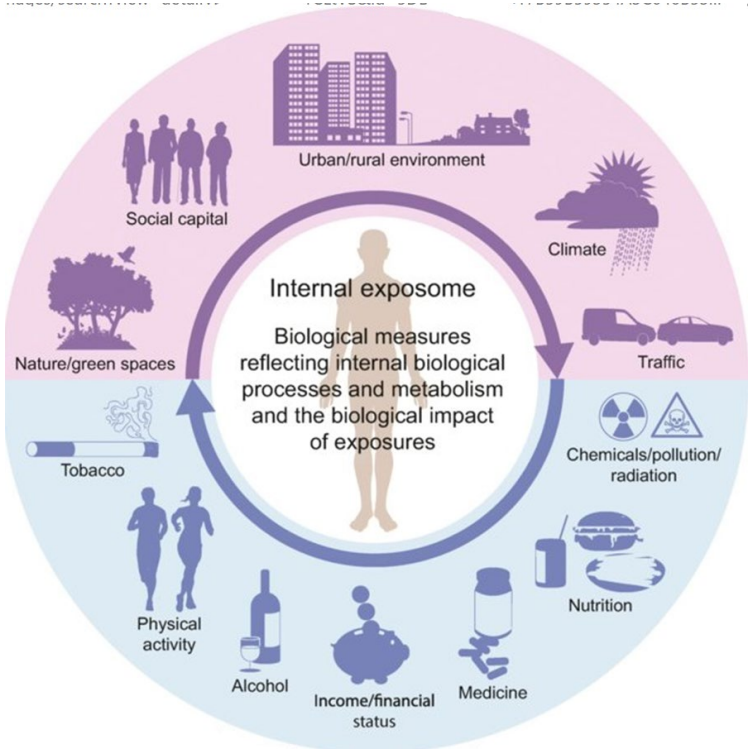
de wereld om je heen

2. Specifieke externe exposoom

wat je persoonlijk tegenkomt of doet

3. Interne exposoom

hoe je lichaam daarop reageert



Wild. Int J Epidemiol 2012;41(1):24-32.

Het algemene externe exposoom

Het algemene externe exposoom omvat factoren op maatschappelijk, fysiek en omgevingsniveau die niet direct uit het lichaam zelf komen



Gebouwde omgeving



Door de mens gemaakte kenmerken van de fysieke omgeving waarin we leven, werken en recreëren

Sociale omgeving

Sociale relaties en de sociale context waarin groepen mensen leven en met elkaar omgaan



Voedselomgeving



De toegankelijkheid, beschikbaarheid, betaalbaarheid en de promotie van voedsel en verkoop van voedsel in onze leefomgeving

Fysisch-chemische omgeving

Alle chemische of fysische factoren die aanwezig zijn in onze lokale omgeving. Oa luchtvervuiling, verkeerslawaai, zware metalen, temperatuur



Het specifieke externe exposoom

Directe blootstellingen op individueel niveau



Diet



Physical activity



Sedentary behaviour



Sleep behaviour



Tobacco use

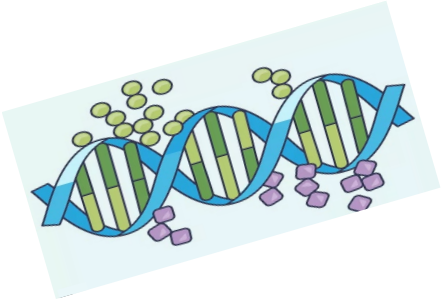


Alcohol consumption



Medication use

Interne exposoom



alle biologische factoren en processen, en de biologische respons op externe blootstelling

Metaboloom:
Complete set van kleine moleculaire chemicaliën gevonden in een biologisch monster.

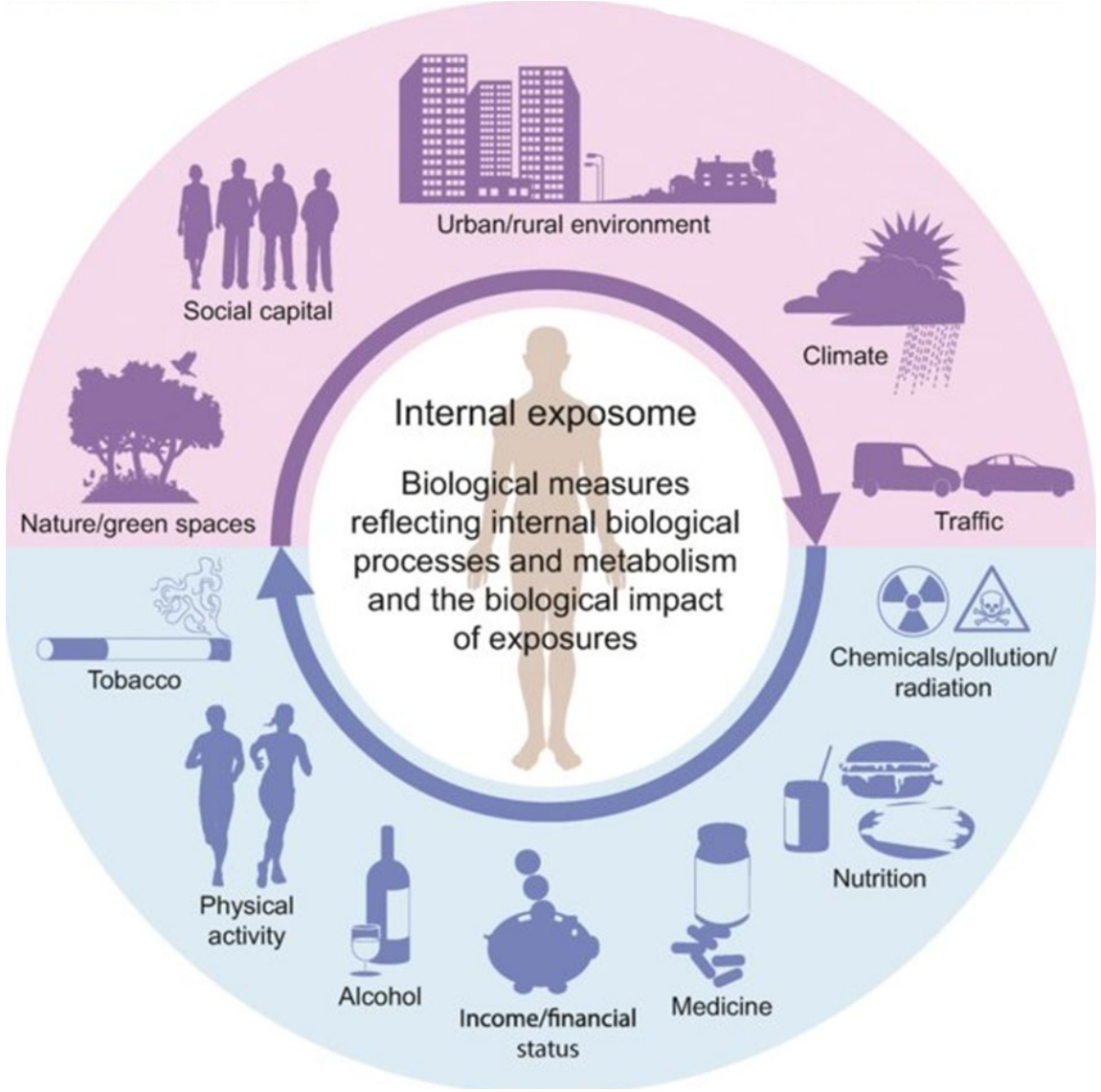
Microbioom:
Collectie van alle microben (bv., bacteriën, schimmels, virussen)

Transcriptoom:
Volledige verzameling van alle RNA-moleculen die in een cel of weefsel worden aangemaakt. Het laat zien welke genen actief zijn.

Proteoom:
Volledige verzameling van alle eiwitten die in een cel of weefsel aanwezig zijn. Het laat zien welke eiwitten actief zijn

Epigenetica:
veranderingen in genactiviteit die niet worden veroorzaakt door veranderingen in het DNA zelf, maar door chemische aanpassingen die bepalen welke genen aan of uit staan.

Algemene externe exposoom



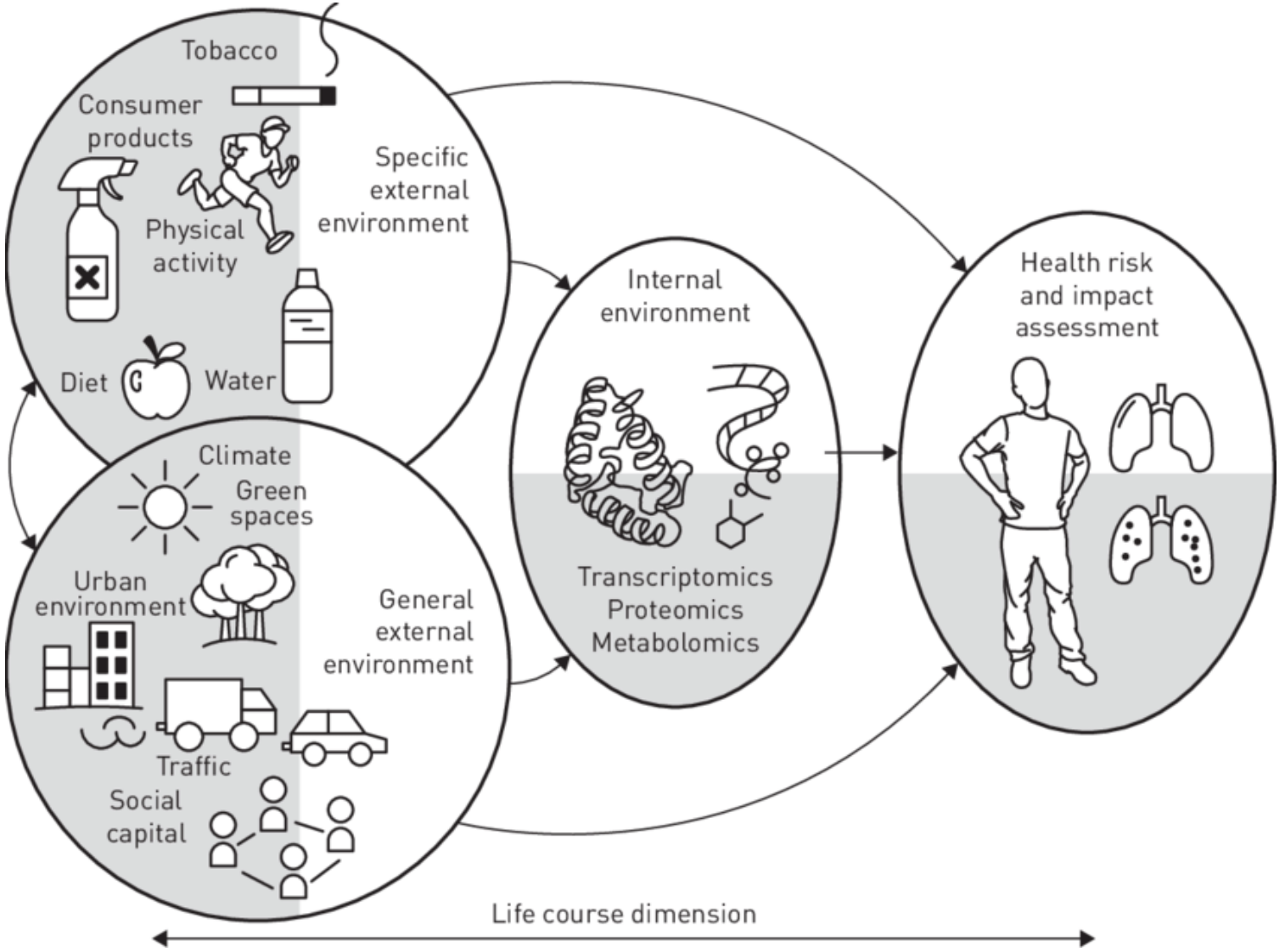
Specifieke externe exposoom

Denk aan je eigen leefomgeving

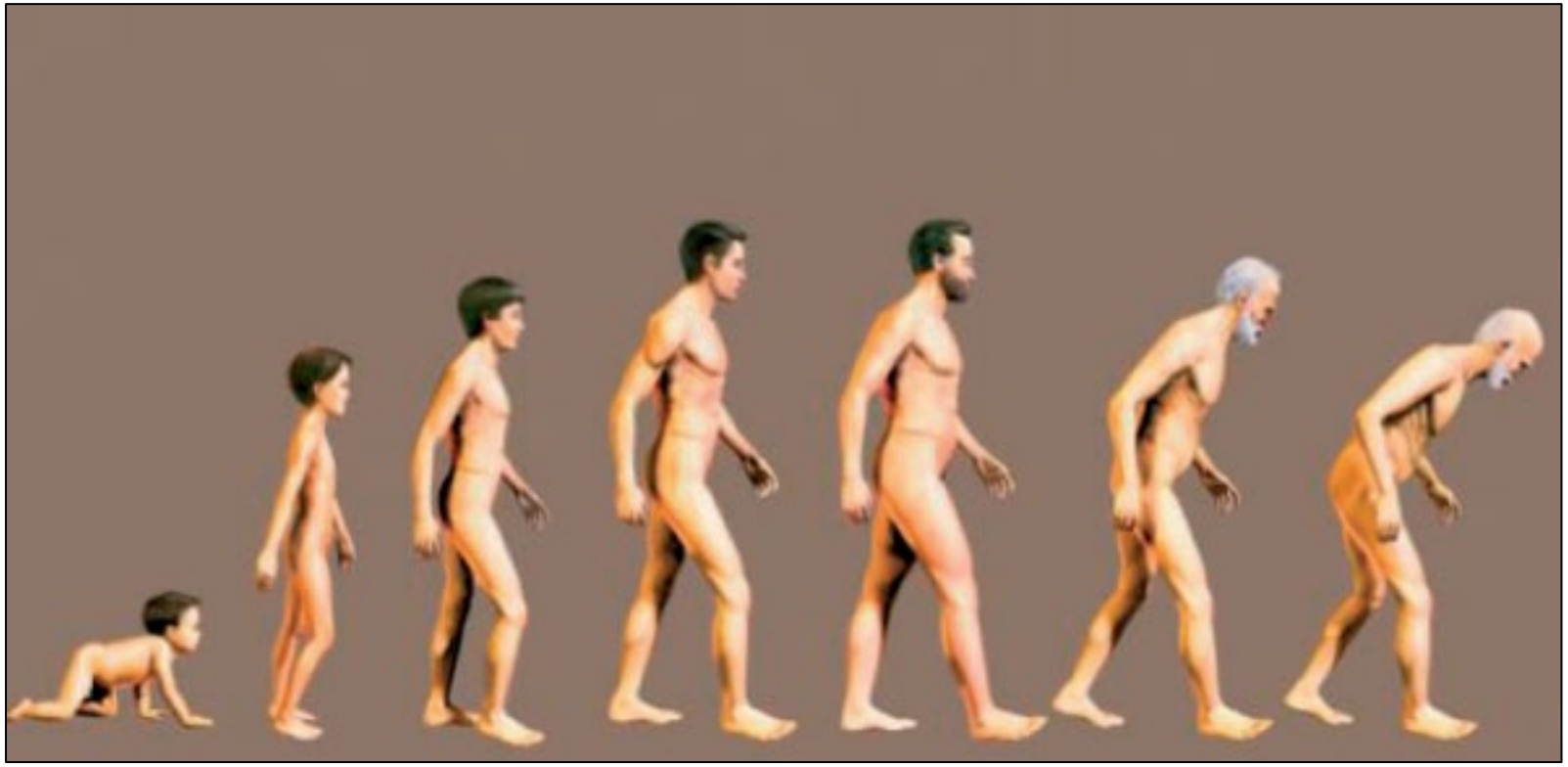
Zijn er algemene externe exposoom factoren die je
1. tegen hart- en vaatziekten beschermen
2. Risico op hart- en vaatziekten vergroten

Bespreek dit met je buurman of buurvrouw

Combineren van kennis en data over interne en externe exposoom is een enorme uitdaging



Dynamisch concept (I): levensloop



Exposome is the sum of all environmental exposures over a complete lifetime, from conception onwards.

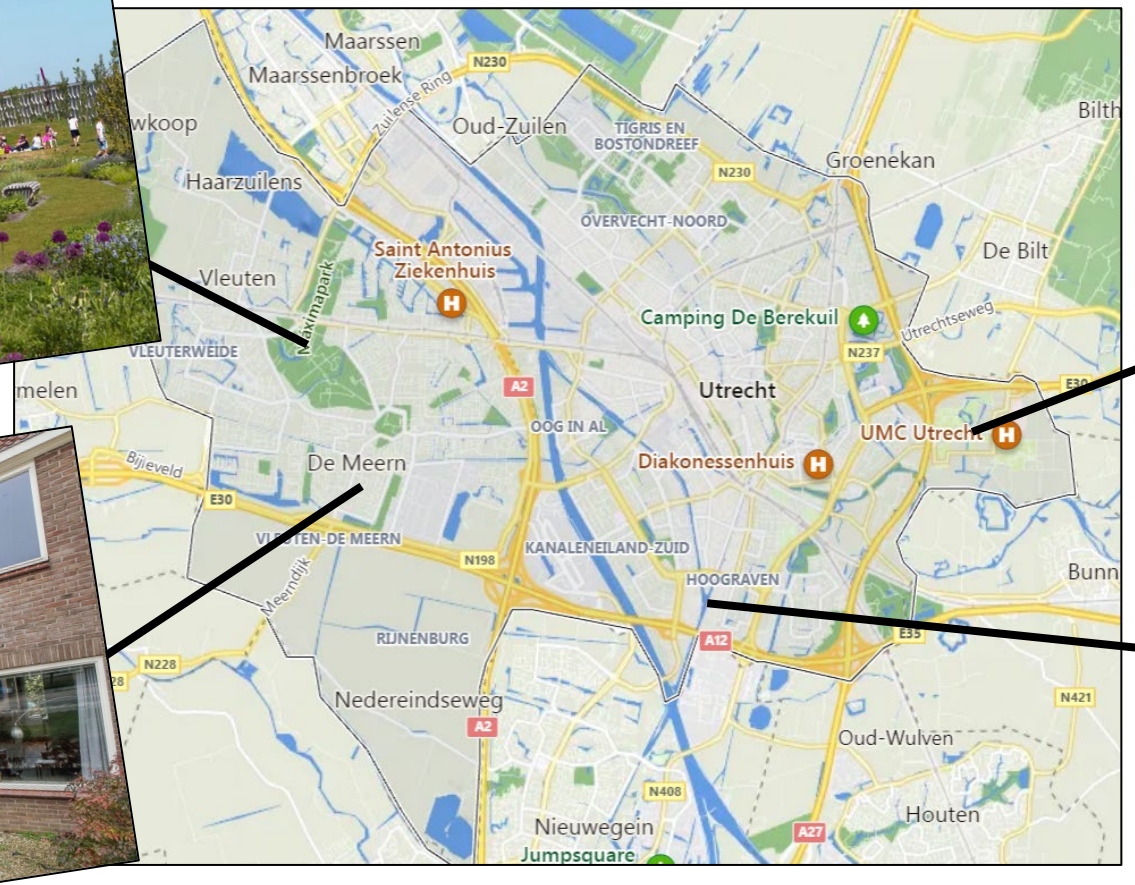
Capturing the exposome requires measurement of exposures over time across the lifecourse of an individual.

Wild. Int J Epidemiol 2012;41(1):24-32.

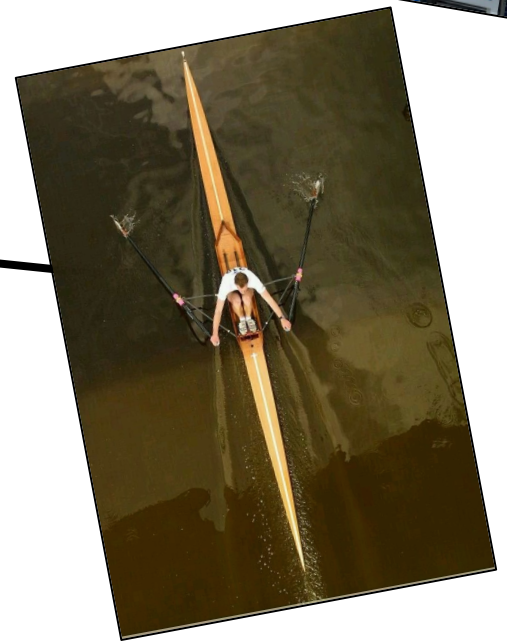
Dynamisch concept (II): tijd en ruimte



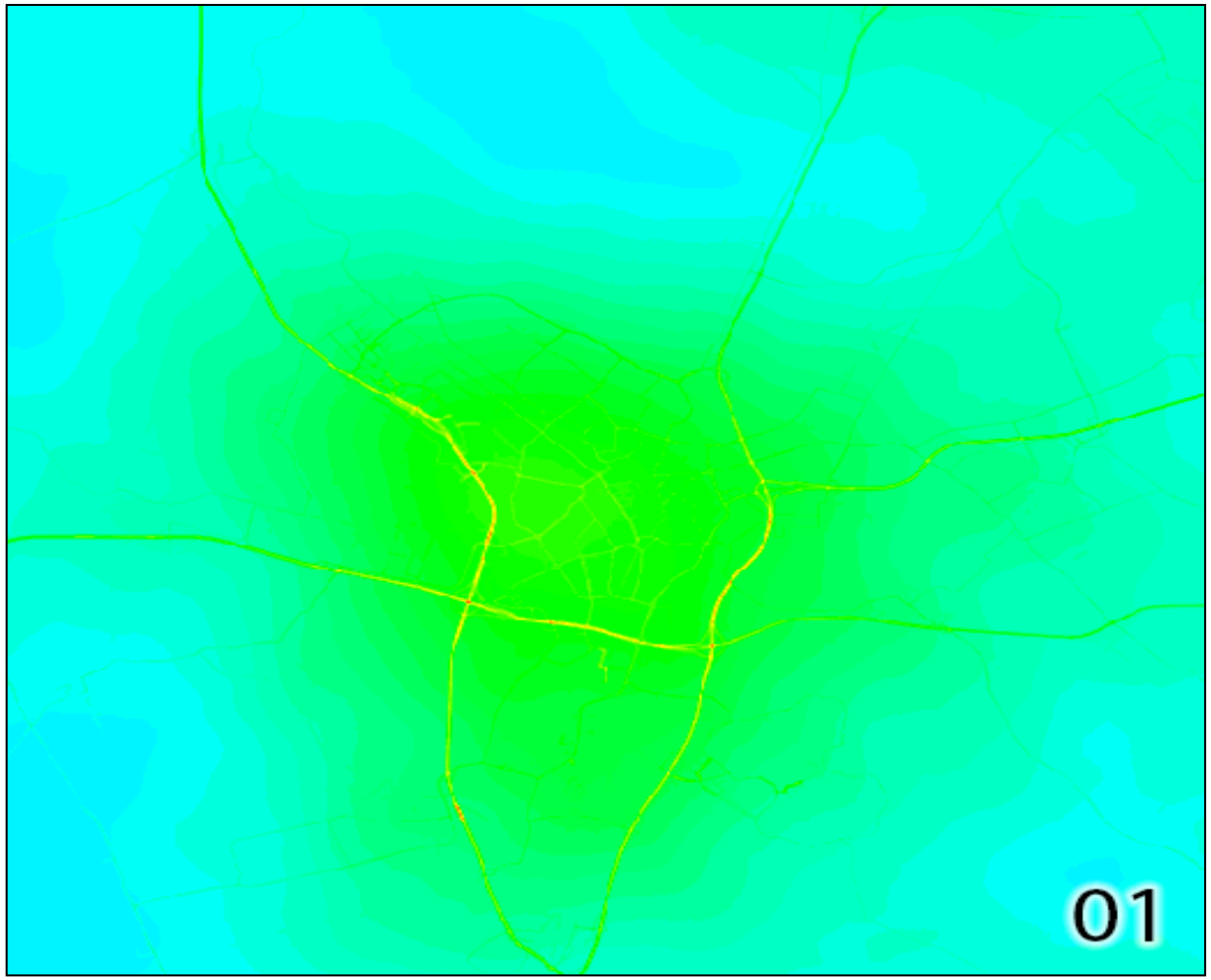








Air pollution in Utrecht on a daily basis

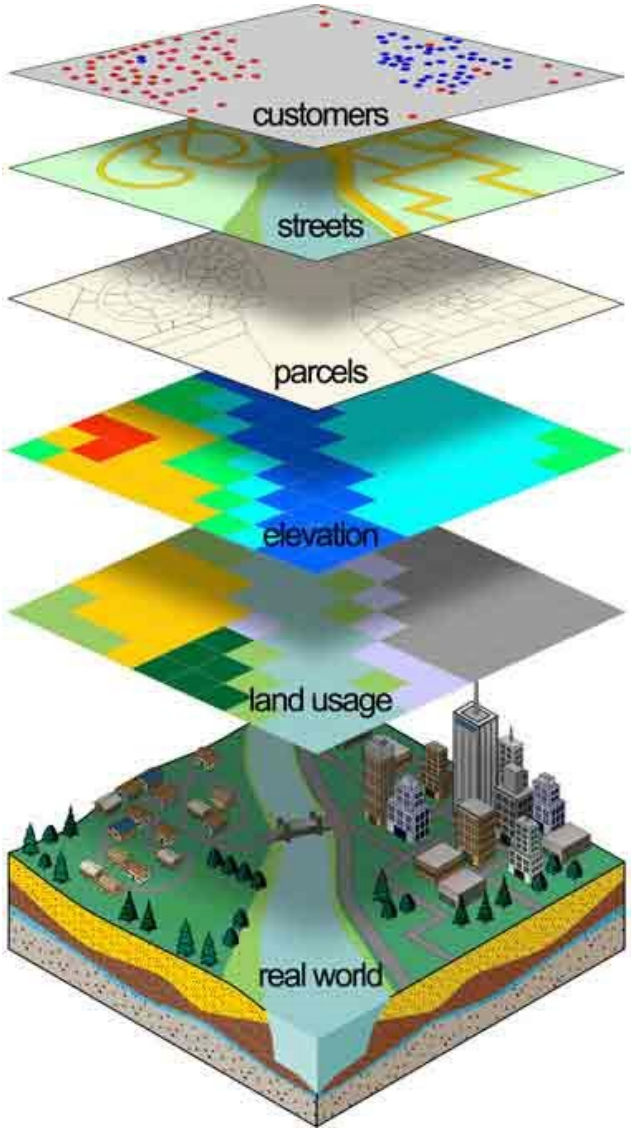


Air pollution levels for each hour of the day in Utrecht, the Netherlands

Vaststellen dynamische blootstelling is moeilijk maar kan in sommige situaties al wel

Geographic Information System (GIS)

…een systeem dat allerlei soorten ruimtelijke data kan opslaan, bewerken, combineren en analyseren



Samengevat

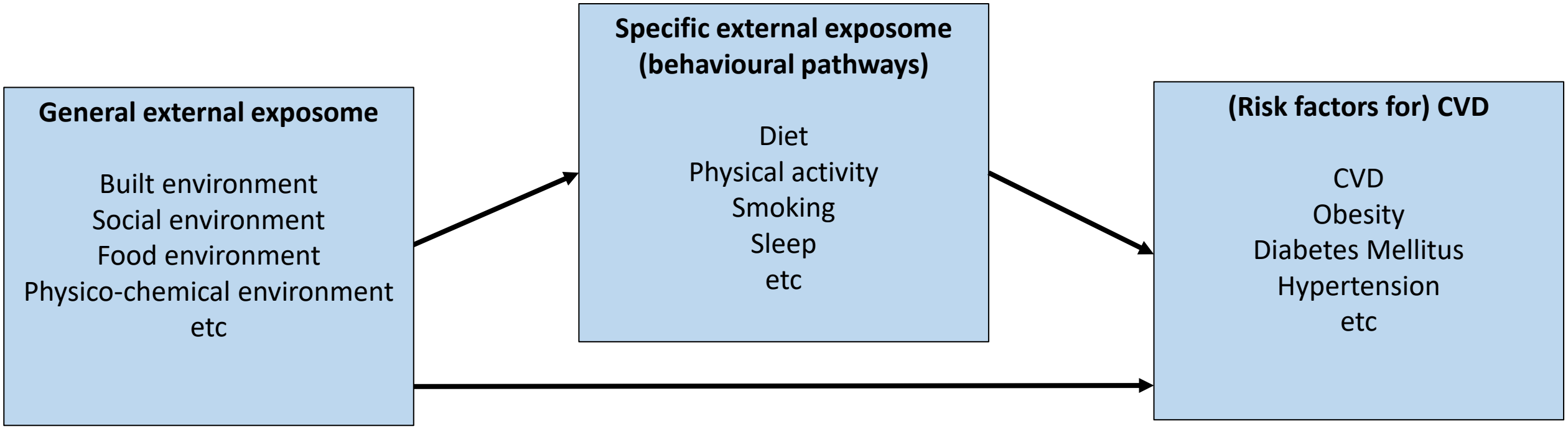
Definitie van het exposoom

Drie exposoom categorieën

Uitdagingen in exposoom onderzoek

- Combineren kennis en data van interne en externe exposoom in relatie tot gezondheid
- Vaststellen van blootstelling aan omgevingsfactoren gedurende de levensloop
- Bepalen van blootstelling rekening houdend met tijd en ruimte

Environmental health studies



ESC European Society of Cardiology
European Journal of Preventive Cardiology (2023) **30**, 1801–1827
https://doi.org/10.1093/eurjpc/zwad241

FULL RESEARCH PAPER
CVD risk factors

The built environment and cardiovascular disease: an umbrella review and meta-meta-analysis

Mingwei Liu [1†], Paul Meijer[1,2†], Thao Minh Lam[2,3,4], Erik J. Timmermans[1], Diederick E. Grobbee [1], Joline W.J. Beulens[1,3,4], Ilonca Vaartjes [1*], and Jeroen Lakerveld[2,3,4]

[1]Julius Global Health, Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht University, Str6.131, P.O. Box 85500, 3508 GA, Utrecht, The Netherlands; [2]Upstream Team, Amsterdam UMC, Vrije Universiteit Amsterdam, De Boelelaan 1089a, 1081 HV, Amsterdam, The Netherlands; [3]Department of Epidemiology and Data Science, Amsterdam UMC, Vrije Universiteit Amsterdam, De Boelelaan 1089a, 1081 HV, Amsterdam, The Netherlands; and [4]Amsterdam Public Health, Health Behaviours & Chronic Diseases, 1105 AZ, Amsterdam, The Netherlands

Received 17 March 2023; revised 2 July 2023; accepted 7 July 2023; online publish-ahead-of-print 24 July 2023

Aims To provide a comprehensive overview of the current evidence on objectively measured neighbourhood built environment exposures in relation to cardiovascular disease (CVD) events in adults.

Methods and results We searched seven databases for systematic reviews on associations between objectively measured long-term built environmental exposures, covering at least one domain (i.e. outdoor air pollution, food environment, physical activity environment like greenspace and walkability, urbanization, light pollution, residential noise, and ambient temperature), and CVD events in adults. Two authors extracted summary data and assessed the risk of bias independently. Robustness of evidence was rated based on statistical heterogeneity, small-study effect, and excess significance bias. Meta-meta-analyses were conducted to combine the meta-analysis results from reviews with comparable exposure and outcome within each domain. From the 3304 initial hits, 51 systematic reviews were included, covering 5 domains and including 179 pooled estimates. There was strong evidence of the associations between increased air pollutants (especially $PM_{2.5}$ exposure) and increased residential noise with greater risk of CVD. Highly suggestive evidence was found for an association between increased ambient temperature and greater risk of CVD. Systematic reviews on physical activity environment, food environment, light pollution, and urbanization in relation to CVD were scarce or lacking.

Conclusion Air pollutants, increased noise levels, temperature, and greenspace were associated with CVD outcomes. Standardizing design and exposure assessments may foster the synthesis of evidence. Other crucial research gaps concern the lack of prospective study designs and lack of evidence from low-to-middle-income countries (LMICs).

Registration PROSPERO: CRD42021246580

Lay summary

- This study is a review of published systematic reviews on the relation between the neighbourhood built environment and cardiovascular disease (CVD) in adults.
- There was strong evidence of a relation between increased air pollutants and a greater risk of CVD. There was also strong evidence of a relation between increased residential noise and a greater risk of CVD. There was highly suggestive evidence of a relation between increased ambient temperature and a greater risk of CVD.
- Systematic reviews that examined other aspects of the built environment, such as the physical activity environment, food environment, light pollution, and urbanization, were scarce or lacking.

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† These authors contributed equally to the study.
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Strong evidence

That various air pollutants increase the risk of CVDs

That aircraft noise increases the risk of CVD mortality



Suggestive evidence

That greenspace lowers the risk of CVD mortality

That traffic noise increases the risk of IHD

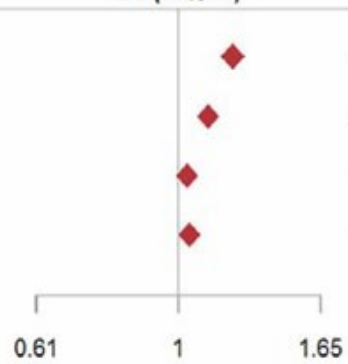
That temperature increases the risk of CVD mortality



We searched **7** databases, got **3,304** hits and included **51** systematic reviews

Meta-meta-analyses

Exposure	Outcome	n	I^2	ES (95% CI)	ES (95% CI)
PM2.5	IHD mortality	29	98.16		1.21 (1.10 to 1.33)
PM2.5	CVD mortality	26	74.23		1.11 (1.09 to 1.14)
NO_2	CeVD mortality	14	45.64		1.03 (1.00 to 1.06)
Heat	CVD mortality	62	98.63		1.04 (1.03 to 1.05)

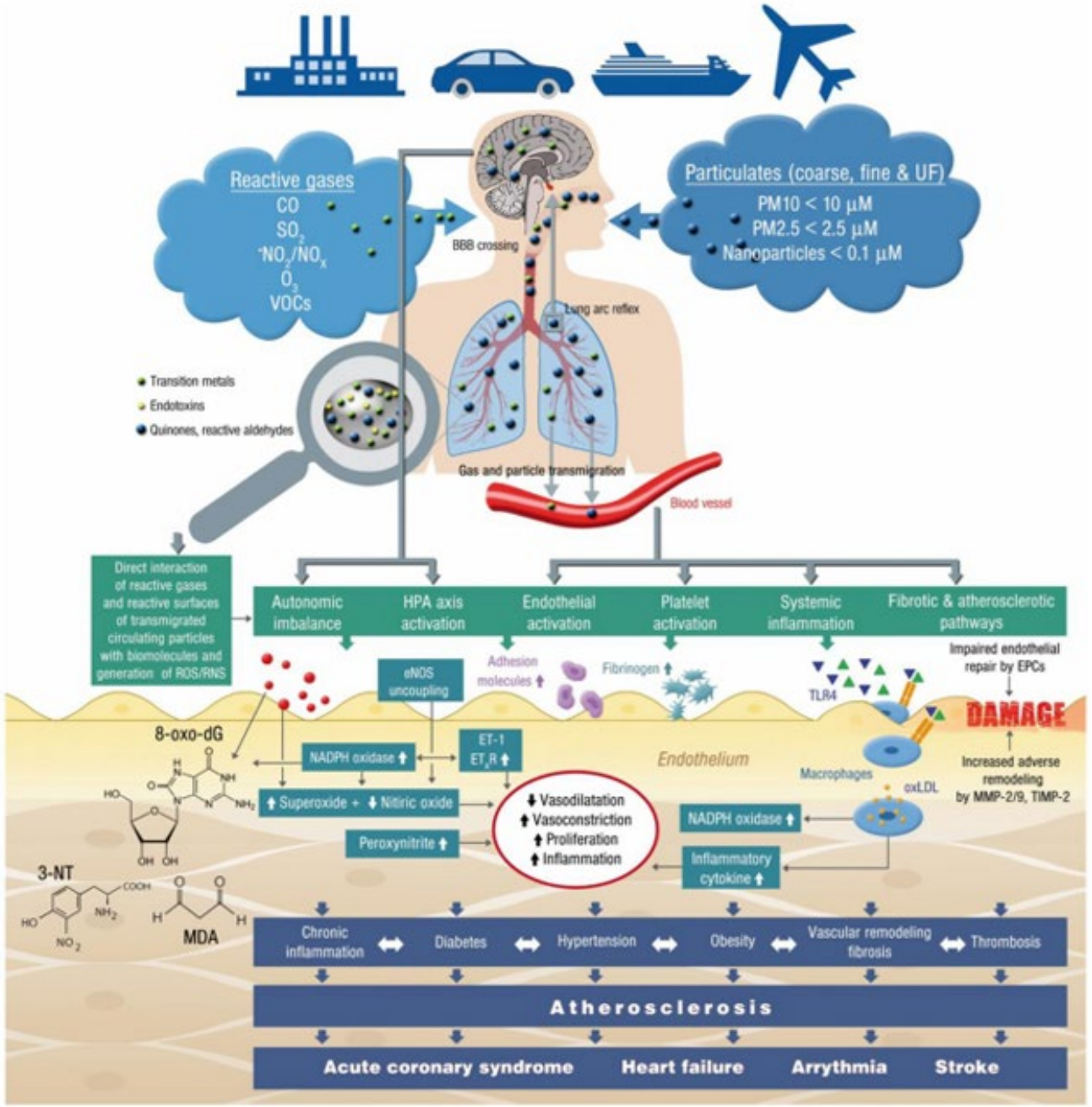


Gaps

Systematic reviews on physical activity environment, food environment, light pollution, and urbanization are scarce or lacking

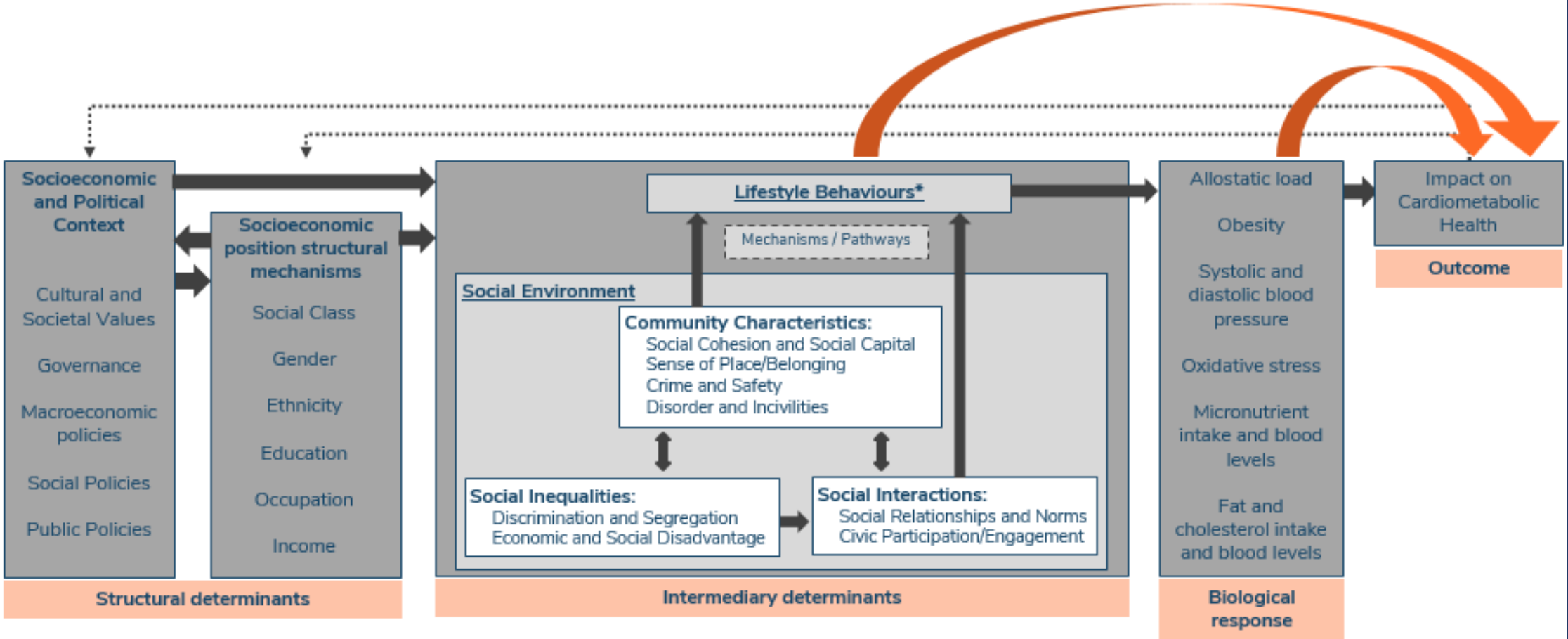
Liu et al. Eur J Prev Cardiol 2023;30(16):1801-27.

Oxidatieve stress
Inflammatie
Autonome disbalans



Piepoli et al.
Eur Heart J
2026;00:1-25.

Social environment and cardiometabolic health (I)



Adapted from World Health Organization "A conceptual framework for action on social determinants of health" (Geneva, 2010), Kepper et al. (Int J Behav Nutr Phys Act, 2019), and Schulz et al. (Environ Health Perspect, 2005).

Social environment and cardiometabolic health (II)



SSM - Population Health 25 (2024) 101559

Contents lists available at ScienceDirect

SSM - Population Health

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

Associations between dimensions of the social environment and cardiometabolic risk factors: Systematic review and meta-analysis

Taymara C. Abreu [a,b,*,1], Joreintje D. Mackenbach [a,b,1], Fleur Heuvelman [a], Linda J. Schoonmade [c], Joline W.J. Beulens [a,b,d,e]

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[d] Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, the Netherlands
[e] Amsterdam Public Health, Amsterdam Cardiovascular Sciences, Amsterdam, Noord-Holland, the Netherlands

ARTICLE INFO

Keywords:
Social epidemiology
Social context
Social networking
Socioeconomic factors
Social determinants of health
Cardiovascular diseases
Metabolic diseases
Deprivation
Exposome

ABSTRACT

Aim: The social environment (SE), including social contacts, norms and support, is an understudied element of the living environment which impacts health. We aim to comprehensively summarize the evidence on the association between the SE and risk factors of cardiometabolic disease (CMD).
Methods: We performed a systematic review and meta-analysis based on studies published in PubMed, Scopus and Web of Science Core Collection from inception to 16 February 2021. Studies that used a risk factor of CMD, e.g., HbA1c or blood pressure, as outcome and social environmental factors such as area-level deprivation or social network size as independent variables were included. Titles and abstracts were screened in duplicate. Study quality was assessed using the Newcastle-Ottawa Scale. Data appraisal and extraction were based on the study protocol published in PROSPERO. Data were synthesized through vote counting and meta-analyses.
Results: From the 7521 records screened, 168 studies reported 1050 associations were included in this review. Four meta-analyses based on 24 associations suggested that an unfavorable social environment was associated with increased risk of cardiometabolic risk factors, with three of them being statistically significant. For example, individuals that experienced more economic and social disadvantage had a higher "CVD risk scores" (OR = 1.54, 95%CI: 1.35 to 1.84). Of the 458 associations included in the vote counting, 323 (71%) pointed towards unfavorable social environments being associated with higher CMD risk.
Conclusion: Higher economic and social disadvantage seem to contribute to unfavorable CMD risk factor profiles, while evidence for other dimensions of the social environment is limited.

Introduction

Cardiometabolic diseases (CMDs), including cardiovascular diseases (CVDs) and type 2 diabetes mellitus (T2DM) are the number one cause of death worldwide (World Health Organization (WHO)). Although some CMDs are highly heritable, e.g., familial hypercholesterolemia (Ison et al.), the non-genetic nature of CMDs is reflected by the close association between lifestyle behaviors and CMD risk. In fact, lifestyle risk factors such as an unhealthy diet or physical inactivity account for more than 70% of total cardiovascular events, 80% of coronary heart disease events and 90% of incidence of T2DM (Mozaffarian et al., 2007).

Alterations of lifestyle risk factors can therefore have a major impact on the prevention of CMDs. Several landmark trials indeed showed that adhering to a Mediterranean diet (Grosso et al., 2017) or a combined lifestyle intervention (Diabetes Prevention Program Research Group, 2002; Maruthur et al., 2009) reduces the risk of CMDs substantially with up to 58% risk reduction of type 2 diabetes. These lifestyle risk factors not only influence established risk markers such as elevated blood pressure, blood lipids, and glucose-insulin homeostasis but also other pathways such as endothelial function, oxidative stress, inflammation

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[1] These authors contributed equally to this work and have shared first authorship.

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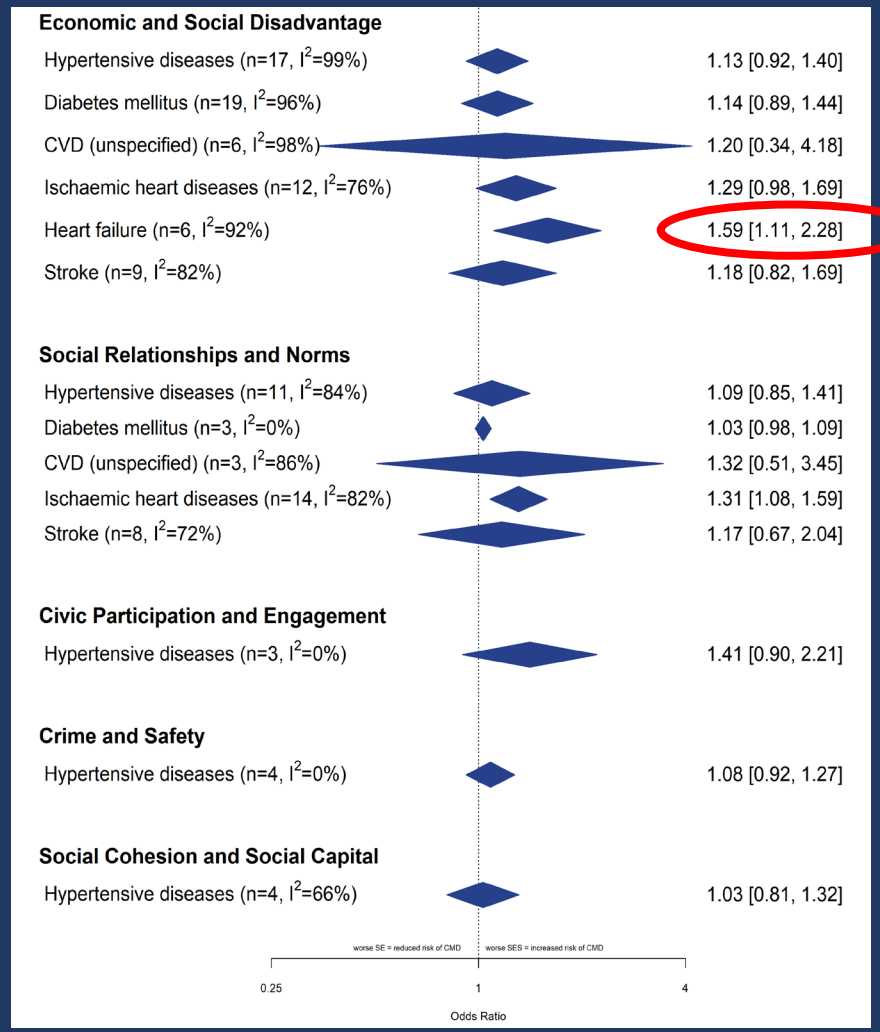


Higher levels of economic and social disadvantage are associated with:

Higher heart failure risk
OR= 1.59, 95% CI: 1.11 to 2.28

CVD risk scores
OR= 1.54, 95% CI: 1.32 to 1.81

Glucose metabolism risk factors
OR= 1.91, 95% CI: 1.56 to 2.32

Cardiovascular health risk factors
OR=1.06, 95% CI: 1.00-1.12

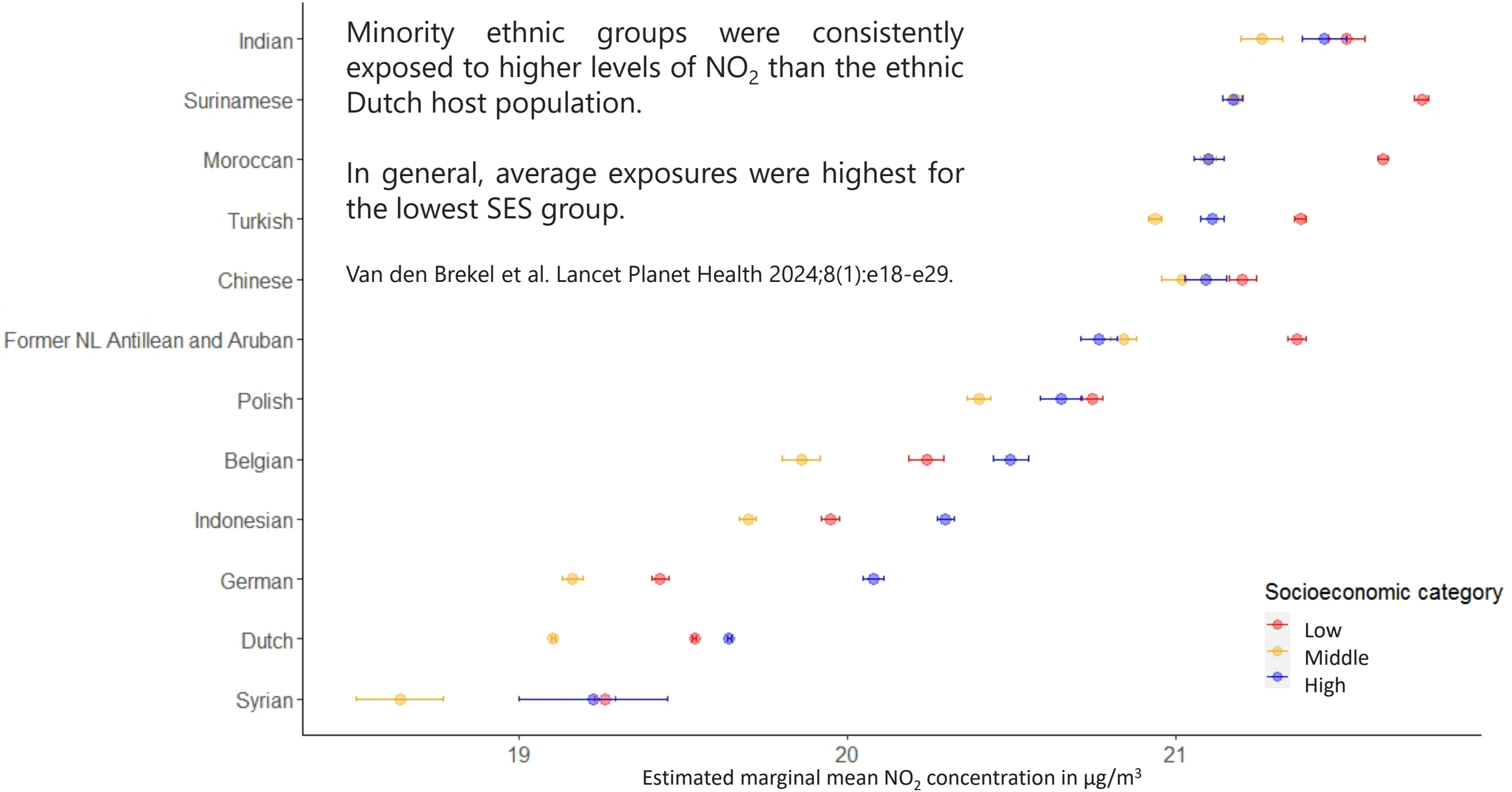
Abreu et al. SSM Popul Health 2024;101559.

Ethnic and SES inequalities in air pollution exposure

Minority ethnic groups were consistently exposed to higher levels of NO_2 than the ethnic Dutch host population.

In general, average exposures were highest for the lowest SES group.

Van den Brekel et al. Lancet Planet Health 2024;8(1):e18-e29.



Environment International 206 (2025) 109914

Contents lists available at ScienceDirect

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

Full length article

Ethnic inequalities in physico-chemical, physical and social neighborhood exposures: An individual-level data analysis of 13,926,781 adults

Mirthe Muilwijk [a,b,c,d,*], Femke Rutters [a,b,c], Jeroen Lakerveld [a,b], Petra Elders [a,b,e], Marieke Blom [b,c,e,f], Karien Stronks [g], Ilonca Vaartjes [d], Joline WJ Beulens [a,b,c,d]

Physico-chemical exposures were less favorable among ethnic minority and low SES populations

Air pollution

Muilwijk et al. Environment International 2025;206:109914.

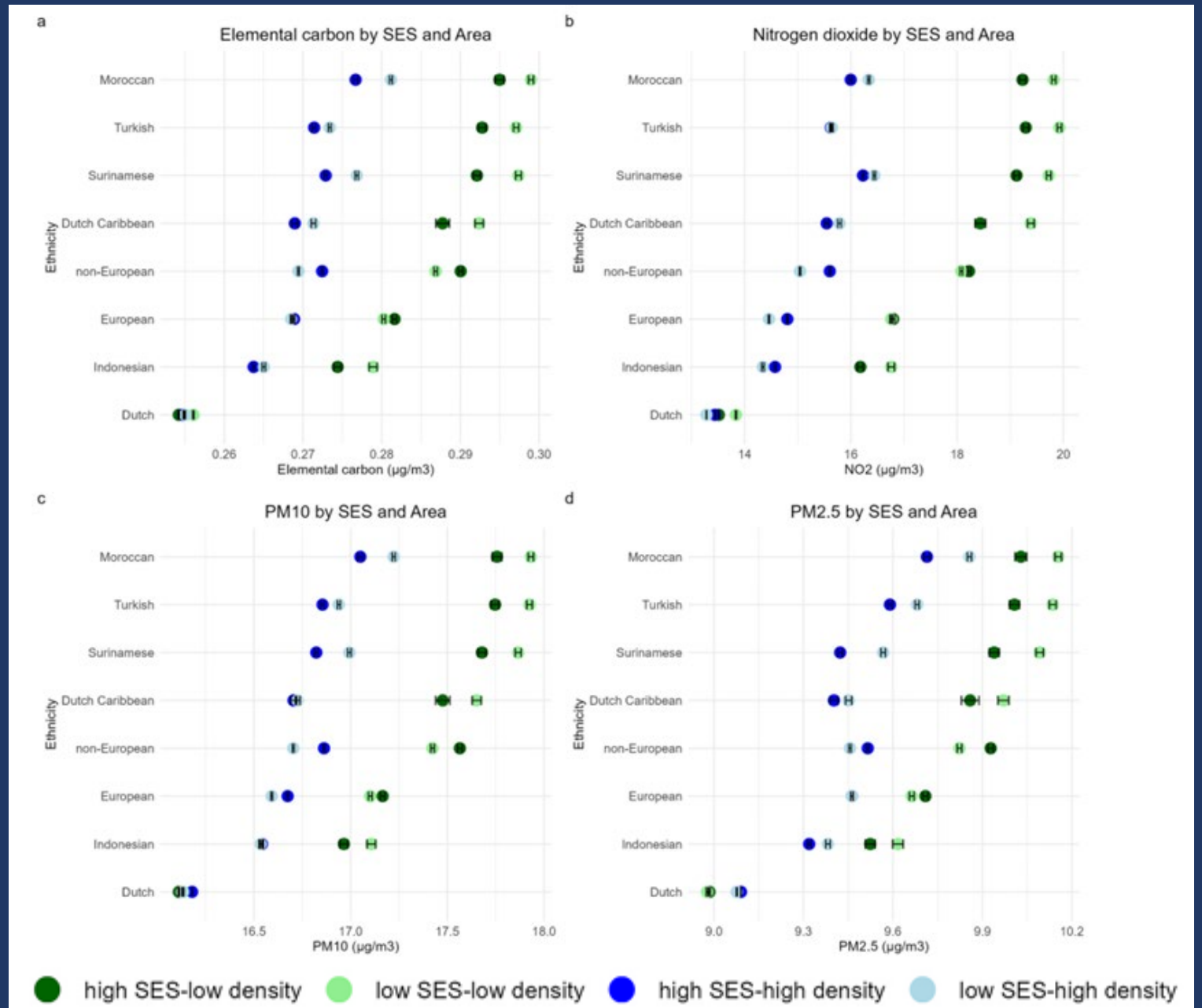

Fig. 1. Estimated marginal means of physicochemical exposures among ethnic groups, by socio-economic status and population density

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Noise and Temperature

Muilwijk et al. Environment International 2025;206:109914.

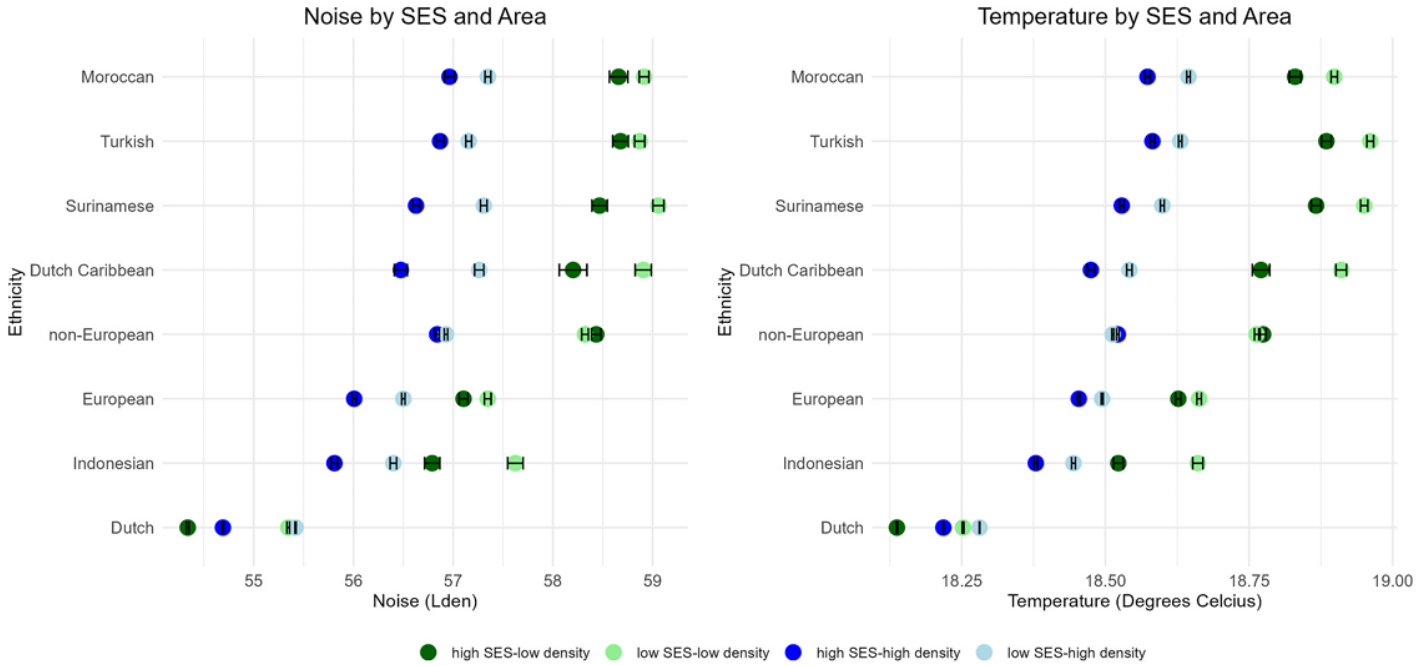

Fig. 1. Estimated marginal means of physicochemical exposures among ethnic groups, by socio-economic status and population density

Cardiometabolic risk factor clustering in children

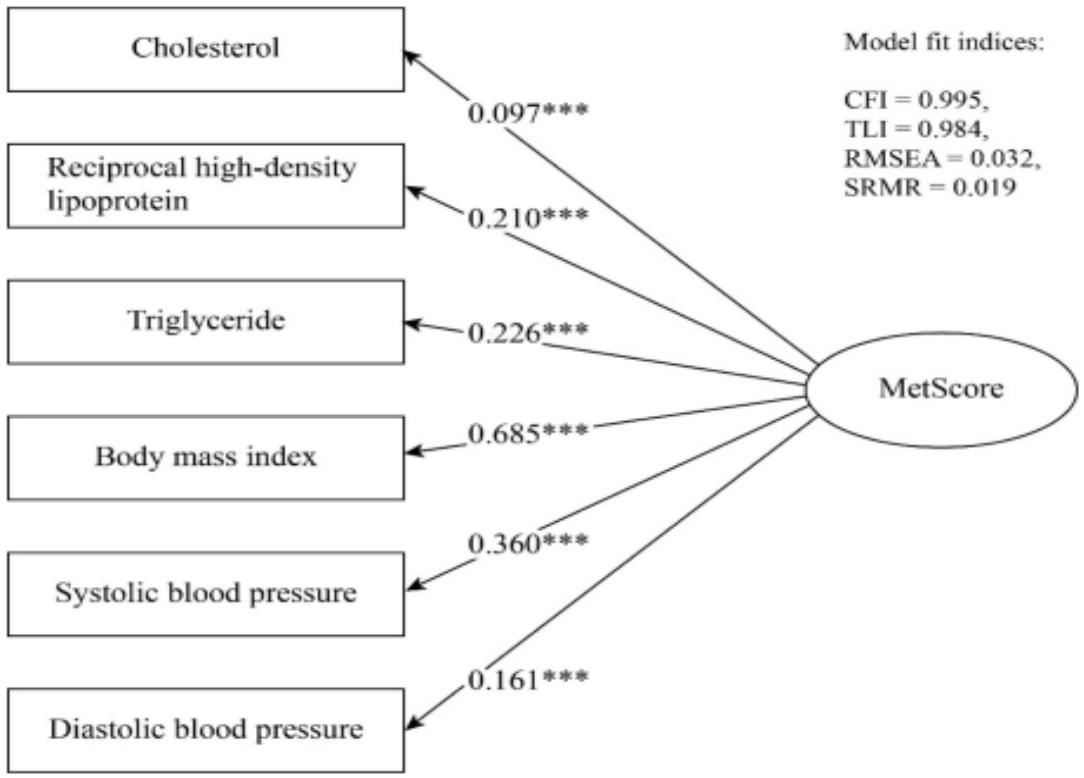

Fig. 1. Factor loadings for cardiometabolic risk factor clustering (MetScore), combing data from the first waves of three cohorts: ABCD, Generation R and Lifelines. All components are standardized into z-scores. Abbreviations: CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual.

Exposure to more **NO_2** and **elemental carbon** was associated with increased cardiometabolic risk in children (5-17 years). More **green space** at residence was associated with decreased cardiometabolic risk in this group.

Liu et al. Environ Int 2024;190:108852.



Environment International 190 (2024) 108852

Contents lists available at ScienceDirect

Environment International

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

Full length article

Longitudinal associations of air pollution and green space with cardiometabolic risk factor clustering among children in the Netherlands

Mingwei Liu [a], Ilonca Vaartjes [a], Gerard Hoek [b], Vincent W.V. Jaddoe [c,d], Susana Santos [c,d,e,f], Anton Schreuder [g], Tanja G.M. Vrijkotte [g], Diederick E. Grobbee [a], Erik J. Timmermans [a,*]

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ABSTRACT

Background: This study examines longitudinal associations of air pollution and green space with cardiometabolic risk among children in the Netherlands.
Methods: Three Dutch prospective cohorts with a total of 13,822 participants aged 5 to 17 years were included: (1) the Amsterdam Born Children and their Development (ABCD) study from Amsterdam (n = 2,547), (2) the Generation R study from Rotterdam (n = 5,431), and (3) the Lifelines study from northern Netherlands (n = 5,844). Air pollution ($PM_{2.5}$, PM_{10}, NO_2, and elemental carbon (EC)) and green space exposures (density in multiple Euclidean buffer sizes) from 2006 to 2017 at home address level were used. Cardiometabolic risk factor clustering was assessed by a MetScore, which was derived from a confirmatory factor analysis of six cardiometabolic risk factors to assess the overall risk. Linear regression models with change in Metscore as the dependent variable, adjusted for multiple confounders, were conducted for each cohort separately. Meta-analyses were used to pool cohort-specific estimates.
Results: Exposure to higher levels of NO_2 and EC was significantly associated with increases in MetScore in Lifelines (per SD higher exposure: β_{NO2} = 0.006, 95 % CI = 0.001 to 0.010; β_{EC} = 0.008, 95 % CI = 0.002 to 0.014). In the other two cohort studies, these associations were in the same direction but these were not significant. Higher green space density in 500-meter buffer zones around participants' residential addresses was not significantly associated with decreases of MetScore in all three cohorts. Higher green space density in 2000-meter buffer zones was significantly associated with decreases of MetScore in ABCD and Lifelines (per SD higher green space density: β_{ABCD} = -0.008, 95 % CI = -0.013 to −0.003; $\beta_{Lifelines}$ = -0.002, 95 % CI = -0.003 to −0.00003). The pooled estimates were β_{NO2} = 0.003 (95 % CI = -0.001 to 0.006) for NO_2, β_{EC} = 0.003 (95 % CI = -0.001, 0.007) for EC, and $\beta_{500m\ buffer}$ = -0.0014 (95 % CI = -0.0026 to −0.0001) for green space.
Conclusions: More green space exposure at residence was associated with decreased cardiometabolic risk in children. Exposure to more NO_2 and EC was also associated with increased cardiometabolic risk.

1. Introduction

Cardiometabolic risk factors are the largest contributors to the global disease burden (GBD 2017 Risk Factor Collaborators, 2018). In terms of disability-adjusted life-years, high systolic blood pressure (SBP), high fasting plasma glucose, high Body Mass Index (BMI), and high low-density lipoprotein cholesterol (LDL-C) were among the top 10 risk factors in 2017 (GBD 2017 Risk Factor Collaborators, 2018). Although

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Obesogenic Built-environment CharacterisTics (OBCT) index



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Epidemiology/Genetics

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Development of a neighborhood obesogenic built environment characteristics index for the Netherlands

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Abstract

Objective: Environmental factors that drive obesity are often studied individually, whereas obesogenic environments are likely to consist of multiple factors from food and physical activity (PA) environments. This study aimed to compose and describe a comprehensive, theory-based, expert-informed index to quantify obesogenicity for all neighborhoods in the Netherlands.

Methods: The Obesogenic Built Environment CharacterisTics (OBCT) index consists of 17 components. The index was calculated as an average of componential scores across both food and PA environments and was scaled from 0 to 100. The index was visualized and summarized with sensitivity analysis for weighting methods.

Results: The OBCT index for all 12,821 neighborhoods was right-skewed, with a median of 44.6 (IQR = 10.1). Obesogenicity was lower in more urbanized neighborhoods except for the extremely urbanized neighborhoods (>2500 addresses/km^2), where obesogenicity was highest. The overall OBCT index score was moderately correlated with the food environment (Spearman $\rho = 0.55$, $p < 0.05$) and with the PA environment ($\rho = 0.38$, $p < 0.05$). Hierarchical weighting increased index correlations with the PA environment but decreased correlations with the food environment.

Conclusions: The novel OBCT index and its comprehensive environmental scores are potentially useful tools to quantify obesogenicity of neighborhoods.

INTRODUCTION

Obesity is a chronic health condition resulting from a prolonged imbalance of energy intake and energy expenditure, causing metabolic, hormonal, and inflammatory reactions in various critical organs [1]. Overweight and obesity have been associated with several chronic comorbidities such as insulin resistance, type 2 diabetes, hypertension, and dyslipidemia [2,3] and have been ranked as the fifth most common cause of mortality worldwide [4]. In the Netherlands, about half of the adult population has overweight, a third of which has obesity [5].

Obesity has multiple causal pathways in which genetic heritability and the environment play equally important roles [6]. Whereas genetic factors are unchangeable throughout the lifetime, the

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Lam et al. Obesity 2022;31:214-24.

OBCT index combines various aspects of the living environment

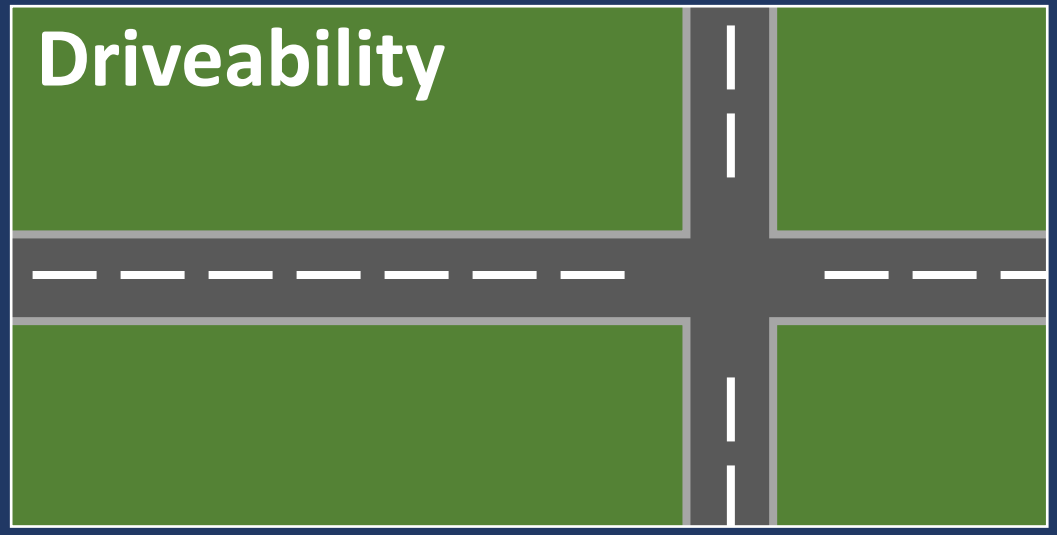
Food environment



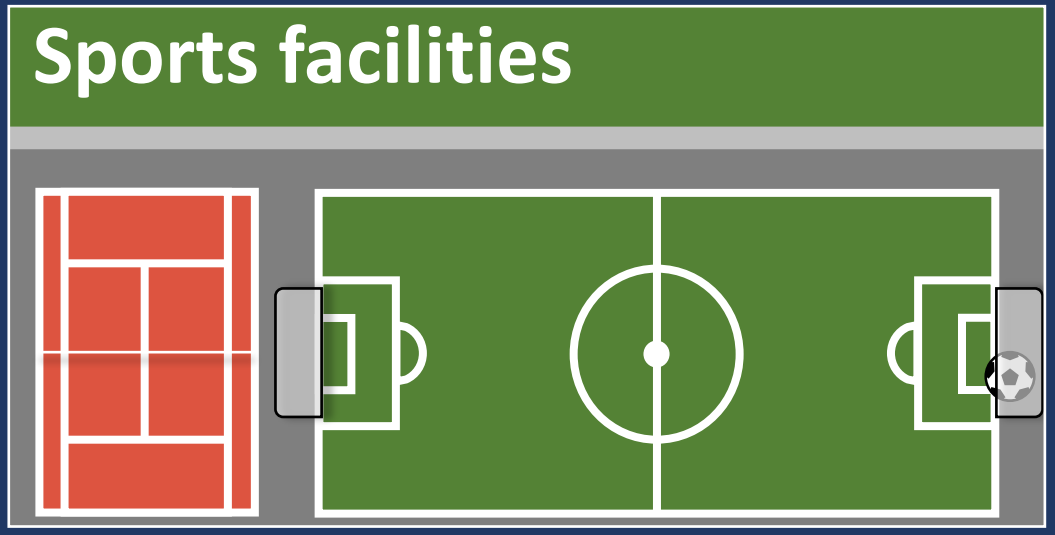
Bikeability and Walkability



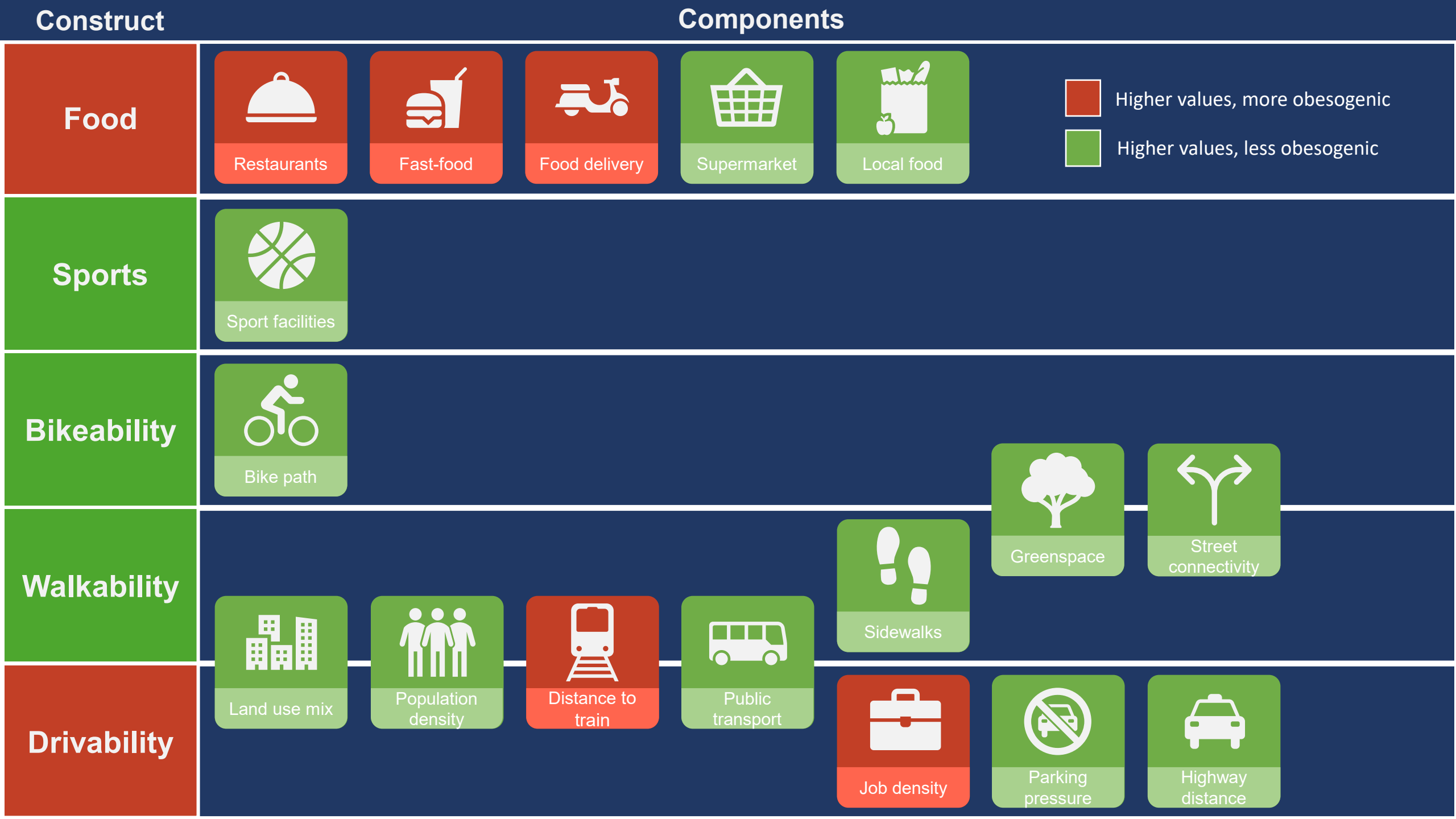
Driveability

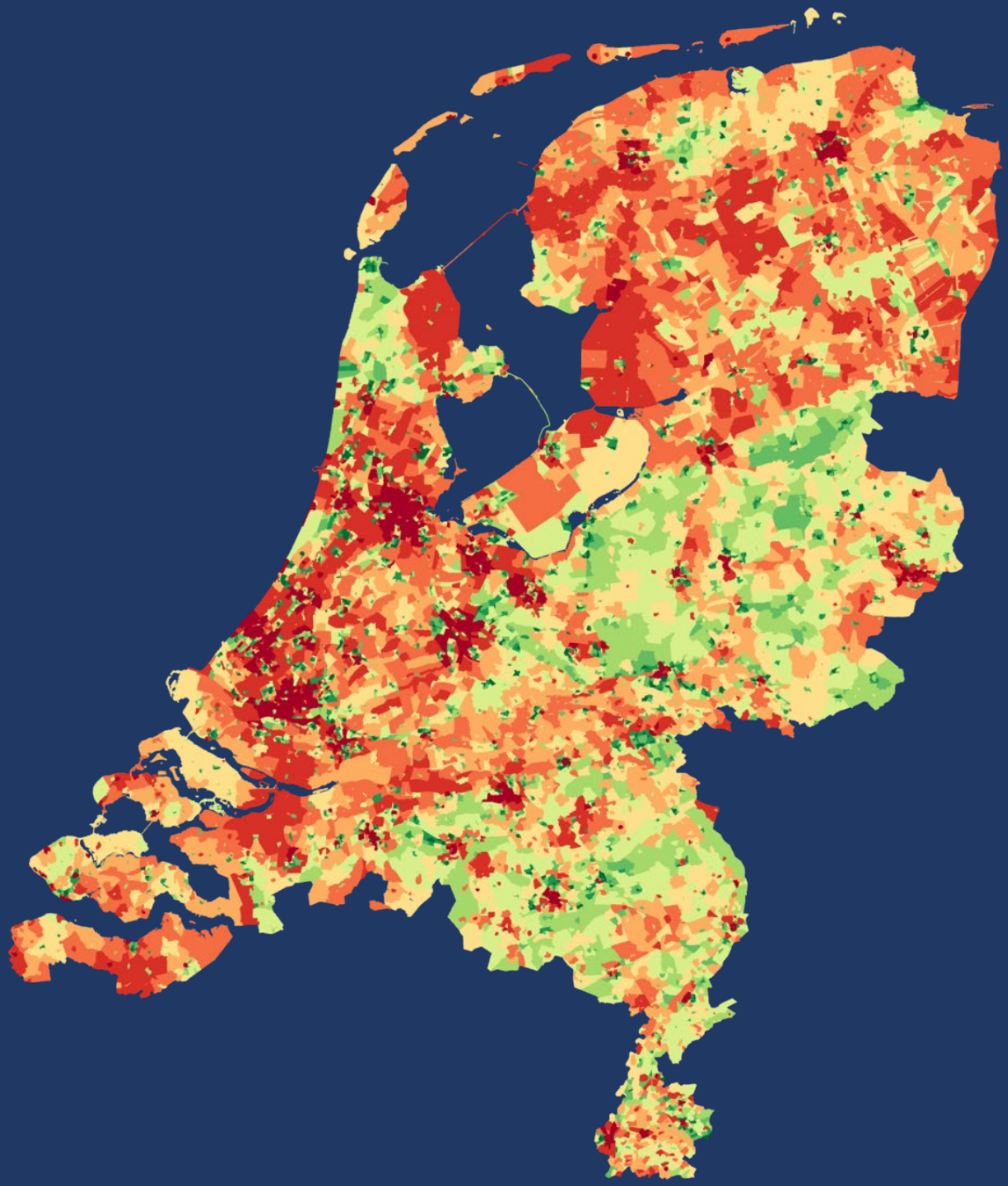


Sports facilities



Lam et al. Obesity. 2023 Jan;31(1):214-224.


Construct
Components
Food
Restaurants
Fast-food
Food delivery
Supermarket
Local food
Higher values, more obesogenic
Higher values, less obesogenic
Sports
Sport facilities
Bikeability
Bike path
Walkability
Greenspace
Street connectivity
Sidewalks
Land use mix
Population density
Distance to train
Public transport
Drivability
Job density
Parking pressure
Highway distance



100 (obesogenic)

0 (not obesogenic)

Lam et al. Obesity 2022;31:214-24.



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The association of obesogenic environments with weight status, blood pressure, and blood lipids: A cross-sectional pooled analysis across five cohorts

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Upstream determinants

ABSTRACT

In this observational cross-sectional study, we investigated the relationship between combined obesogenic neighbourhood characteristics and various cardiovascular disease risk factors in adults, including BMI, systolic blood pressure, and blood lipids, as well as the prevalence of overweight/obesity, hypertension, and dyslipidaemia. We conducted a large-scale pooled analysis, comprising data from five Dutch cohort studies (n = 183,871). Neighbourhood obesogenicity was defined according to the Obesogenic Built-environmental CharacteriSTics (OBCT) index. The index was calculated for 1000m circular buffers around participants' home addresses. For each cohort, the association between the OBCT index and prevalence of overweight/obesity, hypertension and dyslipidaemia was analysed using robust Poisson regression models. Associations with continuous measures of BMI, systolic blood pressure, LDL-cholesterol, HDL-cholesterol, and triglycerides were analysed using linear regression. All models were adjusted for age, sex, education level and area-level socio-economic status. Cohort-specific estimates were pooled using random-effects meta-analyses. The pooled results show that a 10 point higher OBCT index score was significantly associated with a 0.17 higher BMI (95%CI: 0.10 to 0.24), a 0.01 higher LDL-cholesterol (95% CI: 0.01 to 0.02), a 0.01 lower HDL cholesterol (95% CI: −0.02 to −0.01), and non-significantly associated with a 0.36 mmHg higher systolic blood pressure (95%CI: −0.14 to 0.65). A 10 point higher OBCT index score was also associated with a higher prevalence of overweight/obesity (PR = 1.03; 95% CI: 1.02 to 1.05), obesity (PR = 1.04; 95% CI: 1.01 to 1.08) and hypertension (PR = 1.02; 95% CI: 1.00 to 1.04), but not with dyslipidaemia. This large-scale pooled analysis of five Dutch cohort studies shows that higher neighbourhood obesogenicity, as measured by the OBCT index, was associated with higher BMI, higher prevalence of overweight/obesity, obesity, and hypertension. These findings highlight the importance of considering the obesogenic environment as a potential determinant of cardiovascular health.

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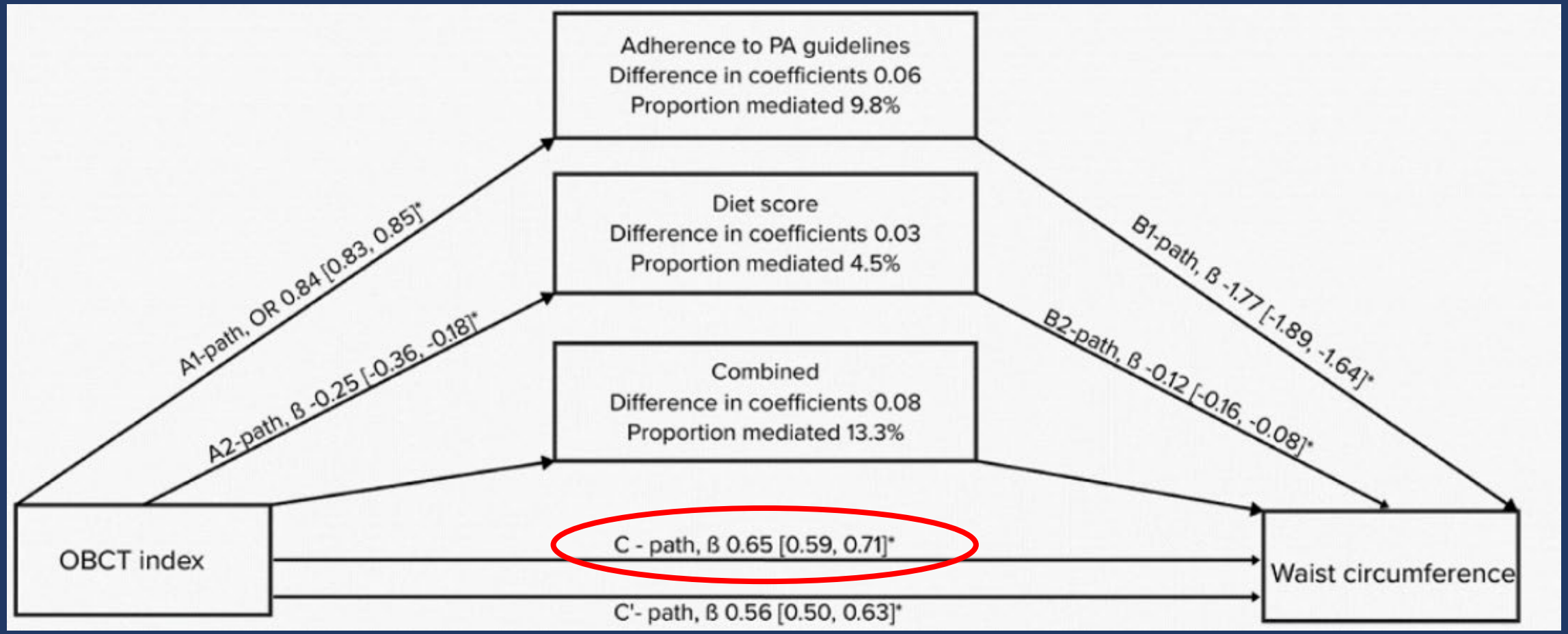
Meijer et al. Environ Res 2024;256:119227.

A 10% increase in the OBCT index is associated with...



Meijer et al. Environ Res 2024;256:119227.



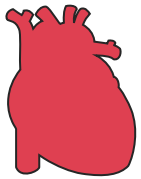
Every 10% increase in OBCT index was significantly associated with a **0.65 centimetre** larger waist circumference.

Van de Geest et al. Health Place 2024;90:103364.



OBCT index
(2006)

N = 4,401,781



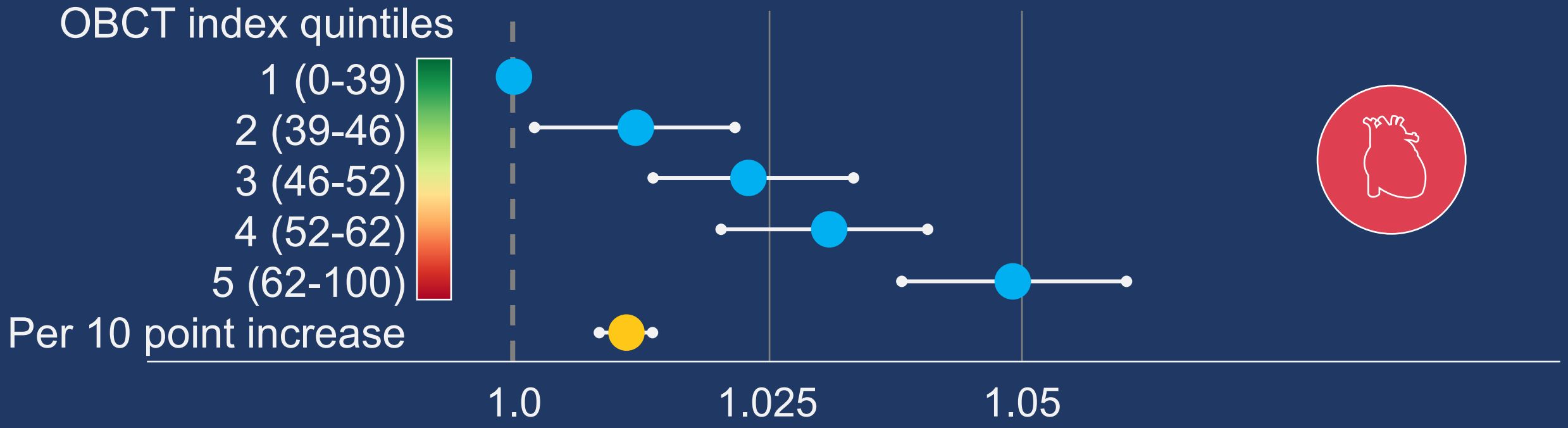
CVD incidence
(2007-2019)

Cox proportional hazards regression models
Hazard ratio (95% CI)

Adjusted for age, sex, ethnicity, partner status, household income, area level SES, PM2.5 exposure, comorbidities, and urbanicity

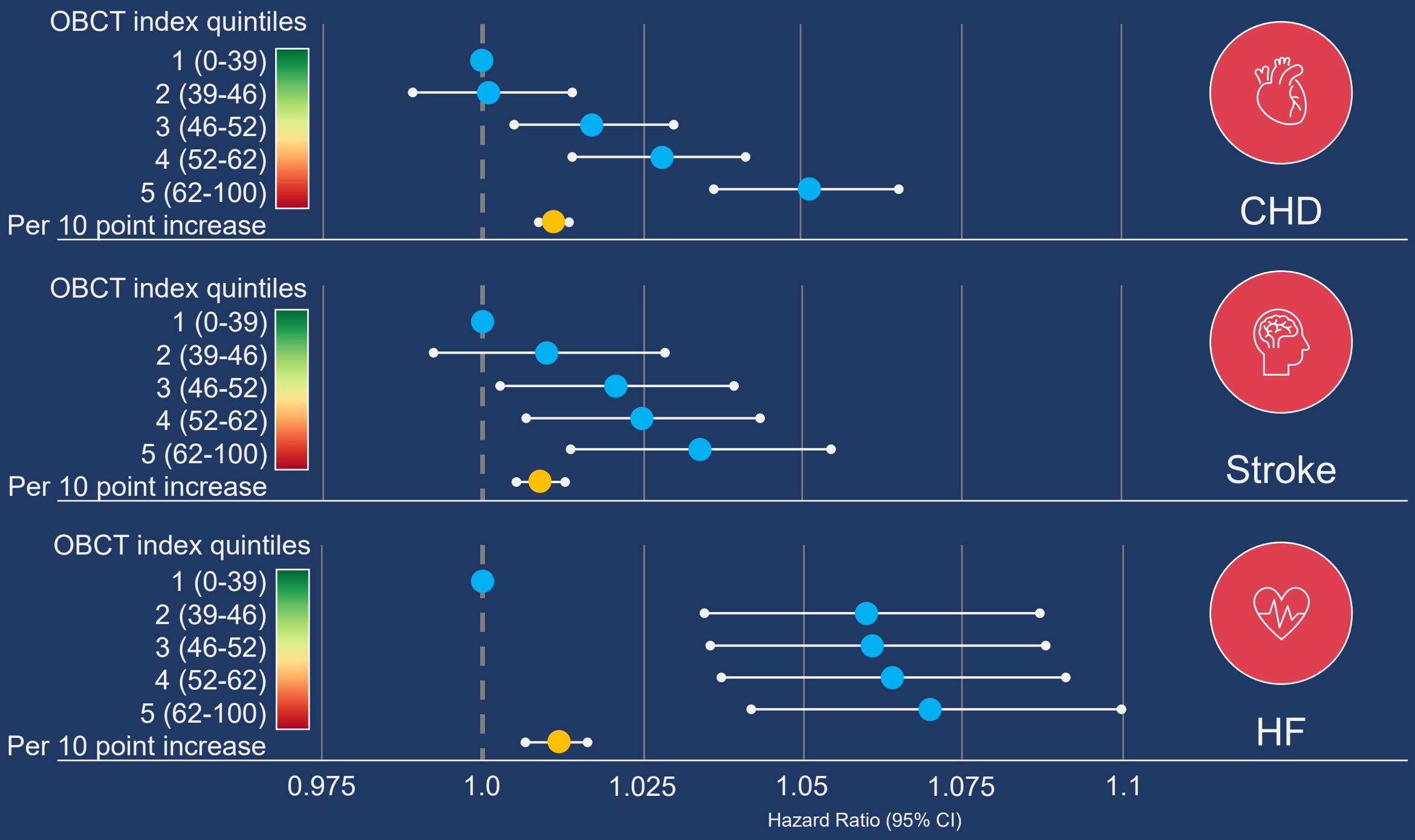
Meijer et al. Lancet Reg Health Eur 2025;59:101494.

Any CVD

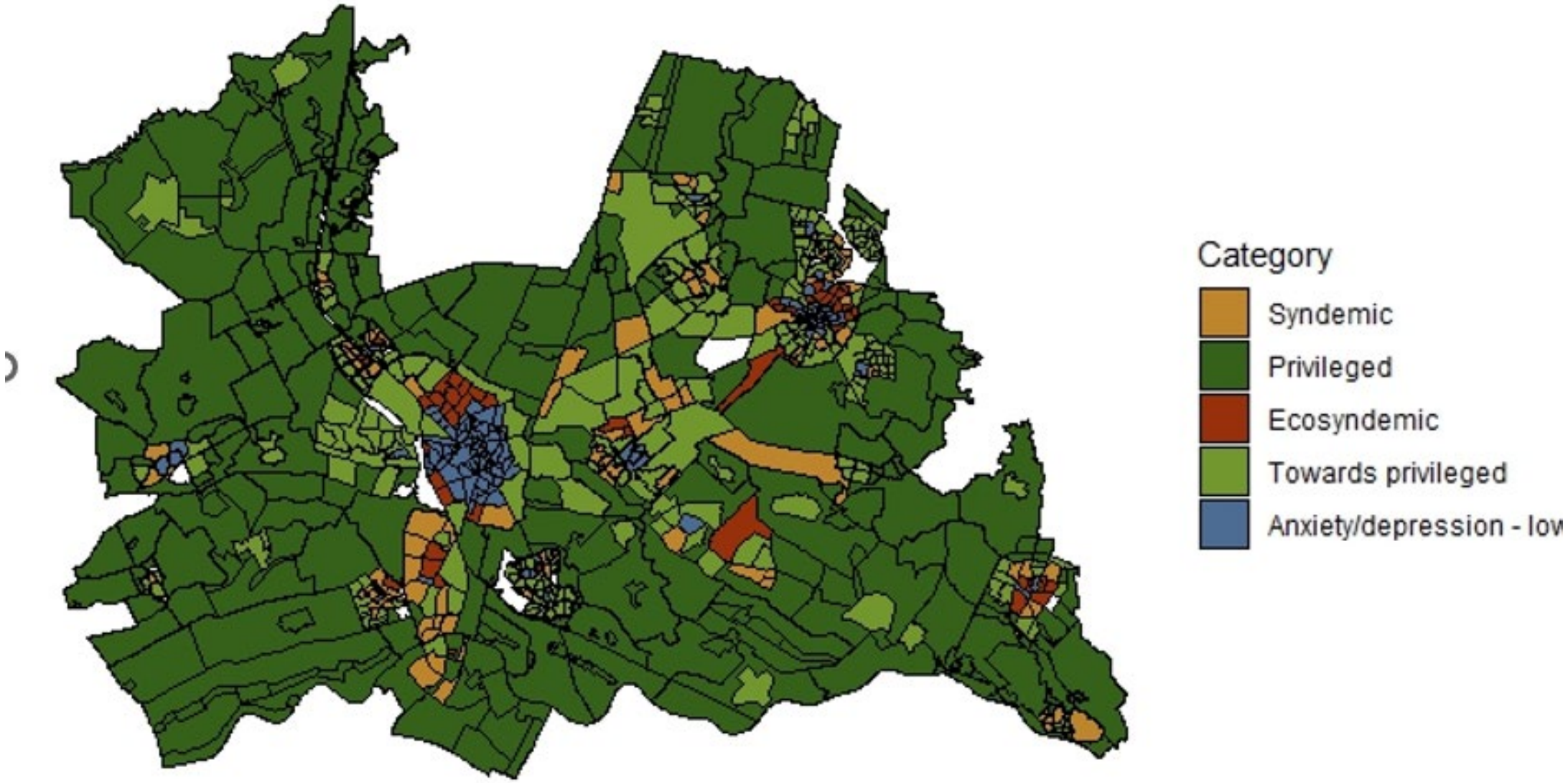


Hazard Ratio (95% CI)

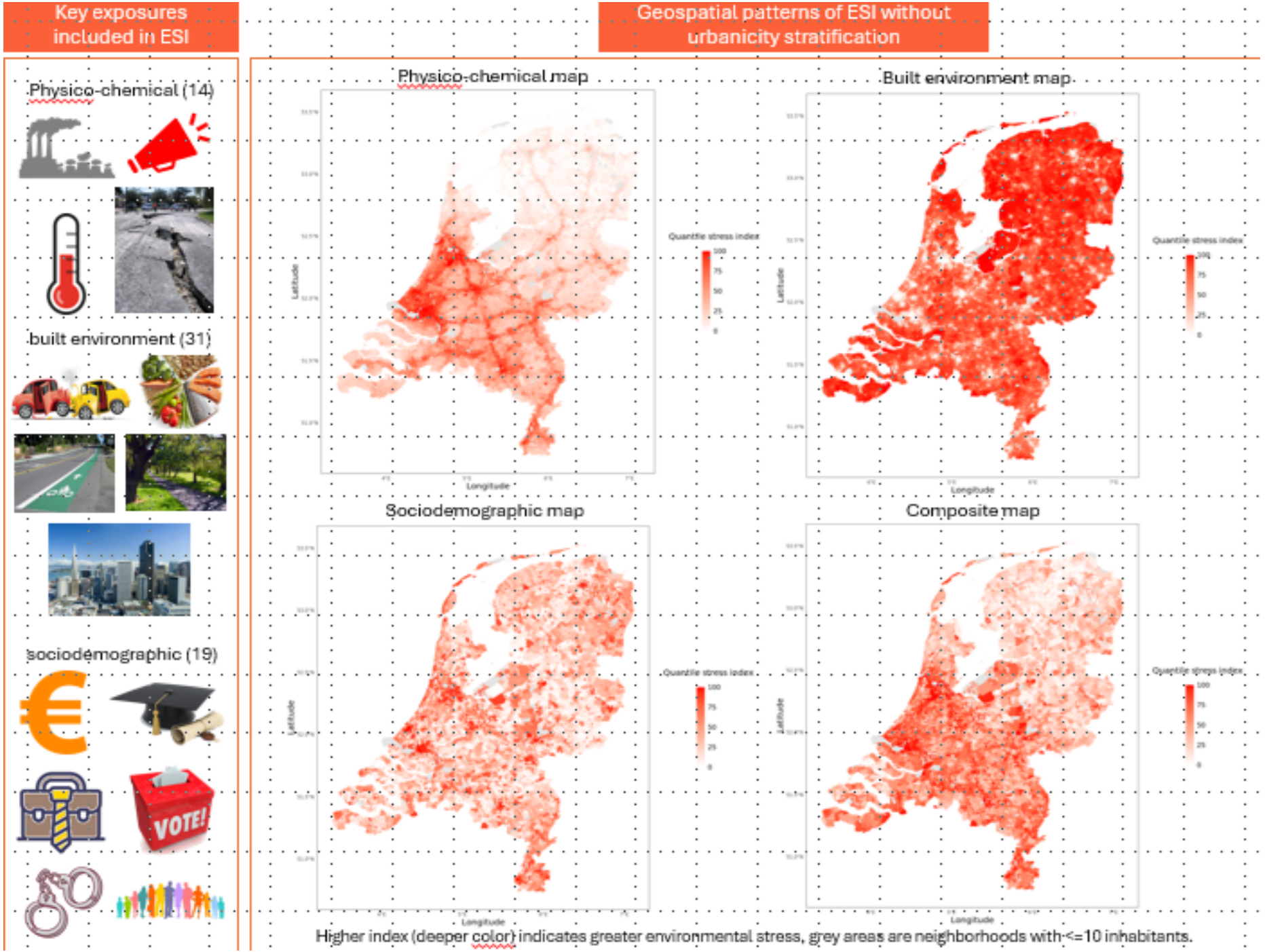
Meijer et al. Lancet Reg Health Eur 2025;59:101494


OBCT index quintiles
1 (0-39)
2 (39-46)
3 (46-52)
4 (52-62)
5 (62-100)
Per 10 point increase
CHD
OBCT index quintiles
1 (0-39)
2 (39-46)
3 (46-52)
4 (52-62)
5 (62-100)
Per 10 point increase
Stroke
OBCT index quintiles
1 (0-39)
2 (39-46)
3 (46-52)
4 (52-62)
5 (62-100)
Per 10 point increase
HF
0.975
1.0
1.025
1.05
1.075
1.1
Hazard Ratio (95% CI)

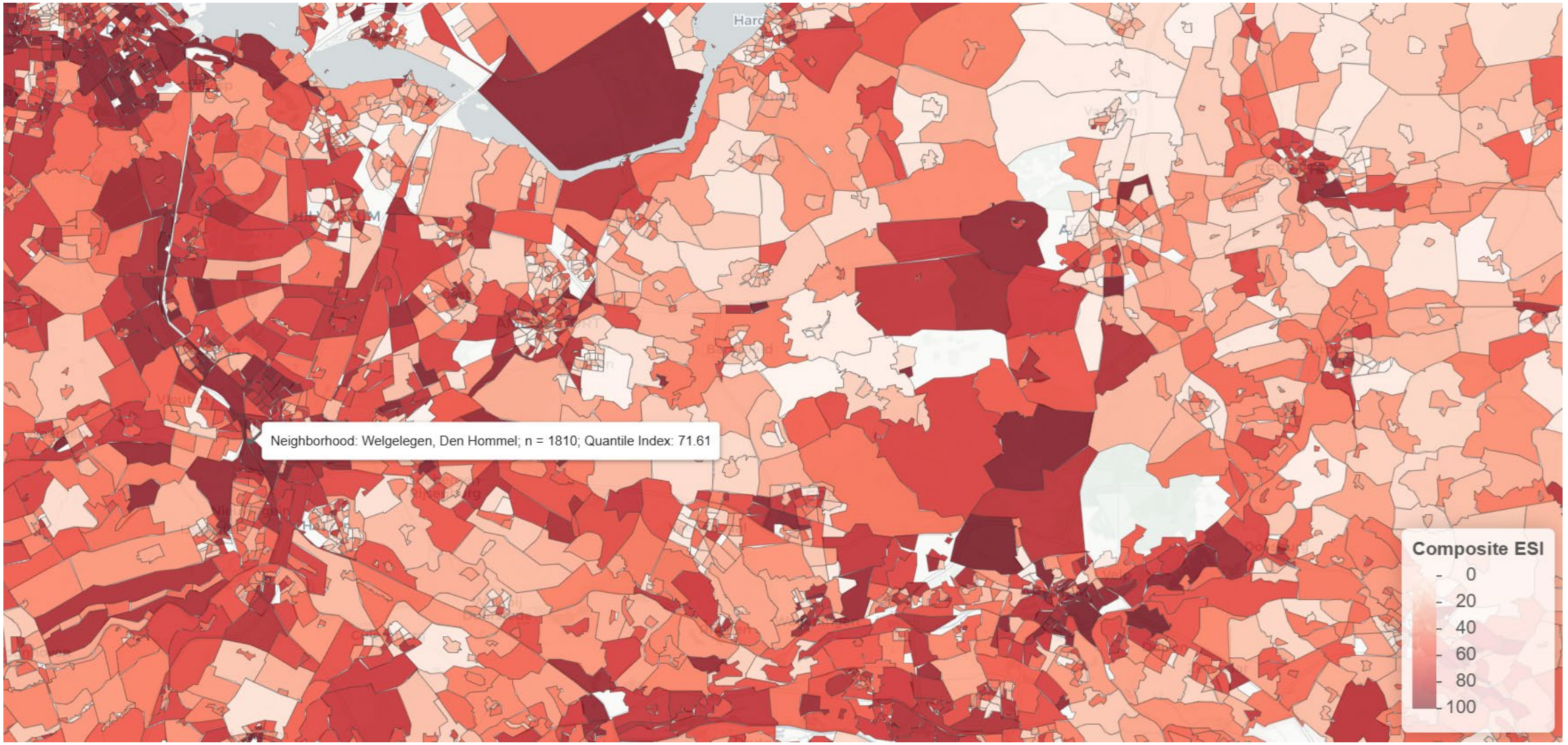
Ecosyndemics Obesity: Obesity + co-morbidity + low SES + poor built environment



Dutch Environmental stressor index



Check je eigen omgeving



- https://yuhong-sun-umc.github.io/ESI-Maps/index.html

Wat kan een huisarts doen

Zorg dat je de kennis hebt en blijf up-to-date

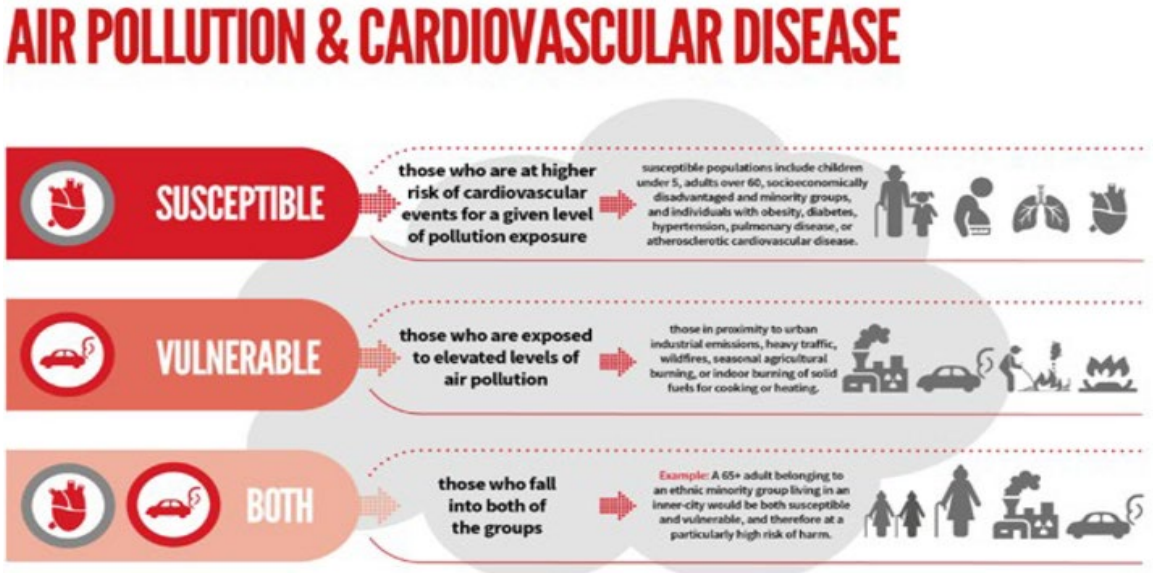
Vergroot bewustzijn onder patiënten en bespreek dat omgeving soms tegen ze kan werken

Laat als huisartsen je stem horen voor populatie-niveau interventies voor gezonde leefomgeving

Identificeer individuen met een hoog risico

Recommendations	Class	Level
Patients at (very) high risk for CVD may be encouraged to try to avoid long-term exposure to regions with high air pollution.	IIb	C
In regions where people have long-term exposure to high levels of air pollution, (opportunistic) CVD risk screening programmes may be considered.	IIb	C

Recommendations	Class	Level[a]
Putting in place measures to reduce air pollution, including reducing PM emission and gaseous pollutants, reducing the use of fossil fuels, and limiting carbon dioxide emissions, are recommended, to reduce CVD mortality and morbidity.	I	C



Brauer et al. Eur Heart J 2021;42(15):1460-63.
Visseren et al. Eur Heart J 2021;42(34):3227-37.

ESC European Heart Journal (2026) 00, 1–25
https://doi.org/10.1093/eurheartj/ehag270

SPECIAL ARTICLE
Epidemiology, prevention, and health care policies

Environmental risk factors and cardiovascular health

A clinical consensus statement of the European Society of Cardiology

Massimo Piepoli [1,2,*], Franz Weidinger[3], Victor Aboyans [4], Ana Abreu [5], Zorana Jovanovic Andersen[6], Jordi Baneras[7], Michele Carugno [8,9], Elisabetta Cerbai [10], Serenella Castelvecchio [11], Andreas Daiber [12,13], Francesco Forastiere[14], Sofie Gevaert [15], Gianluigi Guida [2], Omar Hahad[12,13], Barbara Hoffmann[16], Lukasz Kuzma[17,18,19], Jos Lelieveld [20], Pier Mannuccio Mannucci [21], Hugh Montgomery[22], David E. Newby [23], Mark Nieuwenhuijsen[24,25,26], Michael Papadakis[27], Gianfranco Parati [28,29], Matteo Renzi[30], Martin Röösli [31,32], Renate B. Schnabel[33,34], Linda W. van Laake[35], Sophie Van Linthout [36,37], Mette Sørensen [38,39], Massimo Stafoggia [30], Vassil Traykov [40], Ilonca Vaartjes [41], Thomas Lüscher[42,43,44], Mark R. Miller [45], and Thomas Münzel[12,13]

ESC European Journal of Preventive Cardiology (2026) 00, 1–13
https://doi.org/10.1093/eurjpc/zwag229

REVIEW
Air pollution and environmental science

Climate change and cardiovascular risk factors management: emerging challenges and strategies for prevention and adaptation

Maria Marketou [1]*, Norma Caples[2], Mark D'Abela[3], Paul Dendale [4], Özden Gökdemir[5], Oleksii Korzh[6], Donata Kurpas[7], Ming-Nan Lin[8], Anna Vittoria Mattioli[9], Trine Moholdt [10], Thomas Muenzel[11], Stefano Palermi [12], Panteleimon E. Papakonstantinou[13], Massimo Piepoli [14,15], Dimitris Richter[16], Eduard Shantsila[17], Susanna Sciomer [18], Ilonca Vaartjes [19], Marco Vecchiato[20,21], Elio Venturini[22], Ana Abreu [23], and Alessandro Biffi[24]



Figure 2 Personal-level actions to mitigate climate change and support cardiovascular health.

Table 2 Evaluation of patients' vulnerability to climate-related cardiovascular risk

Risk domain	Clinical relevance	Key questions for PCPs
Individual susceptibility	Pre-existing CVD, respiratory conditions, diabetes, and renal disease increase vulnerability.	Does the patient have underlying conditions that increase their risk?
Environmental exposure	Outdoor workers, residents of urban heat islands, and those living near high-traffic areas face greater exposure.	What are the patient's occupational and residential exposures?
Social and economic factors	Low-income individuals and those with limited access to resources are disproportionately affected.	Does the patient have access to air conditioning, transportation, and other resources?
Community resilience	The capacity of the local health system and infrastructure to respond to extreme weather events is critical.	What are the local climate hazards and the community's preparedness level?

Take home messages



- Ongunstige omgevingsfactoren verhogen het risico op HVZ
- Iedereen is blootgesteld dus ook kleine risico's kunnen een groot effect op populatieniveau hebben
- Sommige groepen zijn kwetsbaarder en/of meer blootgesteld
- Huisarts kan een rol spelen bij preventie

Bedankt voor uw aandacht

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