

Social Determinants of Health

Concepts and Methods Relevant to Air Pollution

Sam Harper



McGill

Department of
**Epidemiology, Biostatistics
and Occupational Health**

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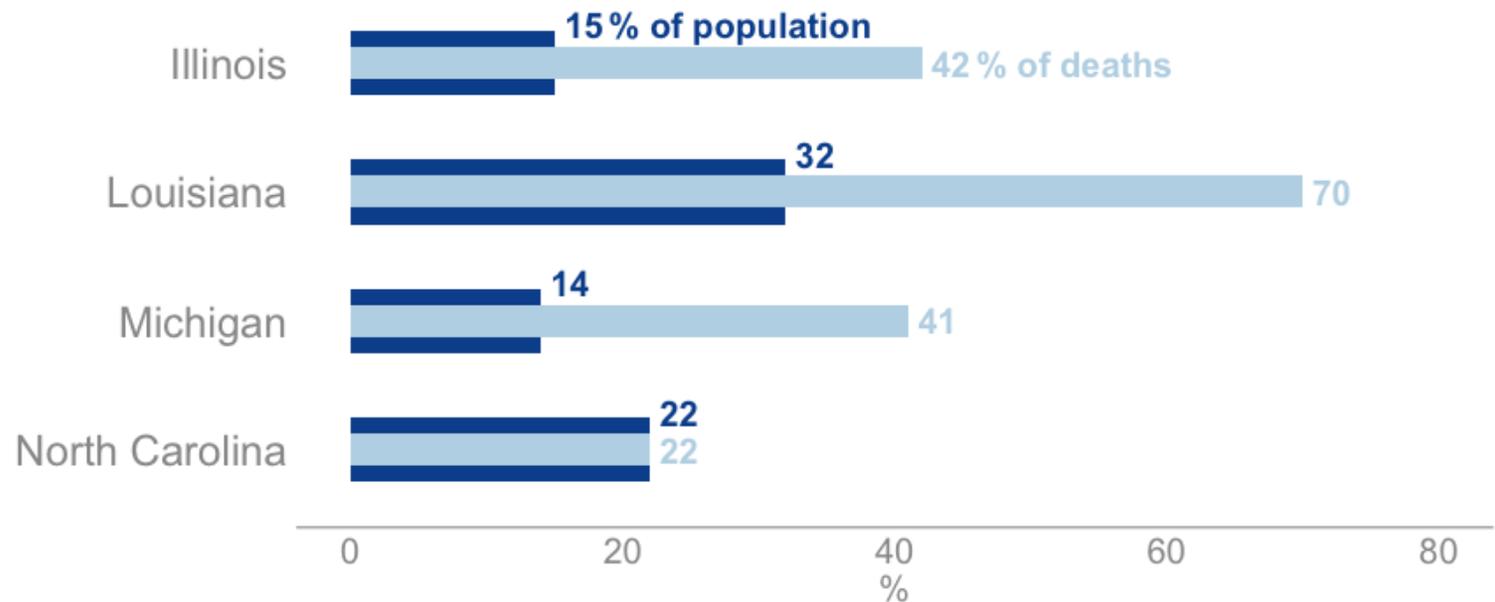


'A Terrible Price': The Deadly Racial Disparities of Covid-19 in America

For the Zulu club, a black social organization in New Orleans, Mardi Gras was a joy. The coronavirus made it a tragedy.

Disproportionate racial impact of COVID-19 on deaths

Pandemic exposure reveals underlying inequalities in social conditions.





“We have long known that emissions coming from these facilities are very dangerous to the health of people who live nearby, and it is black people who live the closest. So I’m getting tired of being told our Covid death rates are only because we’re obese or have diabetes or are eating badly, without any regard to the **systematic harm pollution has caused us.**”

-Beverly Wright
Deep South Center for Environmental Justice



A photograph of Terry Sharpe Sr., 49, held by his widow, Debra Sharpe, and his children, Terry Sharpe Jr. and Emily Sharpe. A truck driver and a Zulu member since 2017, Sharpe died of Covid-19.

"The conditions in the social and physical environment where people live, work, attend school, play and pray have an outsized influence on health outcomes."

"Those in the public-health field call these conditions **social determinants of health**".

What are Social Determinants of Health?

The social determinants of health are the conditions in which people are born, grow, live, work and age.

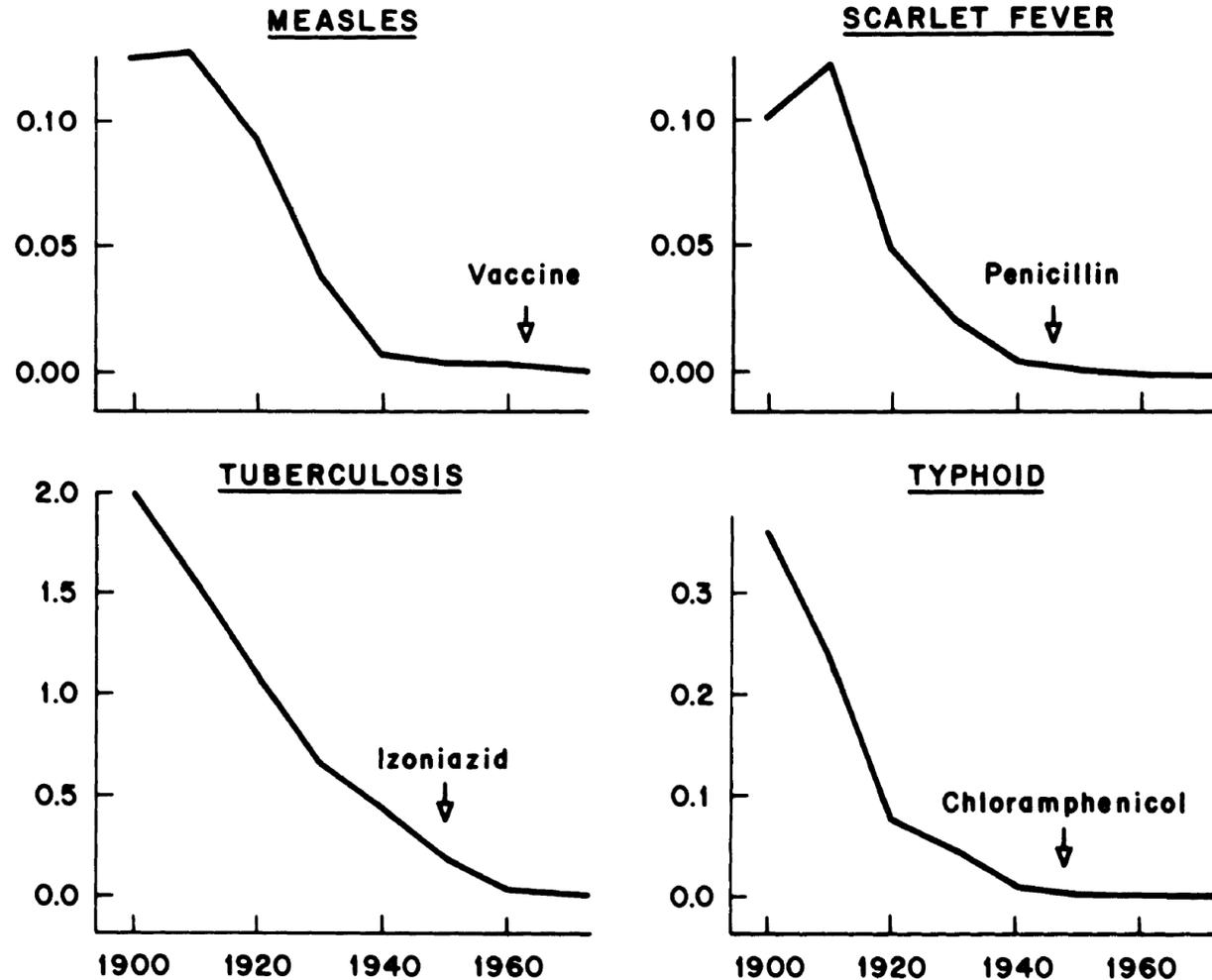
- Availability of resources (e.g., safe housing and local food markets)
- Access to educational, economic, and job opportunities
- Access to health care services
- Quality of education and job training
- Availability of community-based resources in support of community living and - opportunities for recreational and leisure-time activities
- Transportation options
- Public safety
- Social support
- Social norms and attitudes (e.g., discrimination, racism, and distrust of government)
- Exposure to crime, violence, and social disorder
- Socioeconomic conditions (e.g., concentrated poverty)
- Residential segregation
- Language/Literacy
- Access to mass media and emerging technologies
- Culture

Conceptual Ideas

Medical care matters, but not much

Standards of living, hygiene, public health, policies, drive outcomes.

Death rates per 1000

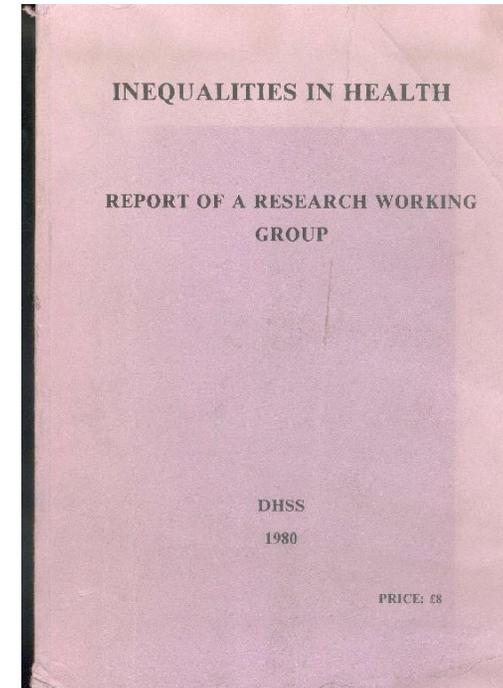


McKinlay & McKinlay (1977); McKeown (1979)

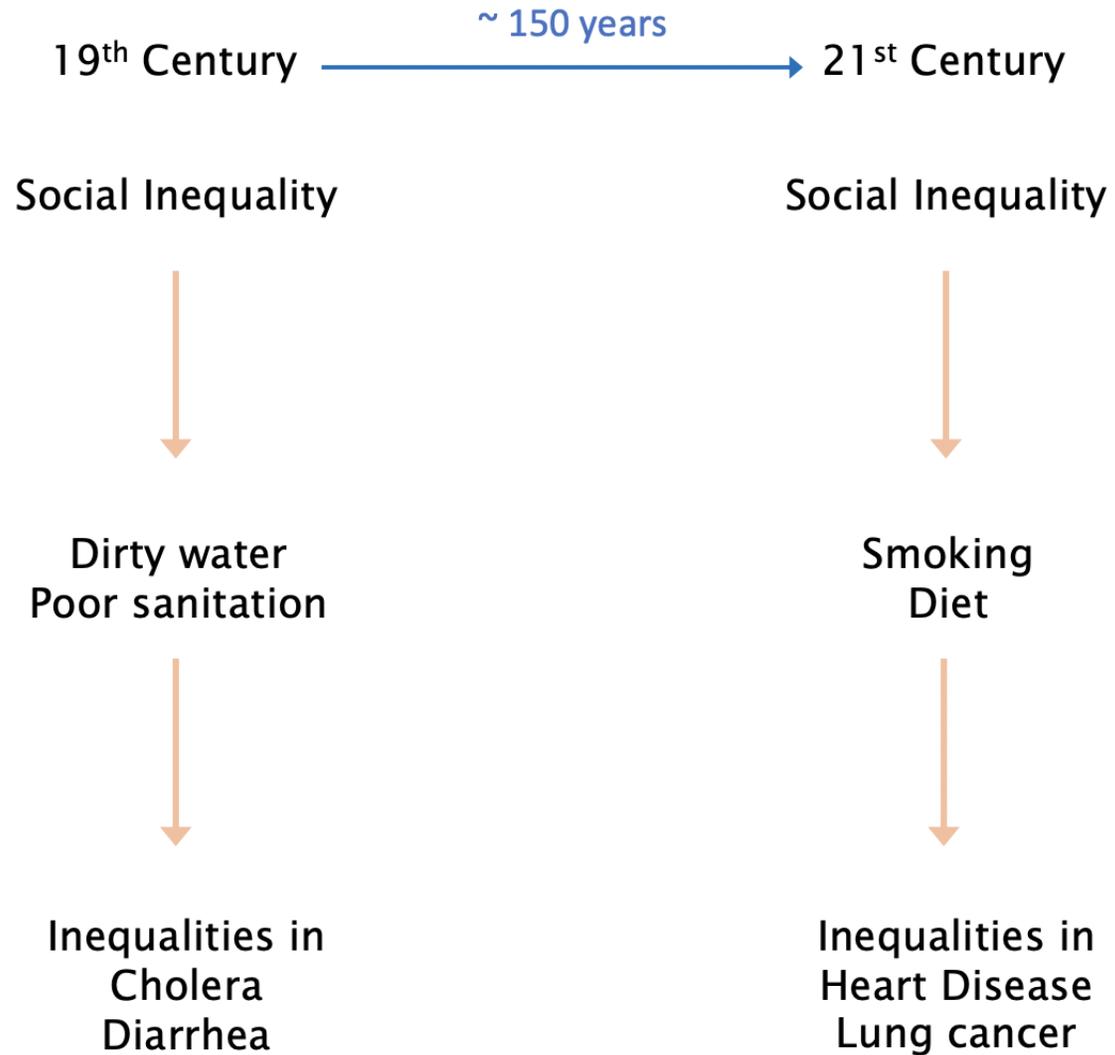
The UK Black Report (1981) cemented the idea of **persistent** health inequalities

Universal health insurance did not reduce inequalities.

More ambitious interventions needed in education, housing and social welfare, in addition to improved clinical care.



Mechanisms may change, but social inequality will reproduce health inequalities.



Risk factors are insufficient

"The social class difference was partly explained by known coronary risk factors: men in the lower grades smoked more and exercised less, they were shorter and more overweight, and they had higher blood pressures and lower levels of glucose tolerance.

Most of the difference, however, remains unexplained. It seems that there are major risk factors yet to be identified"

-Rose and Marmot, 1981

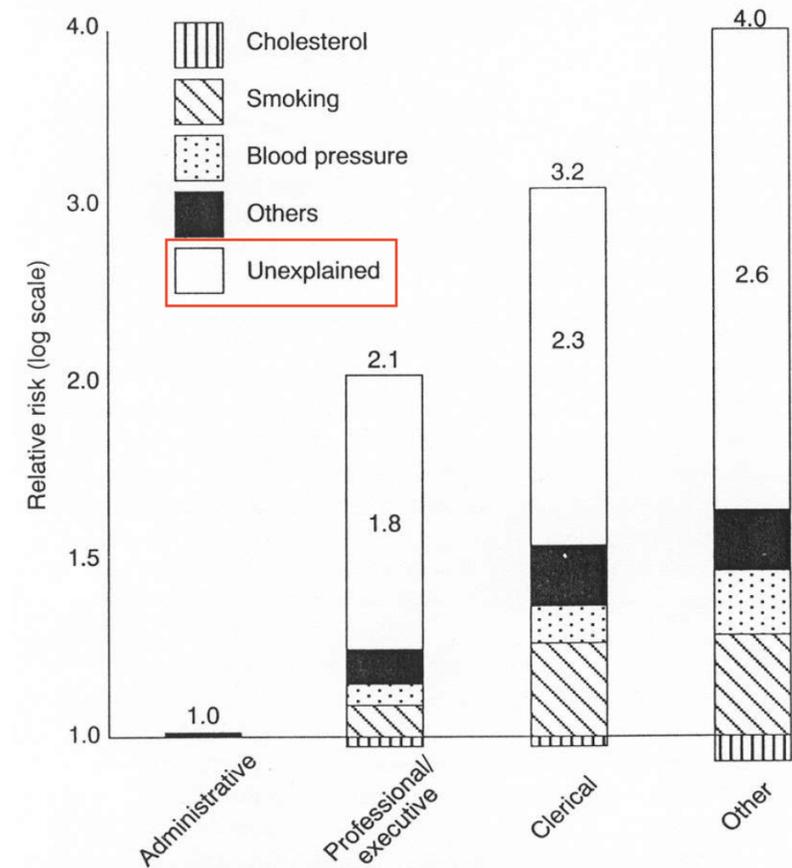
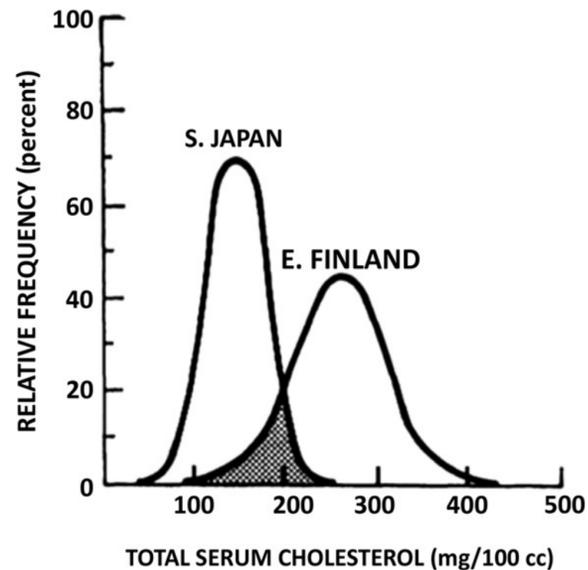


Figure 4.1: Relative risk of death from coronary heart disease according to employment grade, and proportions of differences that can be explained statistically by various risk factors
Note: 'Others' = height, body mass, exercise, glucose tolerance
Source: G. Rose and M. Marmot, Social class and coronary heart disease. *British Heart Journal* 1981: 13-19

Interventions need to be social

"...the primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social."

-Geoffrey Rose



Rose (1992, p.129); Marmot (1998)

Note 📌 y-axis difference!

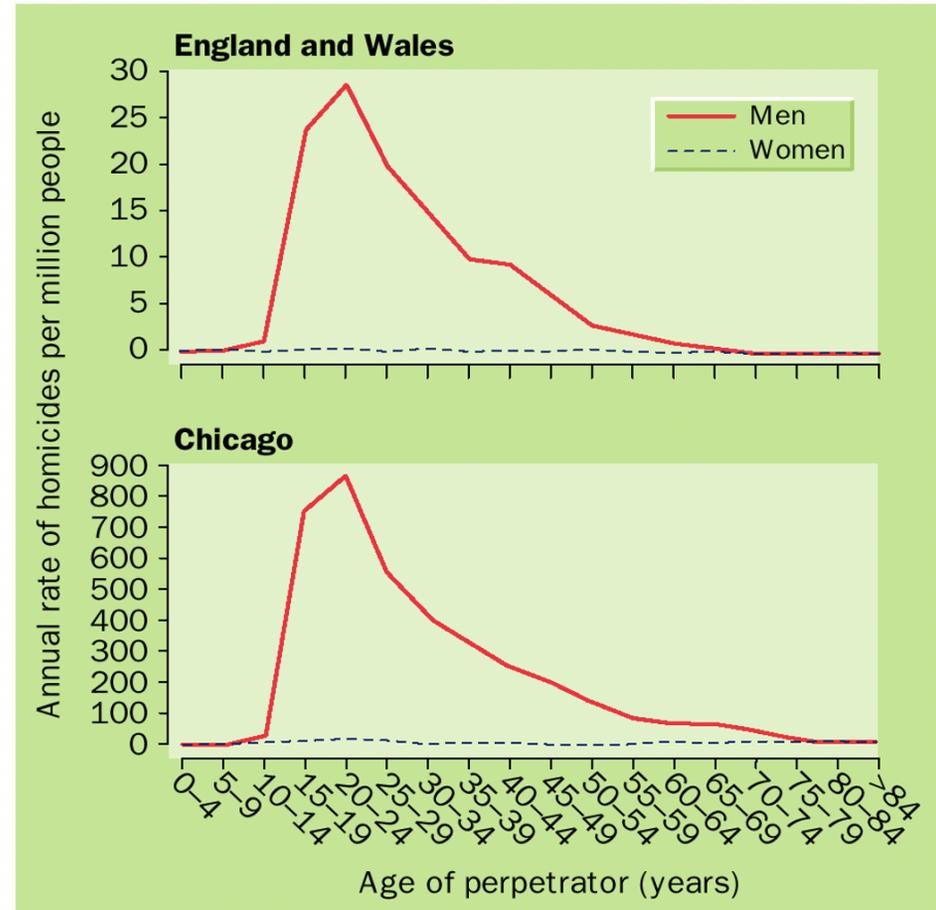


Figure 1: Rates of homicide in Chicago and England and Wales by age and sex of perpetrator



World Health
Organization



Commission on
Social Determinants of Health

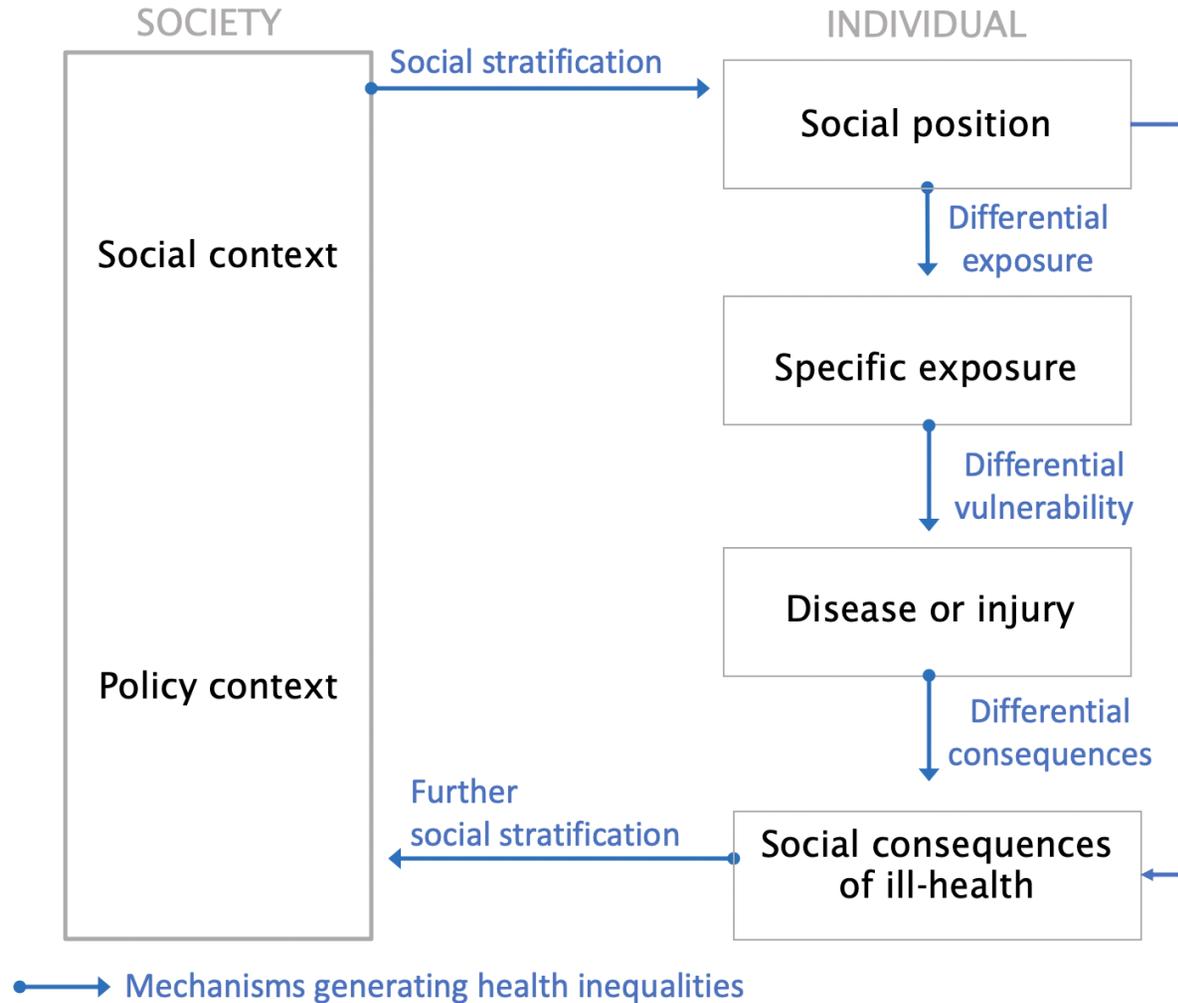
Closing the gap in a generation

"Social injustice is
killing people on a
grand scale."

Health equity through action on
the social determinants of health

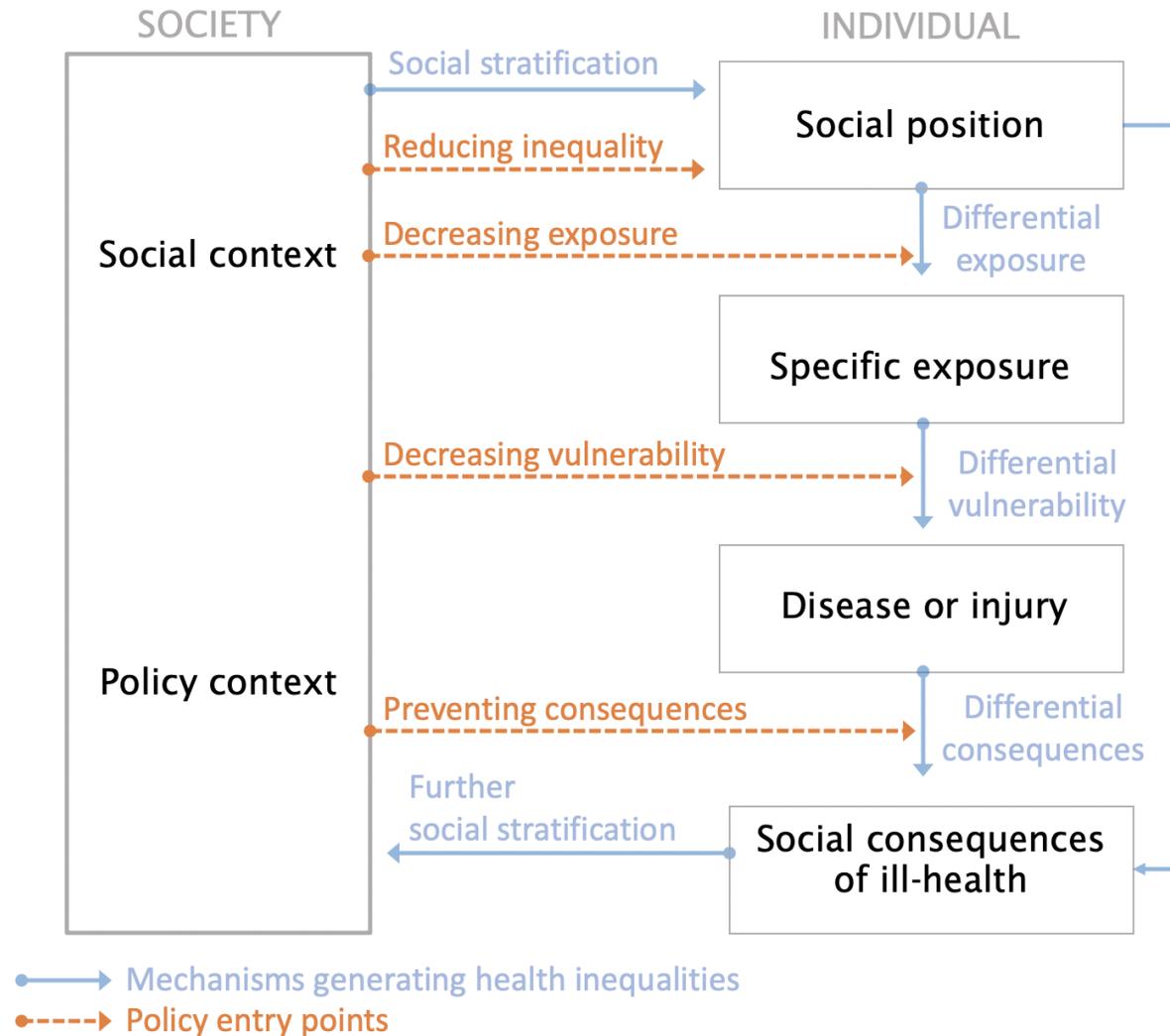
SDOH model

- Explicit links between social exposures
- Differential exposure and susceptibility



SDOH model

- Explicit links between social exposures
- Differential exposure and susceptibility
- Key leverage points for policy intervention



Persistent racial and socioeconomic inequalities in exposure

"...findings raise serious questions about the ability of current policies and institutions to adequately protect people of color and the poor from toxic threats."

Commission for Racial Justice (1987,2007); Kravitz-Wirtz (2016); Rosofsky (2018)

Race Bias Found in Location of Toxic Dumps

By LENA WILLIAMS

Special to The New York Times

WASHINGTON, April 15 — Communities with large concentrations of black and Hispanic people have more hazardous waste facilities than other populated areas, a study released today concluded.

The study, prepared by the United Church of Christ's Commission on Racial Justice, asserted that the possibility that the placement of these dumps resulted by chance was "virtually impossible." It found that depressed economic conditions and a lack of education had made minorities especially vulnerable.

"Many predominantly minority communities are beset with a number of problems, ranging from poverty to unemployment," said the Rev. Benjamin F. Chavis Jr., executive director of the commission. "These communities cannot afford the luxury of being primarily concerned about the quality of their environment when confronted by a plethora of pressing problems related to their day-to-day survival."

Economic Incentives Offered

Although 53 percent of white Americans live in areas with waste sites, the commission found that communities with the greatest numbers of dump-

shad the highest concentration of non-white residents. In addition, the study said that income and home values were substantially lower in communities with such facilities than in communities in the surrounding counties without them.

The group said that in many cases the location of the waste sites seemed to hinge on economic incentives. Residents in communities that agreed to be host to such facilities were often promised jobs and contracts to minority-owned firms, the study found.

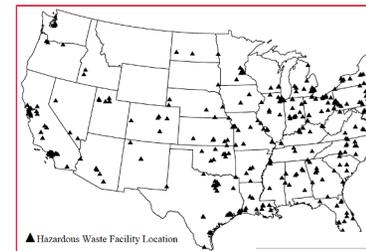
Mr. Chavis said the commission was particularly concerned about the health risks posed by these facilities,

Toxic Wastes and Race at Twenty

1987—2007

A Report Prepared for the United Church of Christ Justice & Witness Ministries

THE LONG-TERM DYNAMICS OF RACIAL/ETHNIC INEQUALITY IN NEIGHBORHOOD AIR POLLUTION EXPOSURE, 1990-2009



Nicole Kravitz-Wirtz

Population Studies Center, University of Michigan

Kyle Crowder

Department of Sociology, University of Washington

Anjum Hajat

Department of Epidemiology, School of Public Health, University of Washington

Victoria Sass

Department of Sociology, University of Washington



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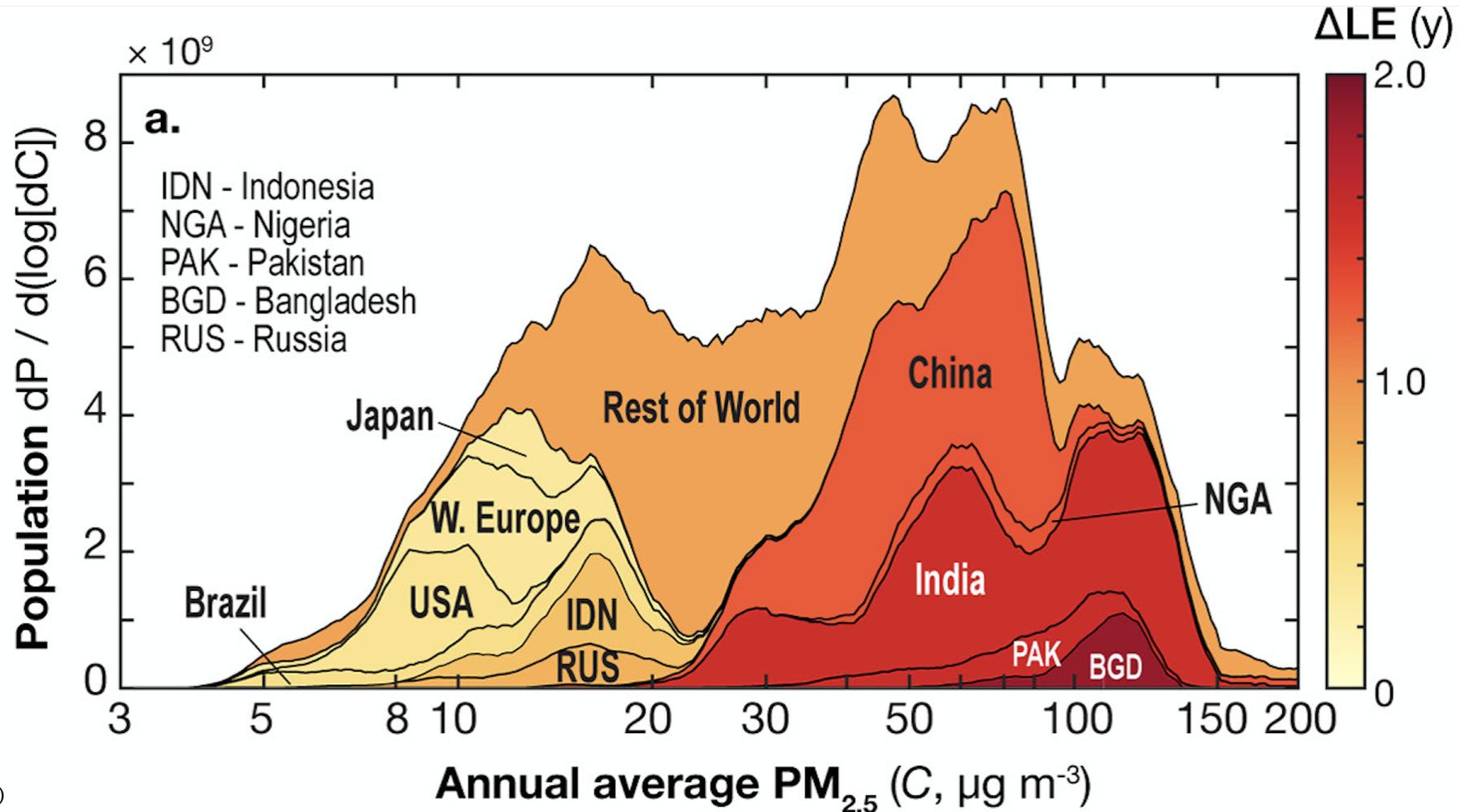


Temporal trends in air pollution exposure inequality in Massachusetts

Anna Rosofsky^{a,*}, Jonathan I. Levy^b, Antonella Zanobetti^b, Patricia Janulewicz^a, M. Patricia Fabian^a

^a Department of Environmental Health, Boston University School of Public Health, Boston, MA, USA
^b Department of Environmental Health, Harvard T.H. Chan School of Public Health, Boston, MA, USA

Individual vs. population determinants



Reviews of evidence on pollution and SDOH

Important heterogeneity

Most find that risks are more concentrated among disadvantaged social groups.

Plea for better methods

O'Neill (2003); Benmarhnia (2014); Hajat (2015); Appleton (2016); Fairburn (2019)

Research | Review

Health, Wealth, and Air Pollution: Advancing Theory and Methods
*Marie S. O'Neill,¹ Michael Jerrett,² Ichiro Kawachi,¹ Jonathan I. Levy,¹ Aaron J. Cohen,³ Nelson Gouveia,⁴ Paul Wilkinson,⁵ Tony Fletcher,⁵ Luis Cifuentes,⁶ and Joel Schwartz,¹ with input from participants of the Workshop on Air Pollution and Socioeconomic Conditions**
DOI 10.1007/s00038-014-0608-0

REVIEW

Addressing equity in interventions to reduce air pollution in urban areas: a systematic review
Tarik Benmarhnia · Lynda Rey · Yuri Cartier · Christelle M. Clary · Séverine Deguen · Astrid Brousselle
Curr Envir Health Rpt (2015) 2:440–450
DOI 10.1007/s40572-015-0069-5

AIR POLLUTION AND HEALTH (JD KAUFMAN AND SD ADAR, SECTION EDITORS)

Socioeconomic Disparities and Air Pollution Exposure: a Global Review
Anjum Hajat¹ · Charlene Hsia² · Marie S. O'Neill³
Curr Envir Health Rpt (2016) 3:287–301
DOI 10.1007/s40572-016-0099-7

EARLY LIFE ENVIRONMENTAL HEALTH (J SUNYER, SECTION EDITOR)

A Systematic Review of the Interplay Between Social Determinants and Environmental Exposures for Early-Life Outcomes
Allison A. Appleton¹ · Elizabeth A. Holdsworth² · Laura D. Kubzansky³
International Journal of Environmental Research and Public Health

MDPI

Social Inequalities in Exposure to Ambient Air Pollution: A Systematic Review in the WHO European Region
Jonathan Fairburn^{1,*} · Steffen Andreas Schüle^{2,3} · Stefanie Dreger^{2,3} · Lisa Karla Hilz^{2,3} · and Gabriele Bolte^{2,3}

Methodological Issues

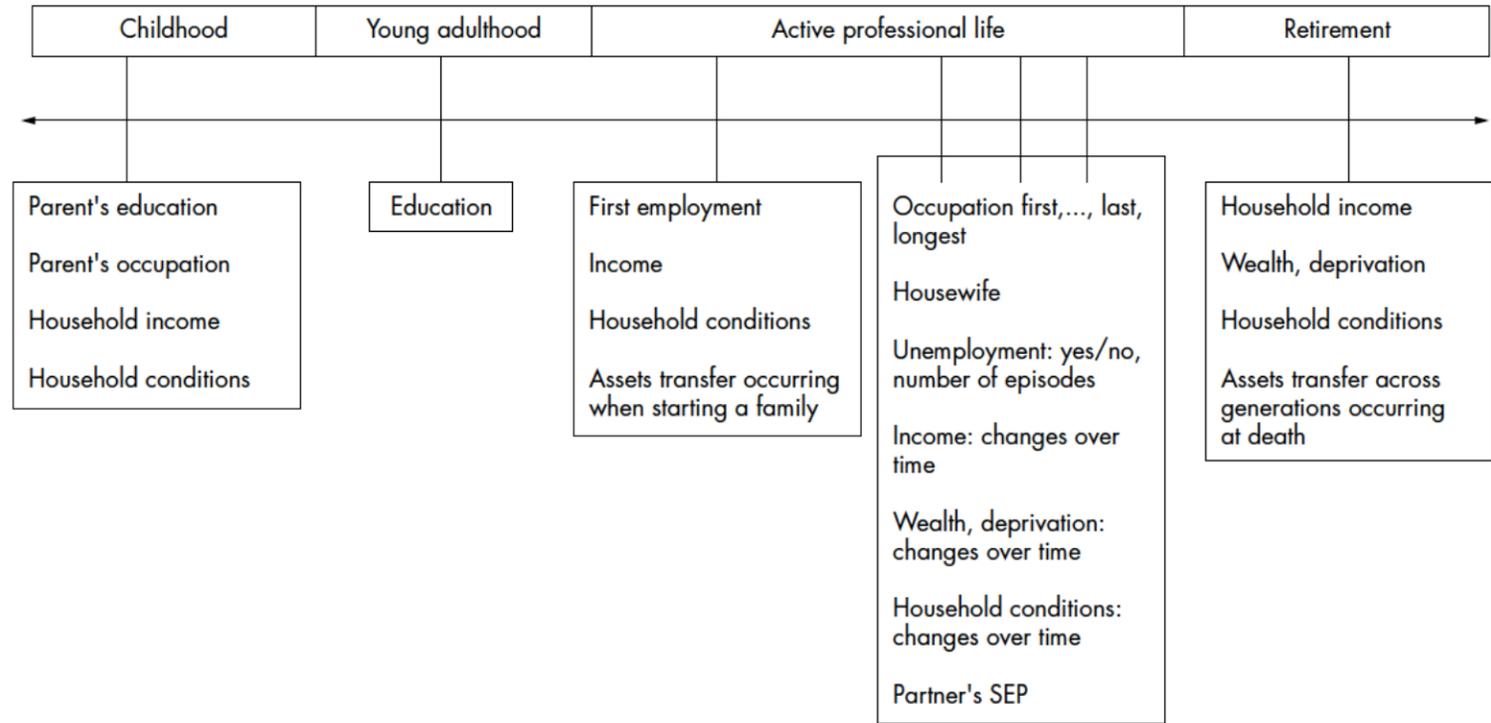
1. Clarity about the study goal

Descriptive aims

require attention to relevant units and measures.

Measures of the "social" are context dependent.

Need to fit for purpose.



What is the relevant risk for a particular pollutant?

Earnings of teachers vs. non-teachers

Social position isn't static

"Status" takes place in the context of an overarching structure.



Source: https://www.hamiltonproject.org/charts/annual_earnings_of_teachers_and_non-teachers

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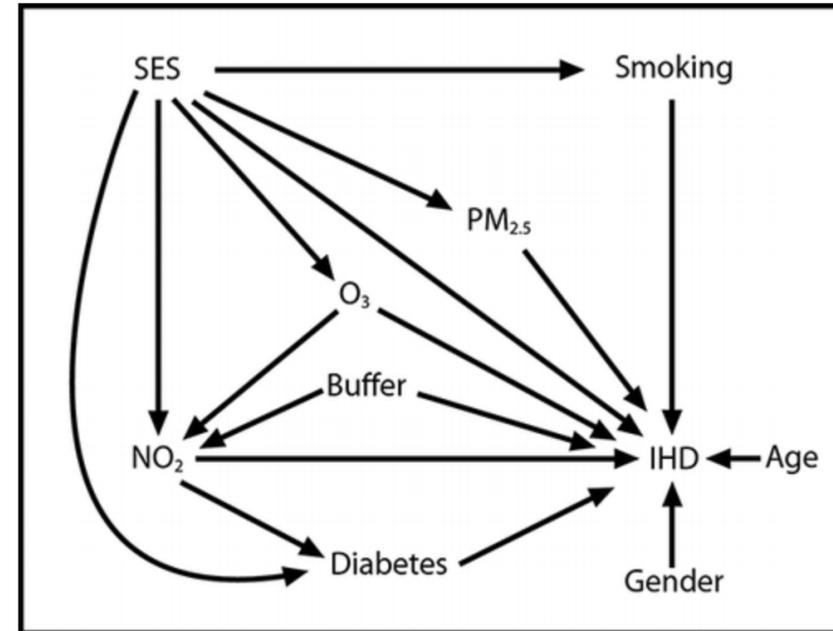
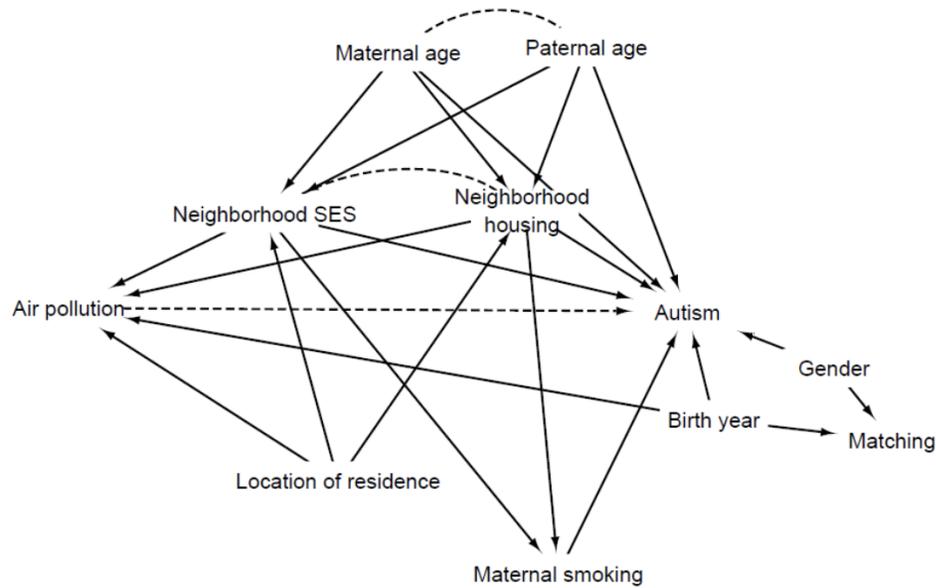
Interventions

need all of the above 🙌 plus causal evidence.

Causal inference is **hard**.

Causal models have implications for analysis.

How do social factors and environmental exposures relate to one another?



2. Multi-level, multi-causal

Incorporating social determinants necessitates integrating multiple causes to explain inequalities.

Social determinants operate at different levels and analyses should reflect it.

Integrating multiple causes to explain inequalities.

...the individual contribution of PM_{2.5} is comparable in magnitude to any single individual- or neighborhood-level factor.

Research

A Section 508-conformant HTML version of this article is available at <https://doi.org/10.1289/EHP490>.

Decomposition Analysis of Black–White Disparities in Birth Outcomes: The Relative Contribution of Air Pollution and Social Factors in California

Tarik Benmarhnia,¹ Jonathan Huang,² Rupa Basu,³ Jun Wu,⁴ and Tim A. Bruckner⁴

¹Department of Family Medicine and Public Health & Scripps Institution of Oceanography, University of California

²Institute for Health and Social Policy, McGill University Montreal, Quebec, Canada

³Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, Oakland, California, USA

⁴Program in Public Health, University of California, Irvine, Irvine, California, USA

BACKGROUND: Racial/ethnic disparities in preterm birth (PTB) are well documented in the epidemiological literature, but little is known about the relative contribution of different social and environmental determinants of such disparities in birth outcome. Furthermore, increased focus has recently turned toward modifiable aspects of the environment, including physical characteristics, such as neighborhood air pollution, to reduce disparities in birth outcomes.

OBJECTIVES: To apply decomposition methods to understand disparities in preterm birth (PTB) prevalence between births of non-Hispanic black individuals and births of non-Hispanic white individuals in California, according to individual demographics, neighborhood socioeconomic environment, and neighborhood air pollution.

METHODS: We used all live singleton births in California spanning 2005 to 2010 and estimated PTBs and other adverse birth outcomes for infants borne by non-Hispanic black mothers and white mothers. To compare individual-level, neighborhood-level, and air pollution [Particulate Matter, 2.5 micrometers or less (PM_{2.5}) and nitrogen dioxide (NO₂)] predictors, we conducted a nonlinear extension of the Blinder–Oaxaca method to decompose racial/ethnic disparities in PTB.

RESULTS: The predicted differences in probability of PTB between black and white infants was 0.056 (95% CI: 0.054, 0.058). All included predictors explained 37.8% of the black–white disparity. Overall, individual (17.5% for PTB) and neighborhood-level variables (16.1% for PTB) explained a greater proportion of the black–white difference in birth outcomes than air pollution (5.7% for PTB).

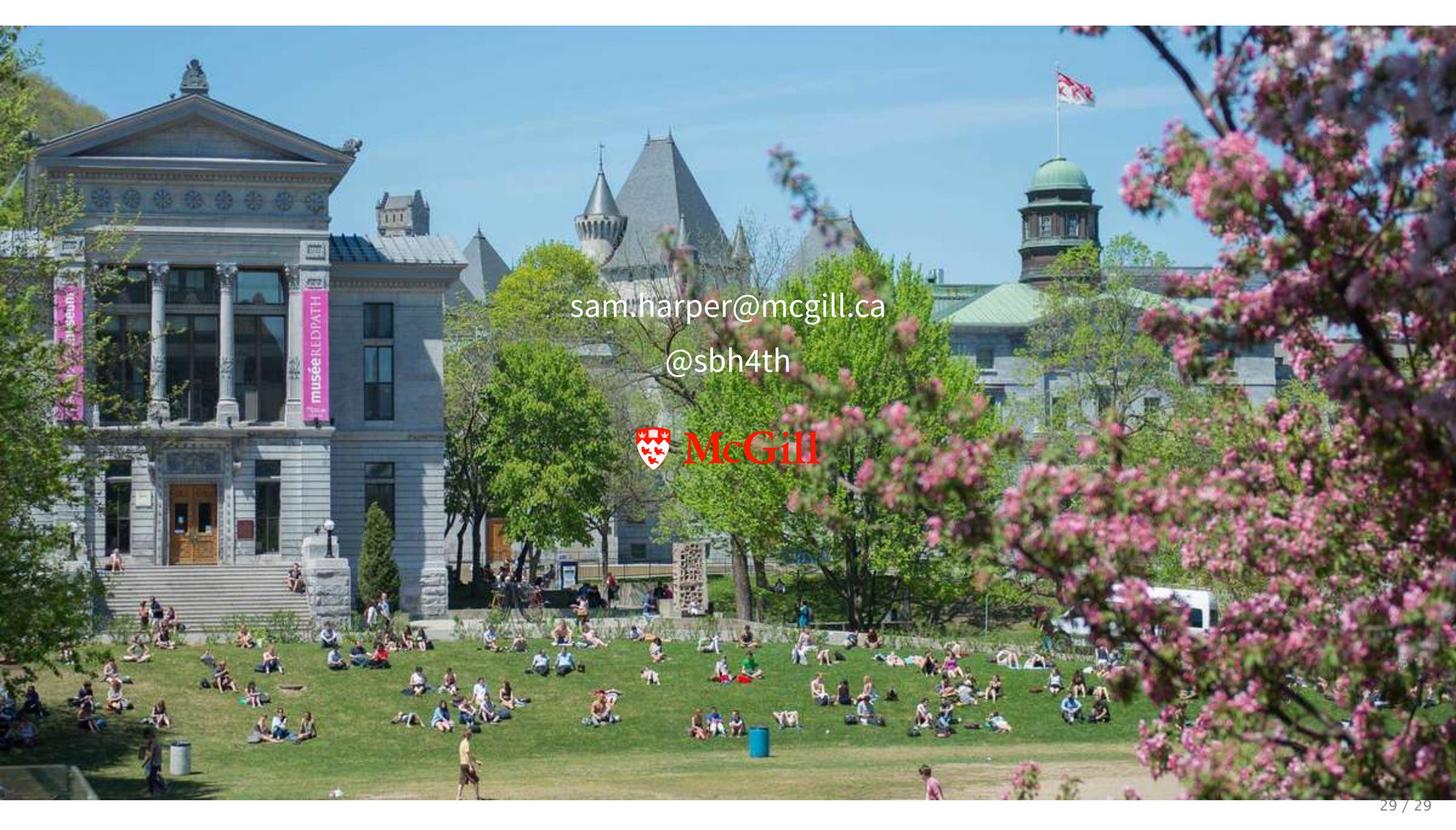
CONCLUSIONS: Our results suggest that, although the role of individual and neighborhood factors remains prevailing in explaining black–white differences in birth outcomes, the individual contribution of PM_{2.5} is comparable in magnitude to any single individual- or neighborhood-level factor. <https://doi.org/10.1289/EHP490>

Parting thoughts

Incorporating social determinants requires conceptual and methodological adjustments.

Estimating the impact of interventions requires (broad) causal inference.

Attention to social determinants should enrich and improve environmental science and policy.



sam.harper@mcgill.ca
@sbh4th

