Mechanisms of social influences on health

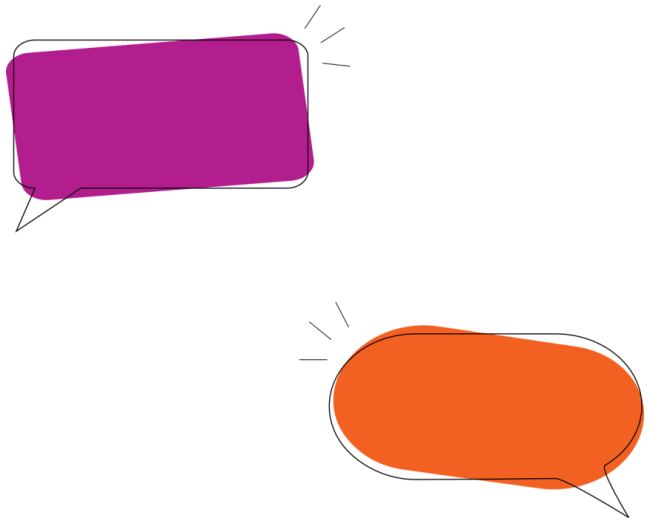
Demography and Social Determinants of Health

2 May 2024

MUNI | RECETOX

Warm up

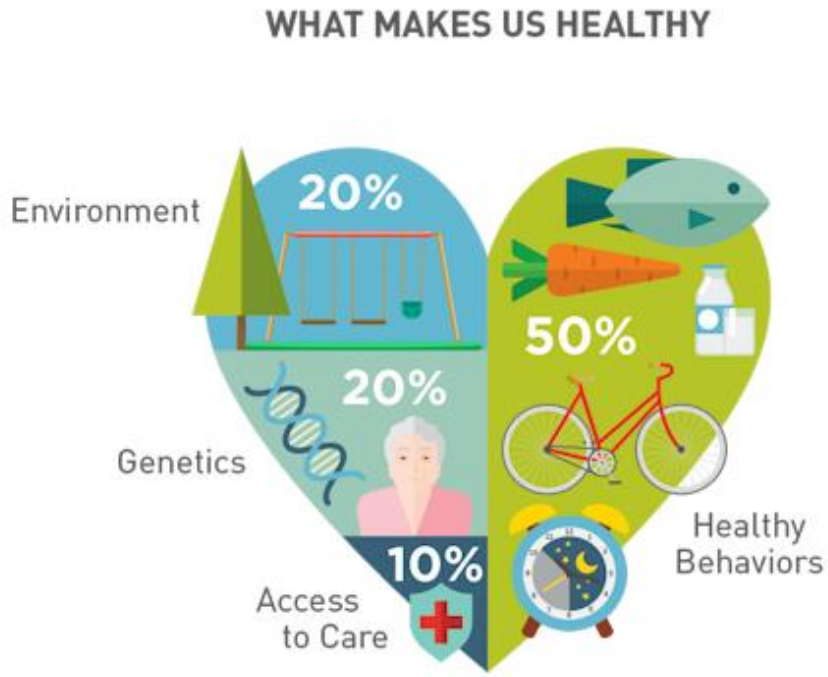
Discuss in pairs what determinants of health mean to you.



3 min

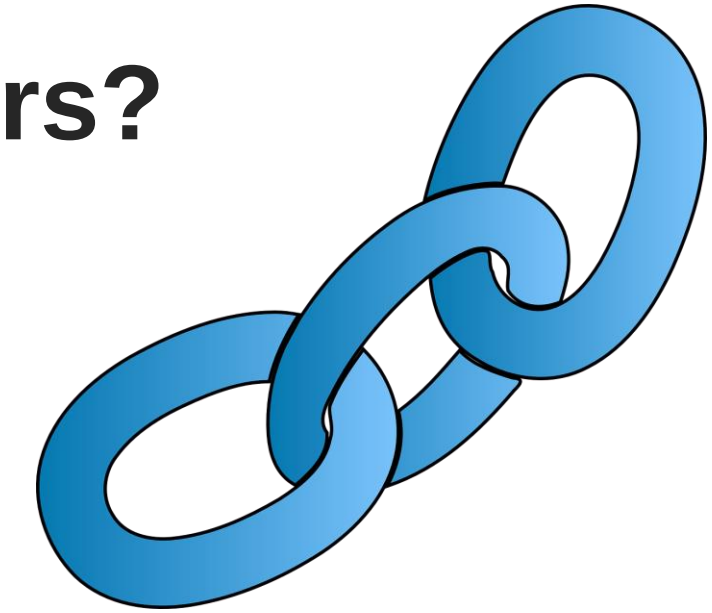
Determinants of health

- Material factors (poverty)
- Socioeconomic position (education, occupation)
- Psychosocial factors (stress, social networks)
- Health behaviours (smoking, drinking)
- Diet
- Environmental factors (pollution, temperature)
- Occupational environment
- Early life (birth weight)
- Genetics
- Health services
- Societal context

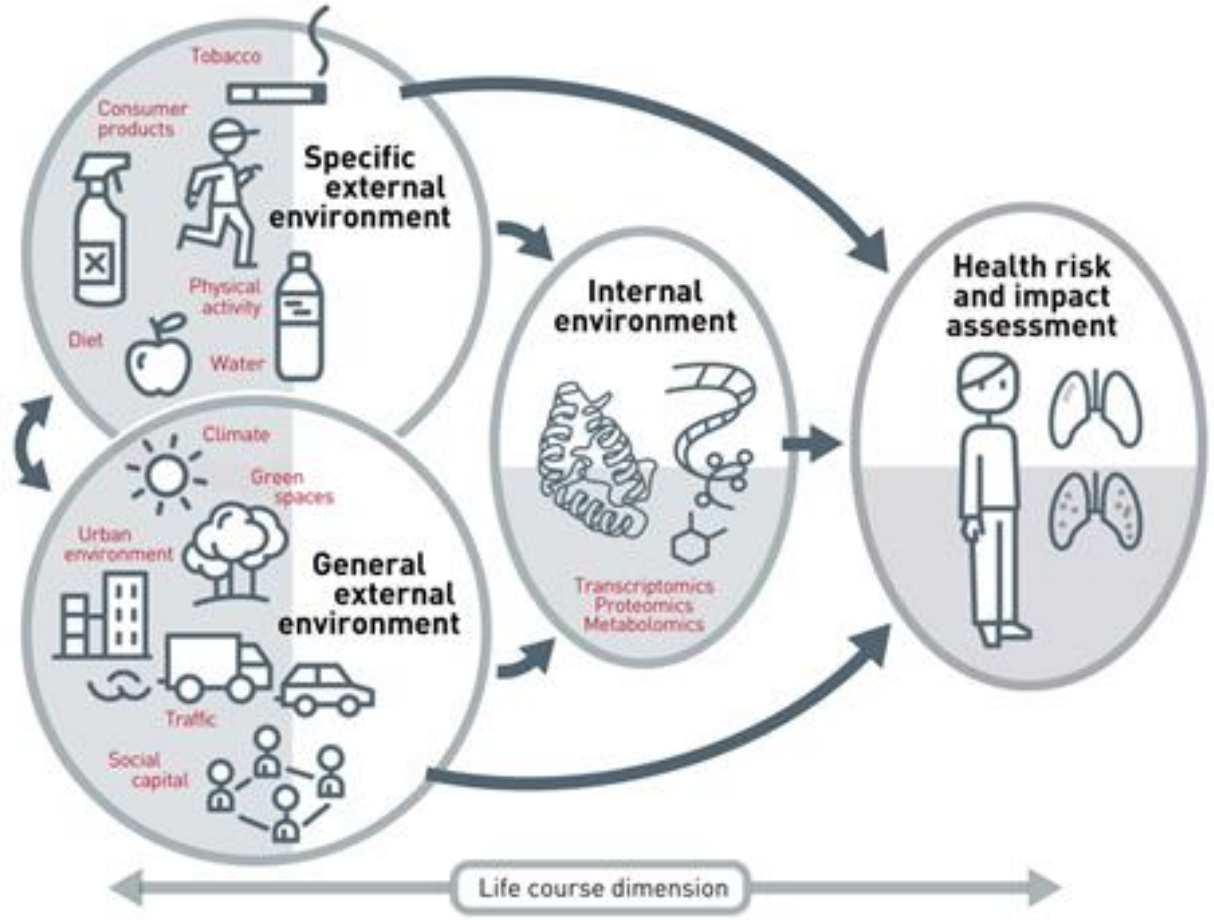


Is there a hierarchy of “risk factors”?

Or chain of risk factors?

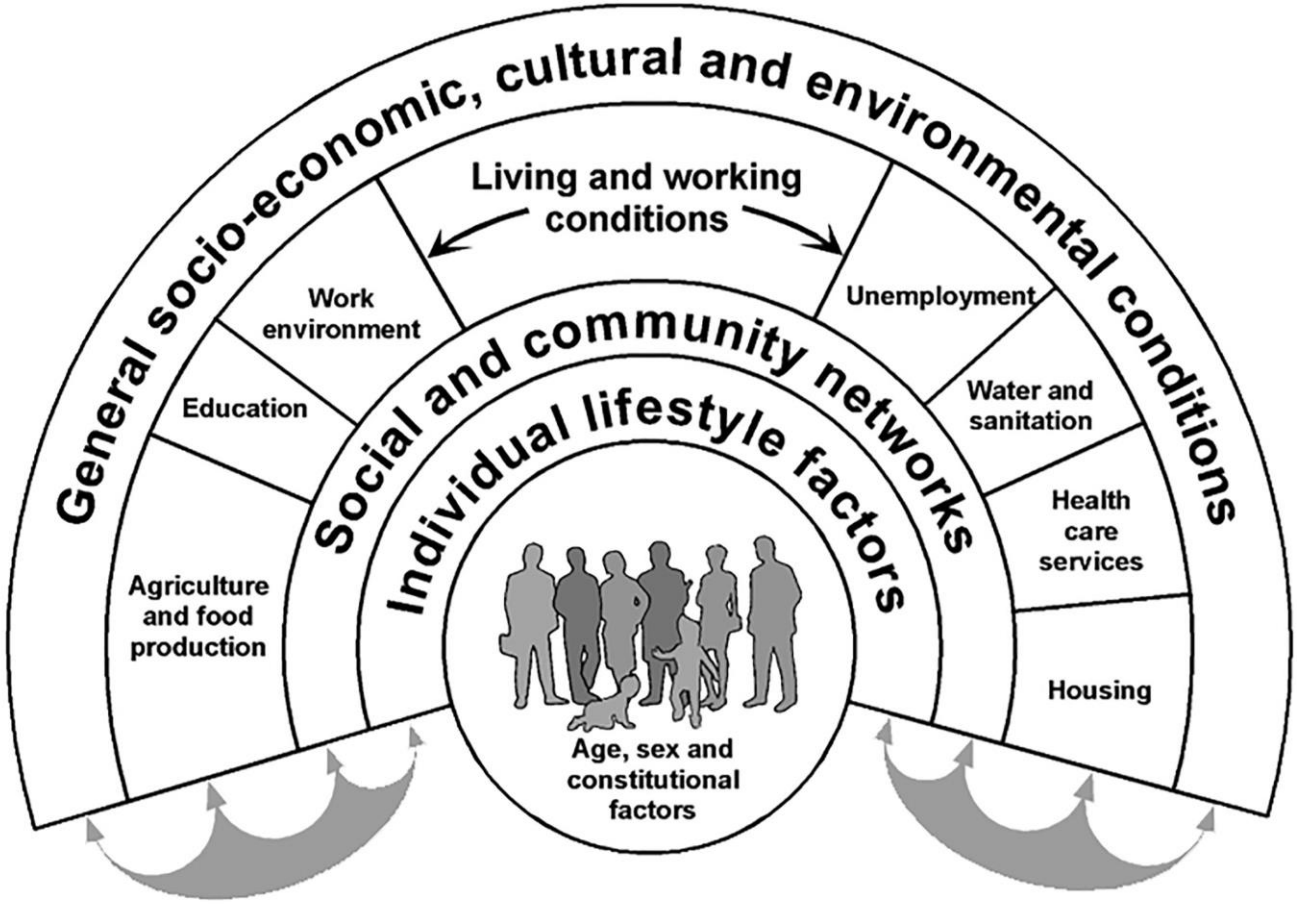


The exposome concept



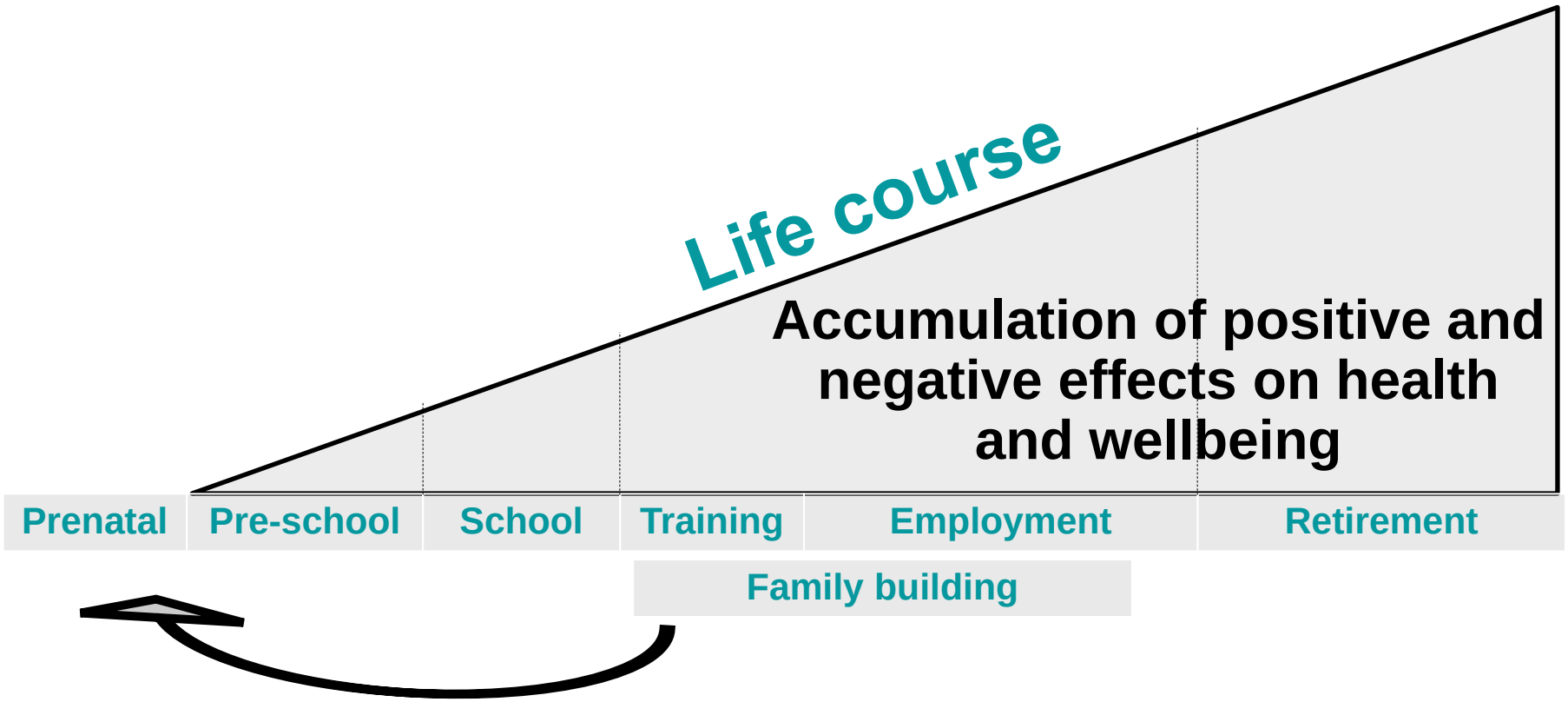
Vrijheid M. (2014). The exposome: a new paradigm to study the impact of environment on health. Thorax, 69(9), 876–878. https://doi.org/10.1136/thoraxjnl-2013-204949

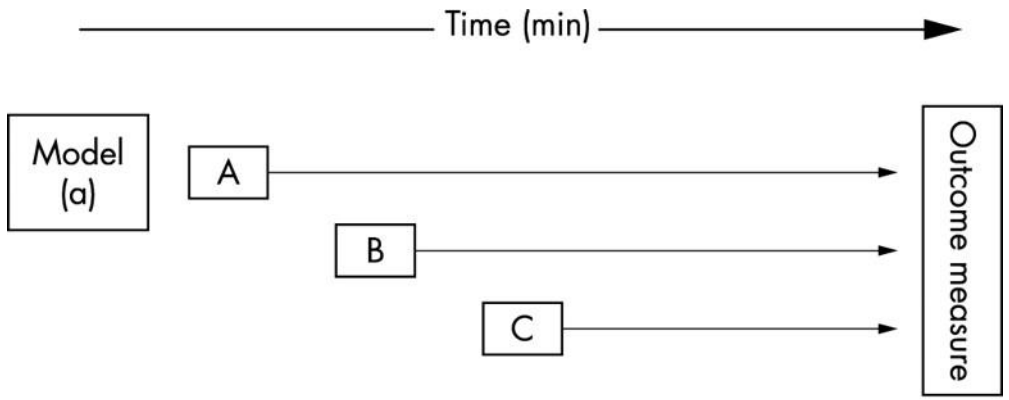
The Dahlgren-Whitehead rainbow model

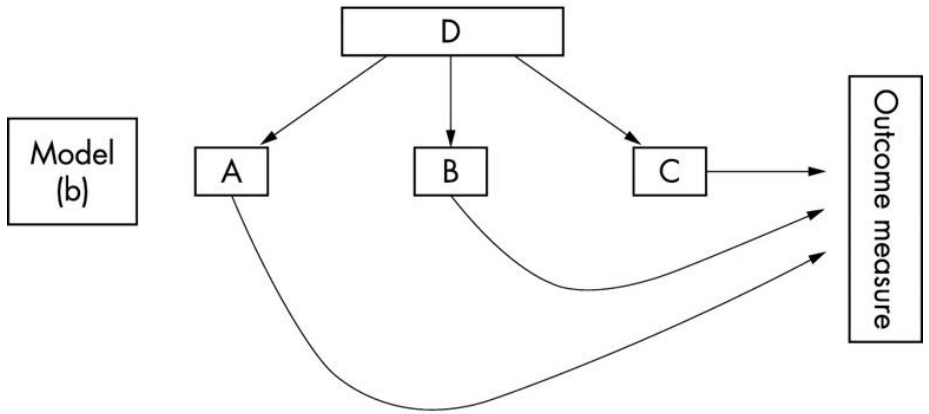


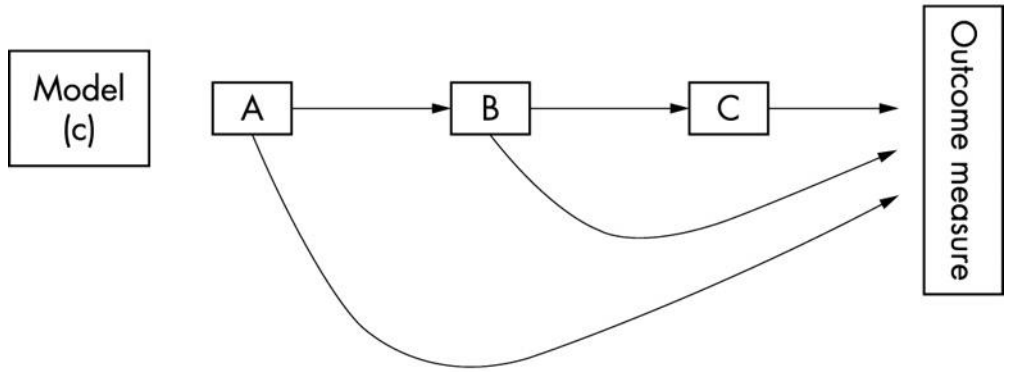
Dahlgren, G., & Whitehead, M. (2021). The Dahlgren-Whitehead model of health determinants: 30 years on and still chasing rainbows. *Public health*, *199*, 20–24. https://doi.org/10.1016/j.puhe.2021.08.009

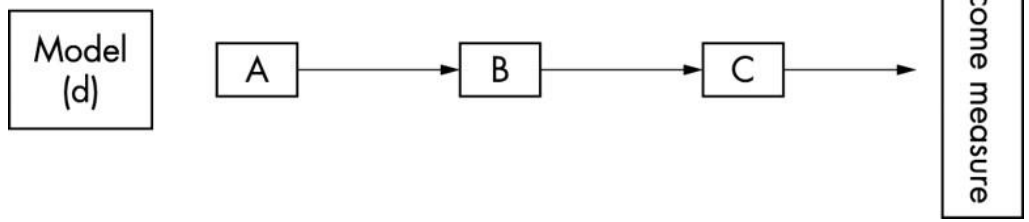
Life course stages





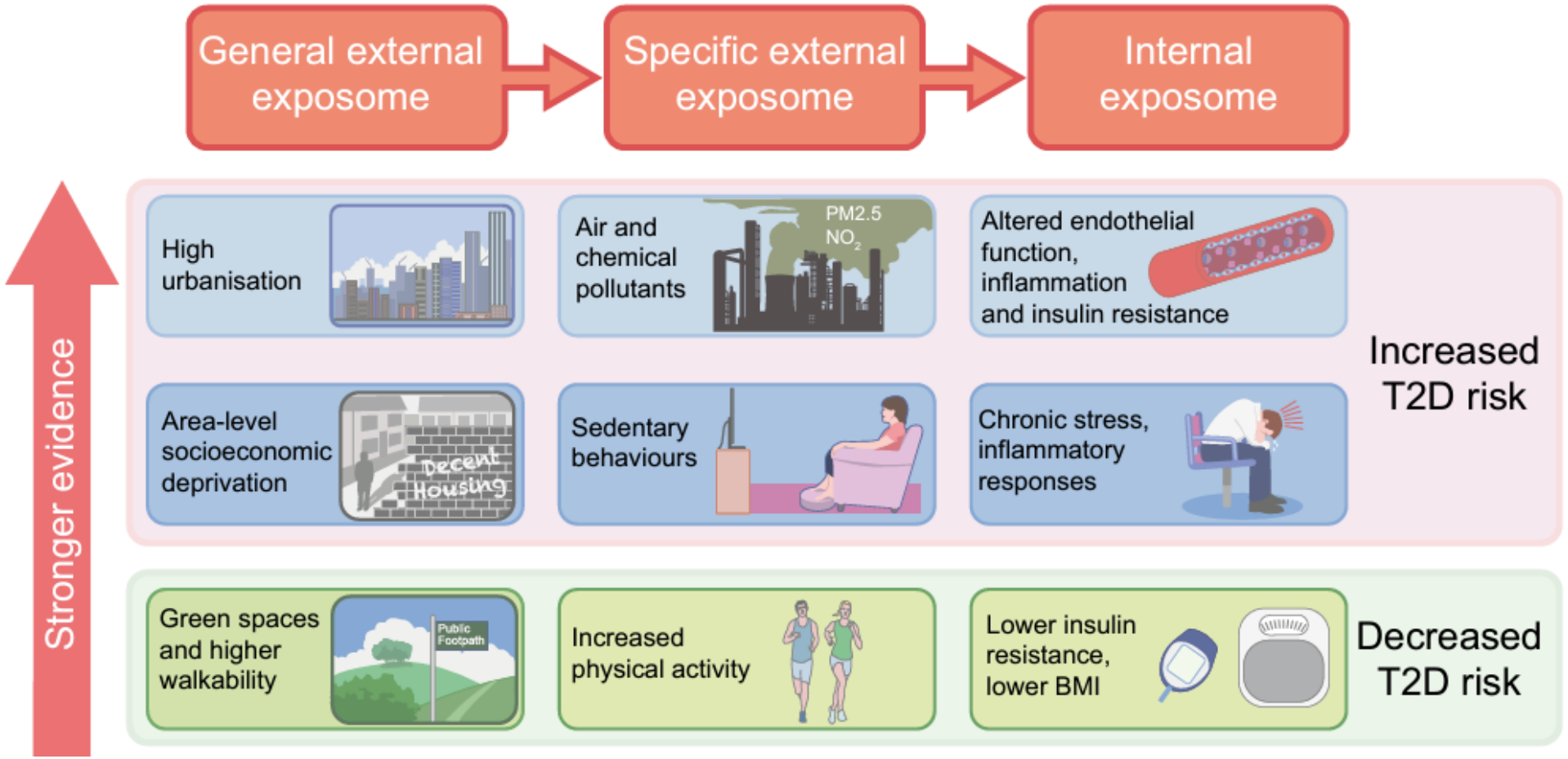






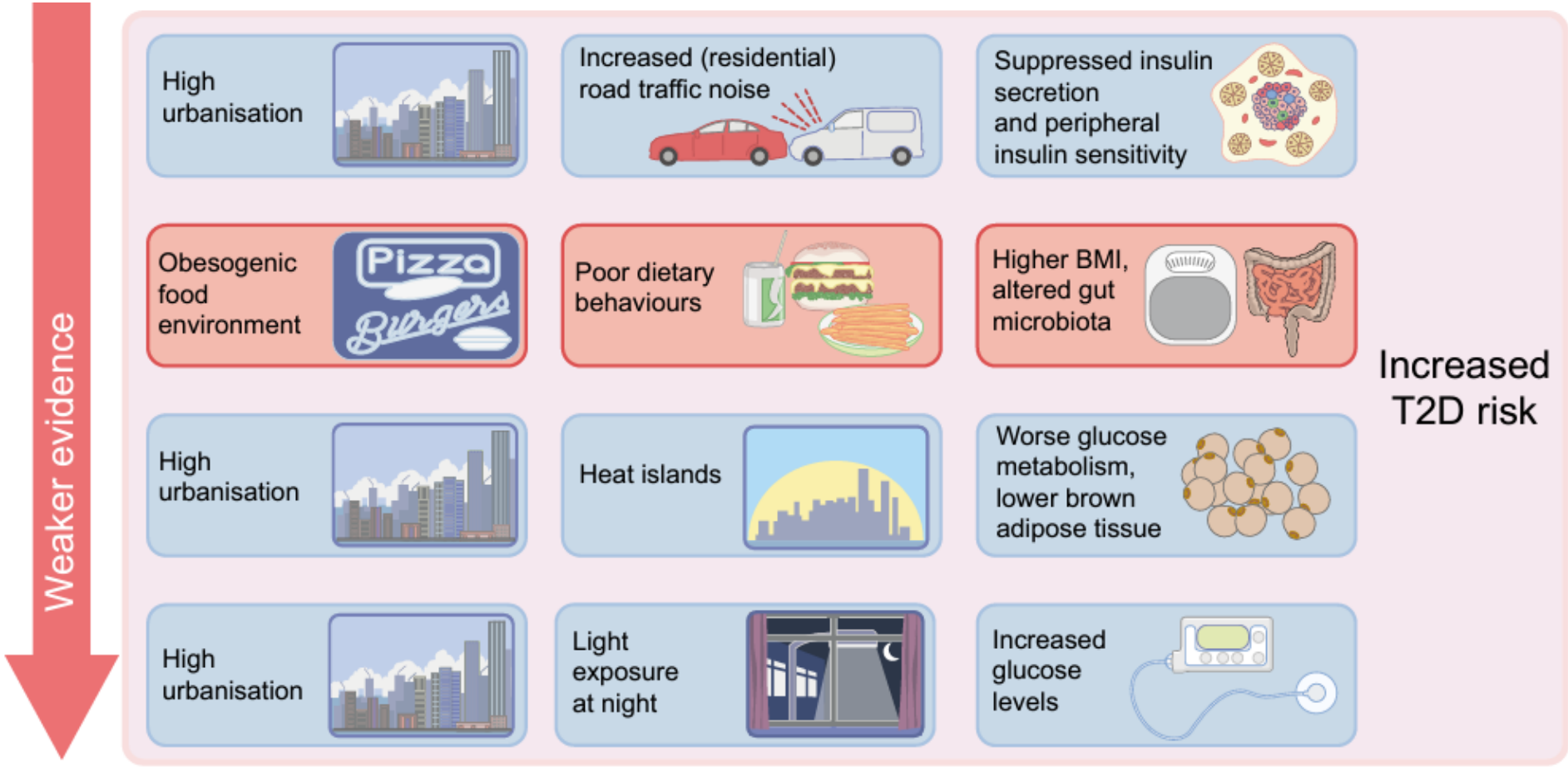
Kuh D, Ben-Shlomo Y, Lynch J, *et al.* Life course epidemiology. *Journal of Epidemiology & Community Health* 2003;**57:**778-783. http://dx.doi.org/10.1136/jech.57.10.778

Environmental risk factors of type 2 diabetes - an exposome approach



Beulens, J. W. J., Pinho, M. G. M., Abreu, T. C., den Braver, N. R., Lam, T. M., Huss, A., Vlaanderen, J., Sonnenschein, T., Siddiqui, N. Z., Yuan, Z., Kerckhoffs, J., Zhernakova, A., Brandao Gois, M. F., & Vermeulen, R. C. H. (2022). Environmental risk factors of type 2 diabetes-an exposome approach. *Diabetologia*, *65*(2), 263–274. https://doi.org/10.1007/s00125-021-05618-w

Environmental risk factors of type 2 diabetes - an exposome approach



Beulens, J. W. J., Pinho, M. G. M., Abreu, T. C., den Braver, N. R., Lam, T. M., Huss, A., Vlaanderen, J., Sonnenschein, T., Siddiqui, N. Z., Yuan, Z., Kerckhoffs, J., Zhernakova, A., Brandao Gois, M. F., & Vermeulen, R. C. H. (2022). Environmental risk factors of type 2 diabetes-an exposome approach. *Diabetologia*, *65*(2), 263–274. https://doi.org/10.1007/s00125-021-05618-w

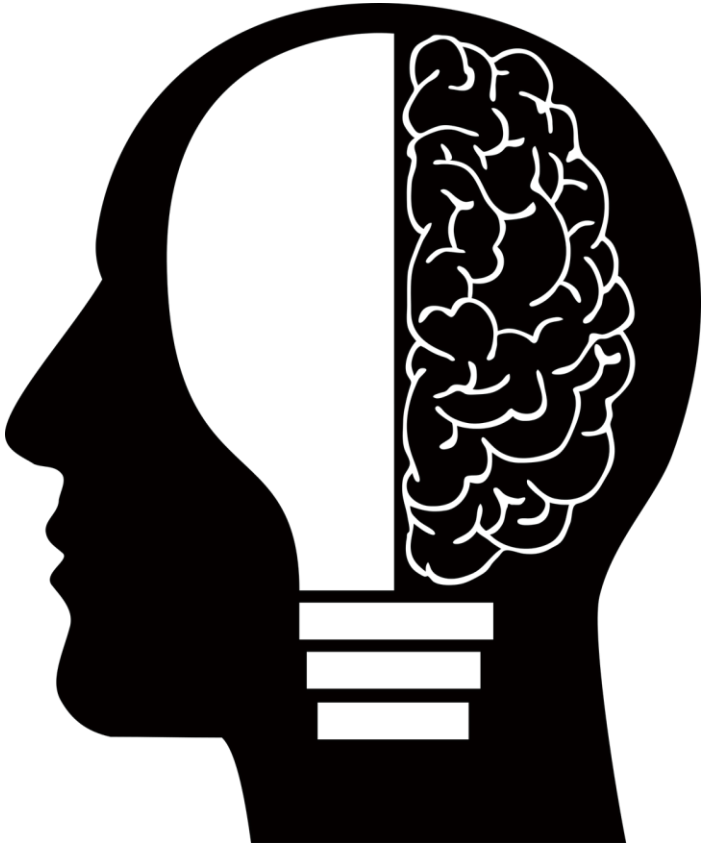
Several ways of assessing pathways

- Regression analysis models (linear, logistic)
- Structural equation models
- Multi-level models
- …

For all methods:

the chain of causes must exist ***IN YOUR HEAD***

= > theory driven



Regression analysis

- Comparing **crude (unadjusted)** RR with RR **adjusted for potential explanatory factor**
- Change in RR indicates whether explanatory factors “explains” any of the association

Hypothetical example

	Crude RR	Adjusted RR
High SES	1.0	
Low SES	2.0	

Regression analysis

- Comparing **crude (unadjusted)** RR with RR **adjusted for potential explanatory factor**
- Change in RR indicates whether explanatory factors “explains” any of the association

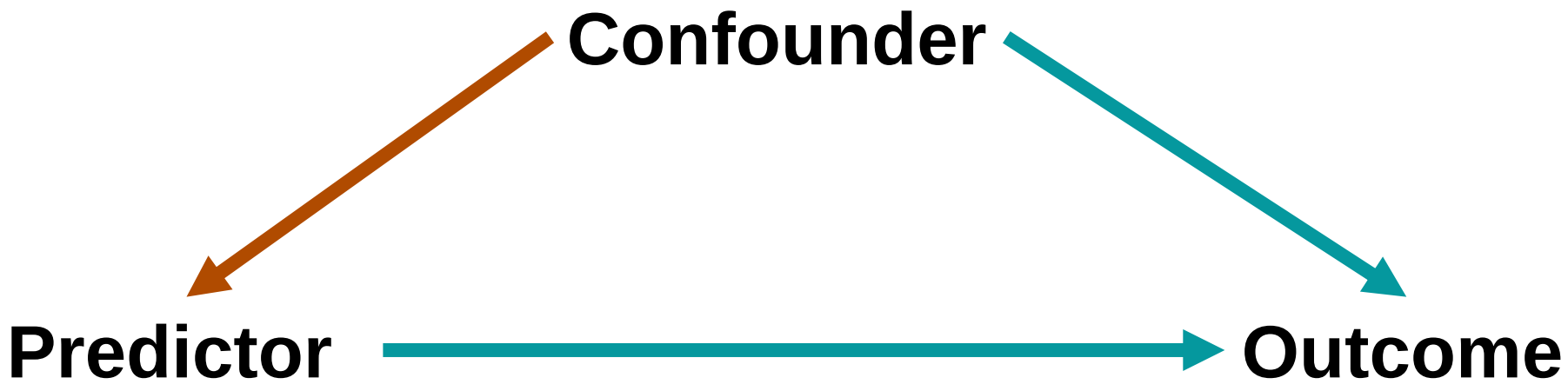
Hypothetical example

	Crude RR	Adjusted RR
High SES	1.0	1.0
Low SES	2.0	1.5

Adjustment (i.e. variable adjusted for) “explained” half of the increased risk associated with low SES.

Confounder

- Confounder can distort the “true” relationship between exposure and outcome (confounding bias)
- Confounders do not lie on the causal pathway

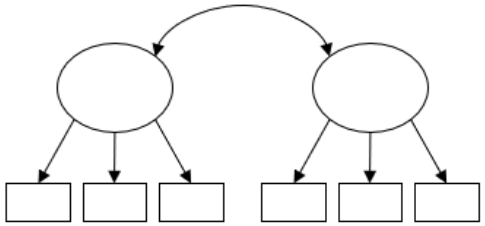


Mediator

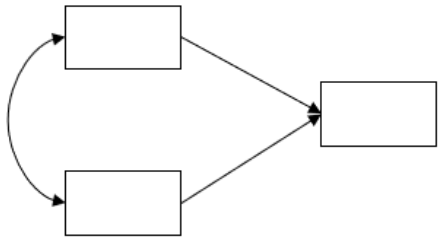
- Mediator lies on the causal pathway between predictor and outcome
- Mediation analysis: examine the mechanism(s) by which the predictor may influence the outcome

Structural equation modelling

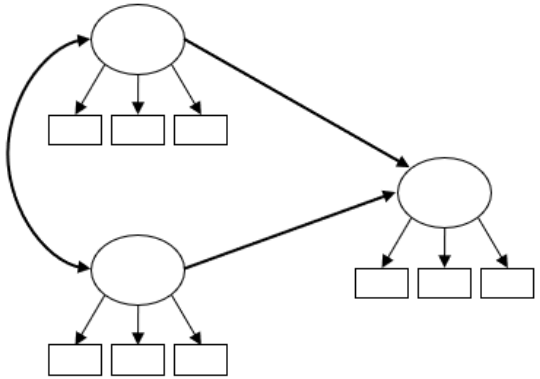
- Modeling complex associations between variables



Confirmatory Factor Analysis (CFA)

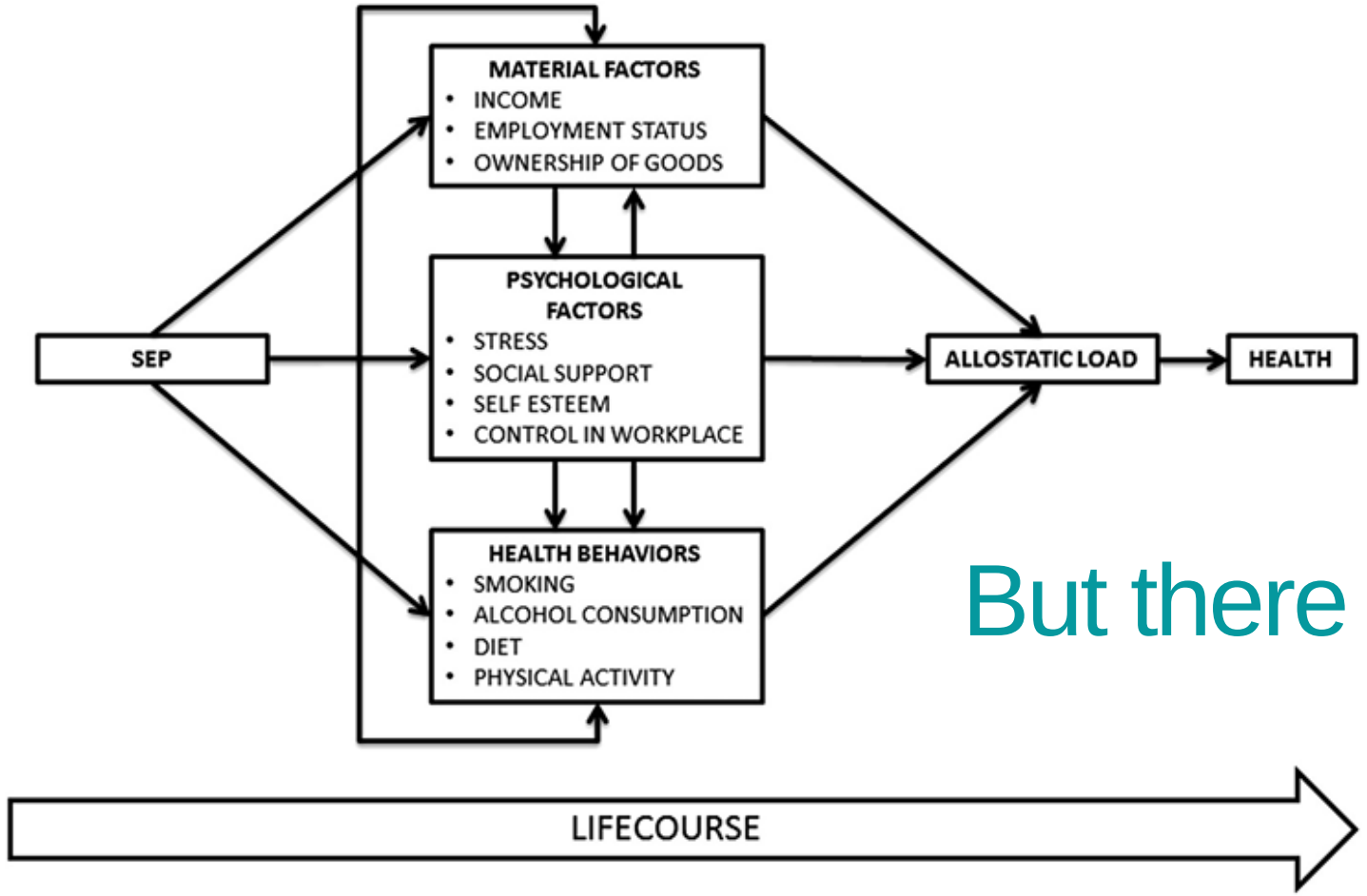


Path Analysis



Structural Equation Model (SEM)

Theoretical pathways linking SEP and health



But there are more..

Robertson T, Benzeval M, Whitley E, Popham F. The role of material, psychosocial and behavioral factors in mediating the association between socioeconomic position and allostatic load (measured by cardiovascular, metabolic and inflammatory markers). Brain Behav Immun. 2015 Mar;45:41-9. doi: 10.1016/j.bbi.2014.10.005. Epub 2014 Oct 22. PMID: 25459100; PMCID: PMC4349498.

European Journal of Clinical Nutrition

www.nature.com/ejcn

ARTICLE OPEN

Check for updates

The explanation of educational disparities in adiposity by lifestyle, socioeconomic and mental health mediators: a multiple mediation model

Anna Bartoskova Polcrova[1✉], Albert J. Ksinan[1], Juan P. González-Rivas[2,3], Martin Bobak[1,4] and Hynek Pikhart[1,4]

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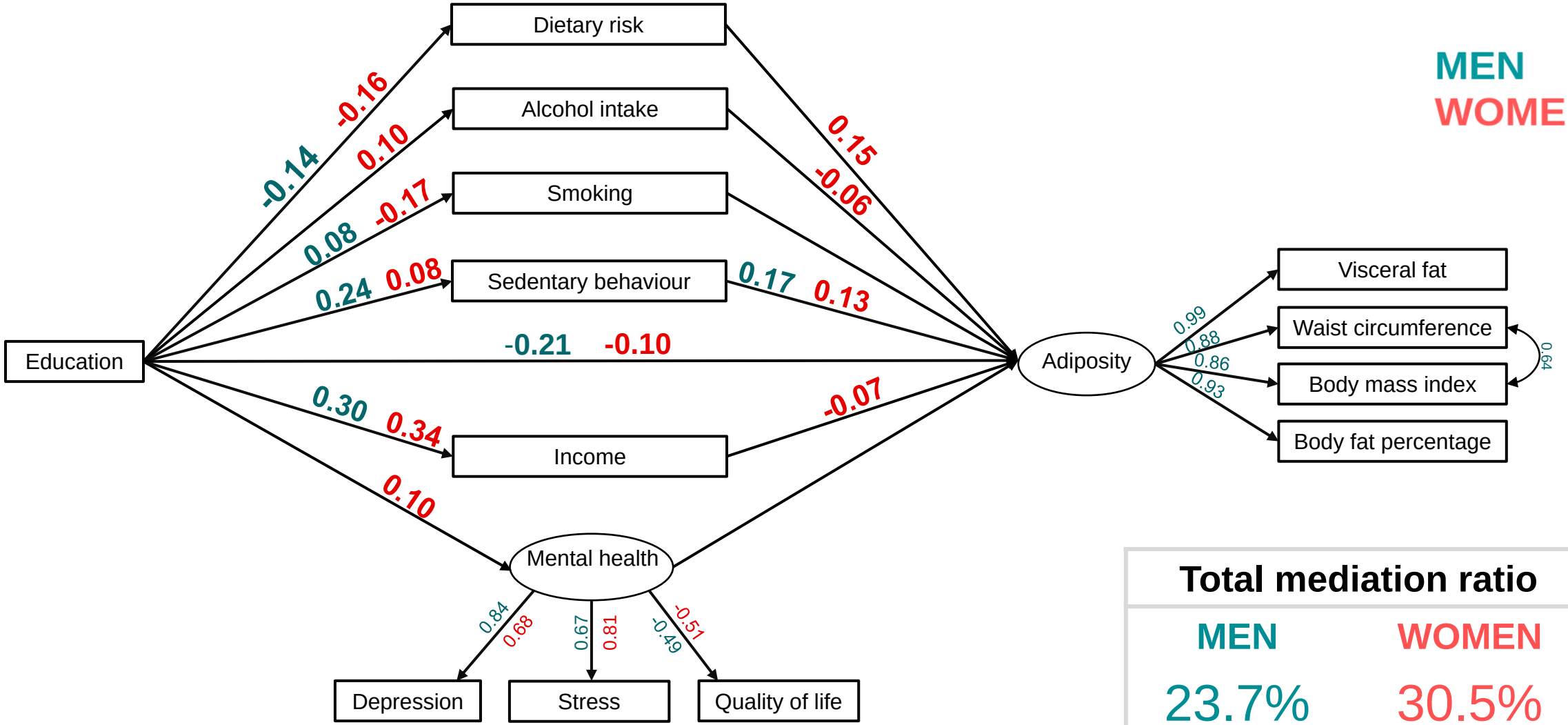
AIM

- To investigate the educational disparities in adiposity and the role of potential lifestyle, socioeconomic and mental health mediators.

Table 2. Subjects characteristics and potential mediators in categories of education by sex.

	Men					Women				
	Total	**High**	**Middle**	**Low**	***p***	**Total**	**High**	**Middle**	**Low**	***p***
n (%)	977 (45.36)	440 (45.04)	333 (34.08)	204 (20.88)		1177 (54.64)	456 (38.74)	498 (42.31)	223 (18.95)	
Age (years)	46.74	45.18	46.27	50.80	**<0.001**	47.77	44.23	49.10	51.95	**<0.001**
BMI (kg/m^2)	26.86	25.96	27.11	28.39	**<0.001**	25.51	23.97	26.10	27.39	**<0.001**
Waist circumference (cm)	96.75	94.05	97.44	101.36	**<0.001**	84.53	80.58	85.86	89.68	**<0.001**
Body fat (%)	21.61	20.09	21.81	24.60	**<0.001**	30.75	27.96	31.54	34.66	**<0.001**
VFA (cm^2)	86.44	78.37	87.91	101.61	**<0.001**	92.01	81.54	96.16	104.24	**<0.001**

Bartoskova Polcrova, A., Ksinan, A. J., González-Rivas, J. P., Bobak, M., & Pikhart, H. (2024). The explanation of educational disparities in adiposity by lifestyle, socioeconomic and mental health mediators: a multiple mediation model. *European journal of clinical nutrition*, 10.1038/s41430-024-01403-1. Advance online publication. https://doi.org/10.1038/s41430-024-01403-1



Total mediation ratio	
MEN	WOMEN
23.7%	30.5%

Standardized direct and indirect effects of multiple mediation analysis by sex, adjusted for age. Reported β significant at p<0.05.

Bartoskova Polcrova, A., Ksinan, A. J., González-Rivas, J. P., Bobak, M., & Pikhart, H. (2024). The explanation of educational disparities in adiposity by lifestyle, socioeconomic and mental health mediators: a multiple mediation model. *European journal of clinical nutrition*, 10.1038/s41430-024-01403-1. Advance online publication. https://doi.org/10.1038/s41430-024-01403-1

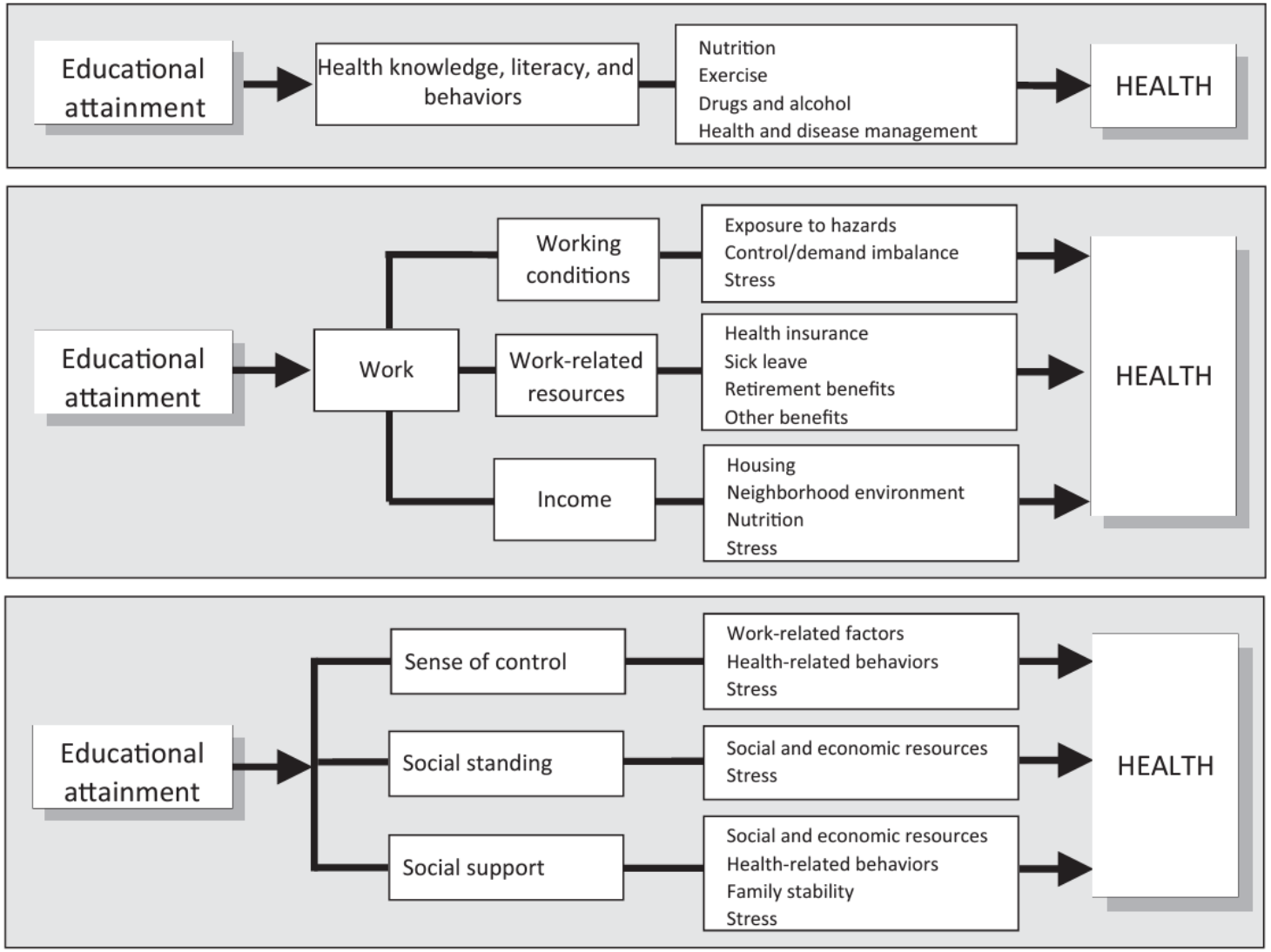


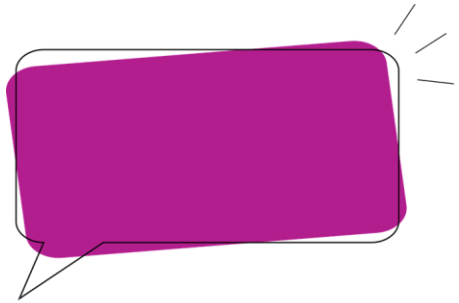
Figure 4

Multiple pathways linking education to health.

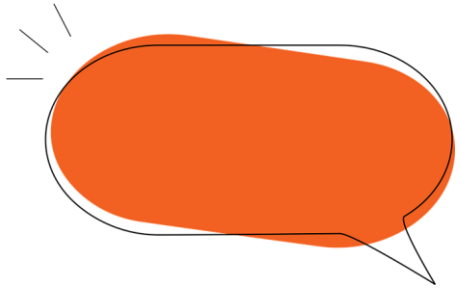
Braveman, P., Egerter, S., & Williams, D. R. (2011). The social determinants of health: coming of age. Annual review of public health, 32, 381–398. https://doi.org/10.1146/annurev-publhealth-031210-101218

Wake up

What is the relationship between social determinants and environmental exposure?



Discuss in pairs, 3 min



Environmental injustice

- Socioeconomic position may predispose

individuals to increased environmental exposure

Contents lists available at ScienceDirect

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The geography of environmental injustice

Eric Vaz*, Adam Anthony, Meghan McHenry

Ryerson University, Department of Geography and Environmental Studies, Toronto, ON, Canada

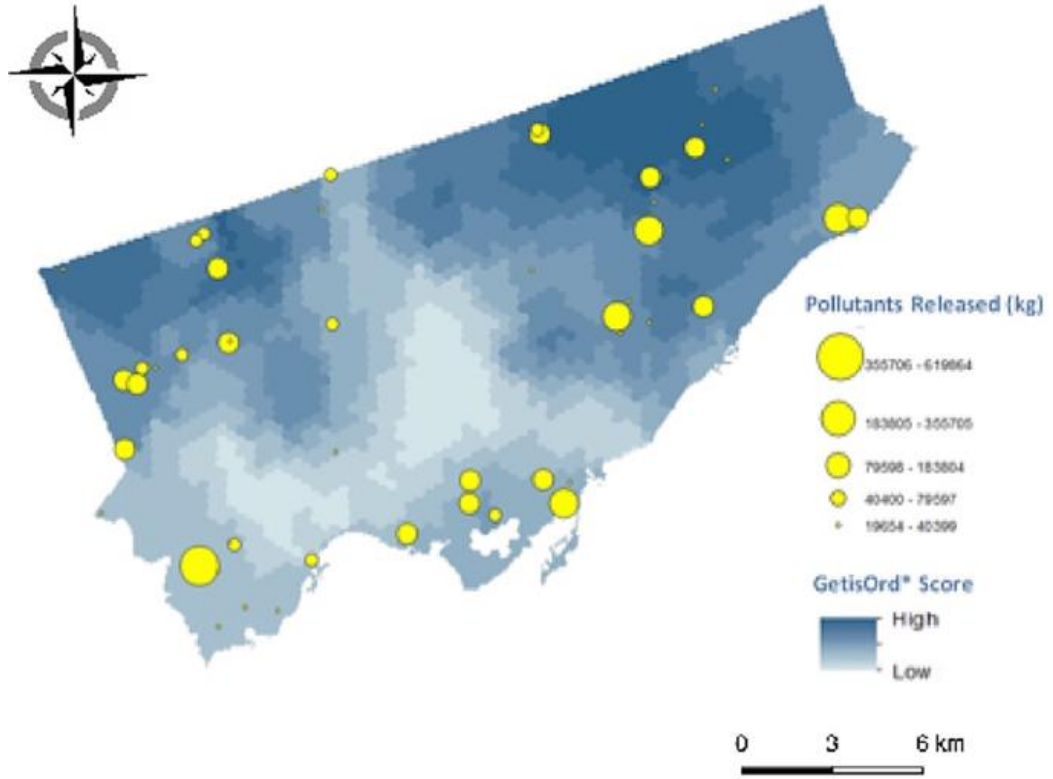

Fig. 6. Concentration of minority populations and pollutant emissions.

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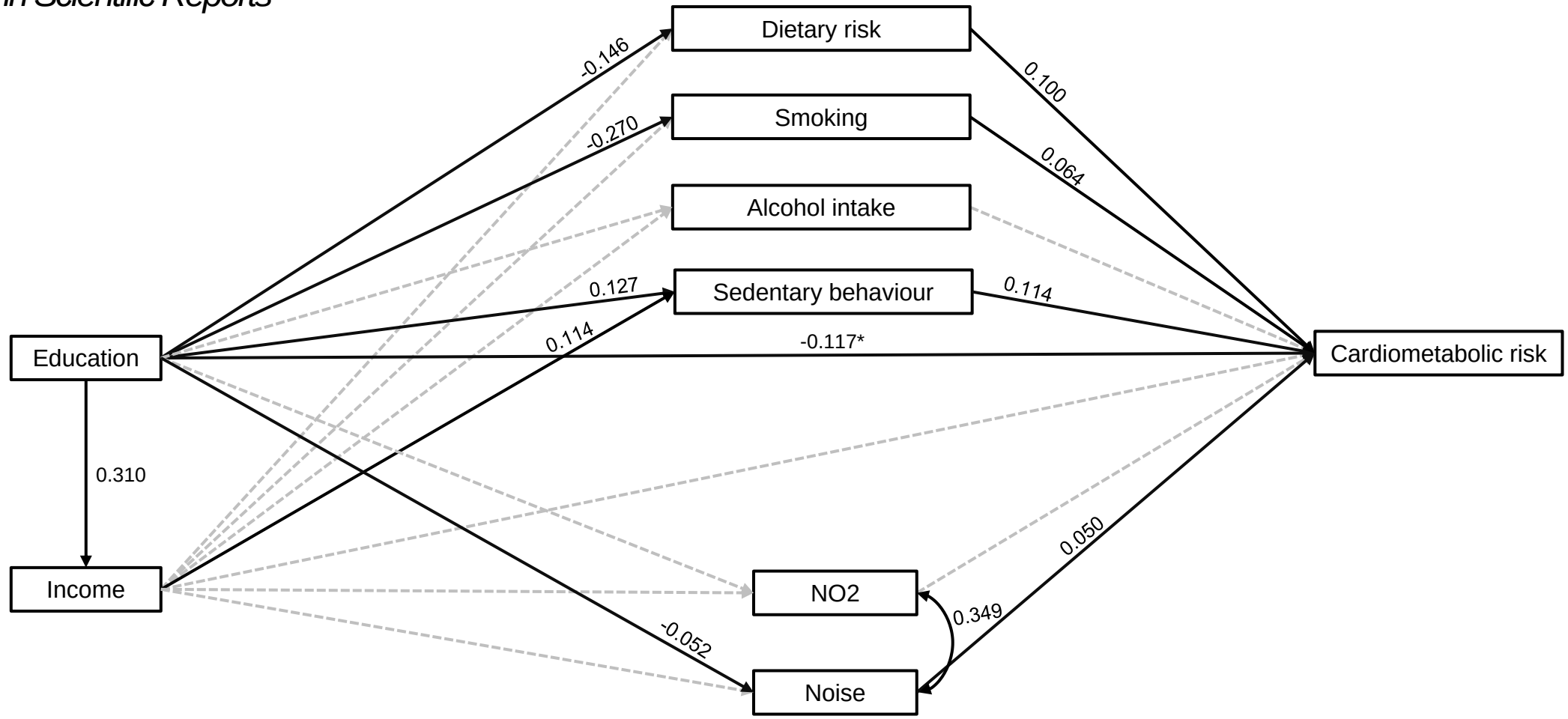
Social and environmental stressors of cardiometabolic health

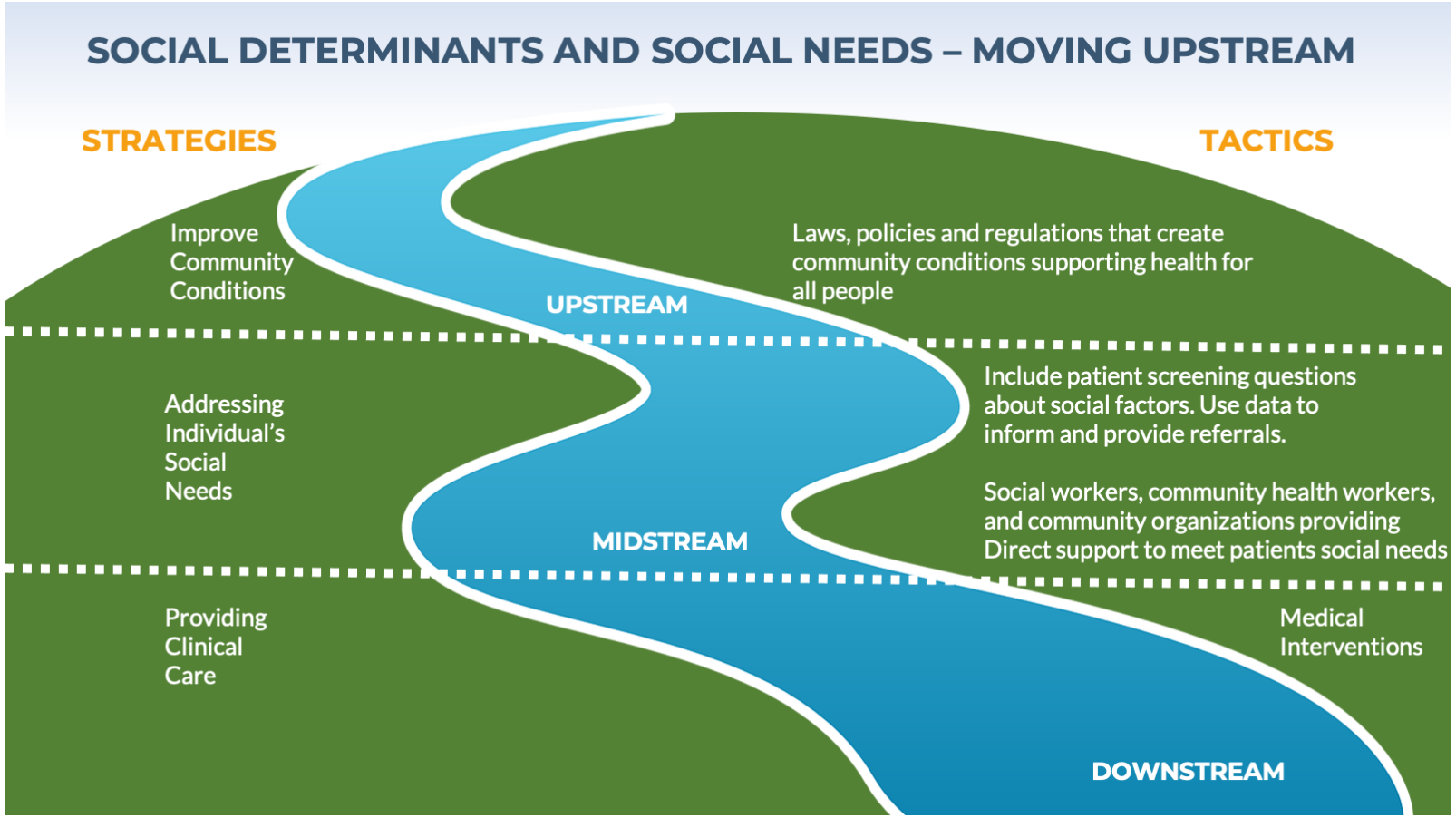
Anna Bartoskova Polcrova, Andrea Dalecka, Daniel Szabo, Juan Pablo Gonzalez Rivas, Martin Bobak, Hynek Pikhart

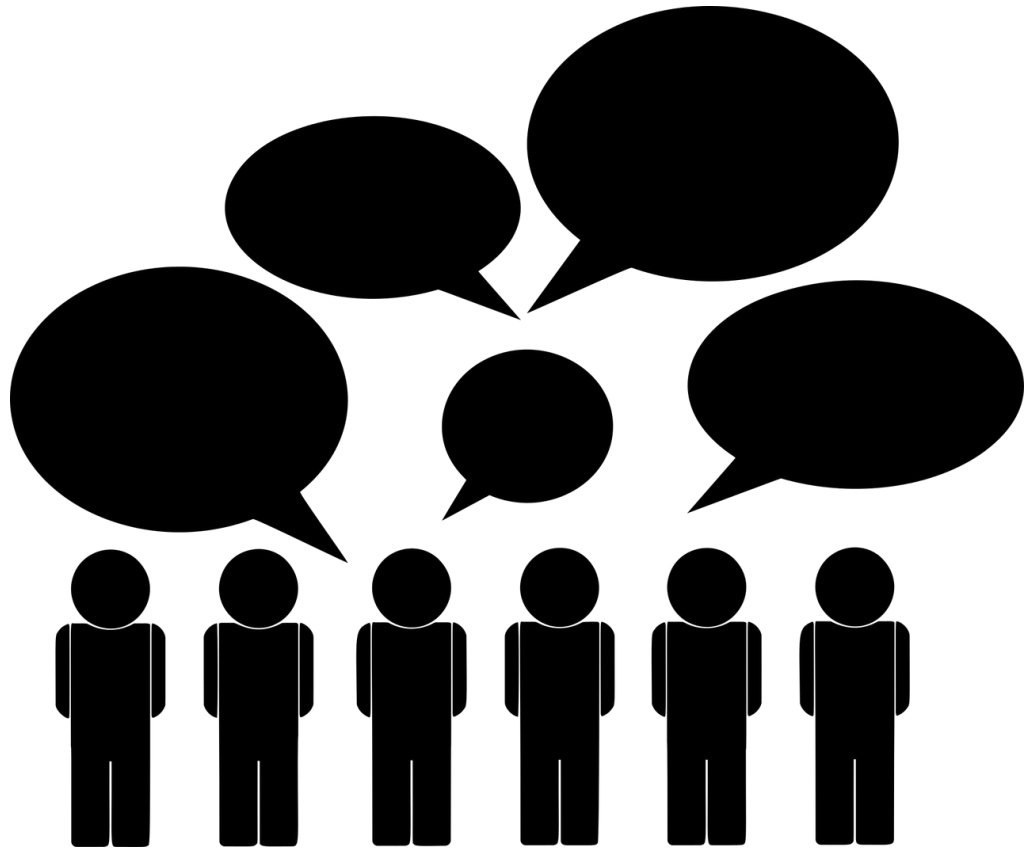
Under review in Scientific Reports



Observed statistically significant (p<0.05) relationships in complex structural model, adjusted for sex and age. Dotted lines represent tested but statistically non-significant relationships.

Moving upstream



https://healthendeavour.agency/time-to-look-upstream/

Questions ?