

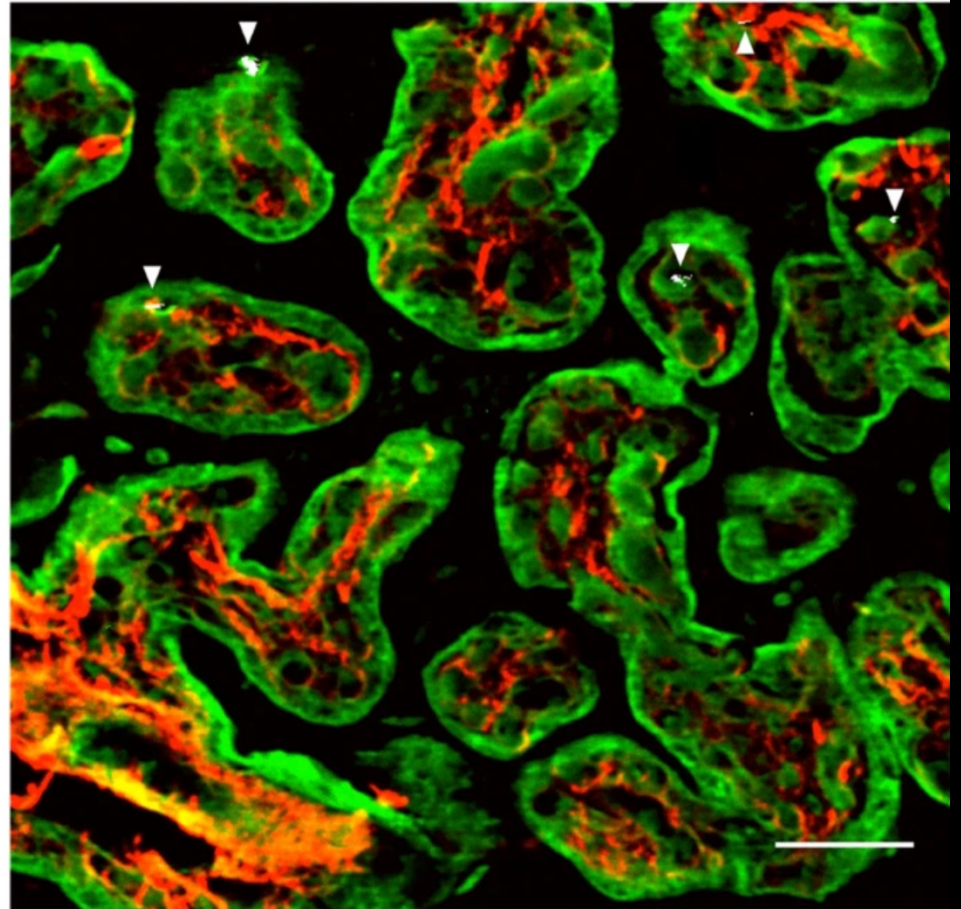


Air pollution affects children before they are born

# Particulate matter and the placenta

Black carbon particles in the human placenta, both maternal and fetal side.

Fig. 1



Saenen, N.D. et al. Air pollution-induced placental alterations: an interplay of oxidative stress, epigenetics, and the aging phenotype?. *Clin Epigenet* **11**, 124 (2019).



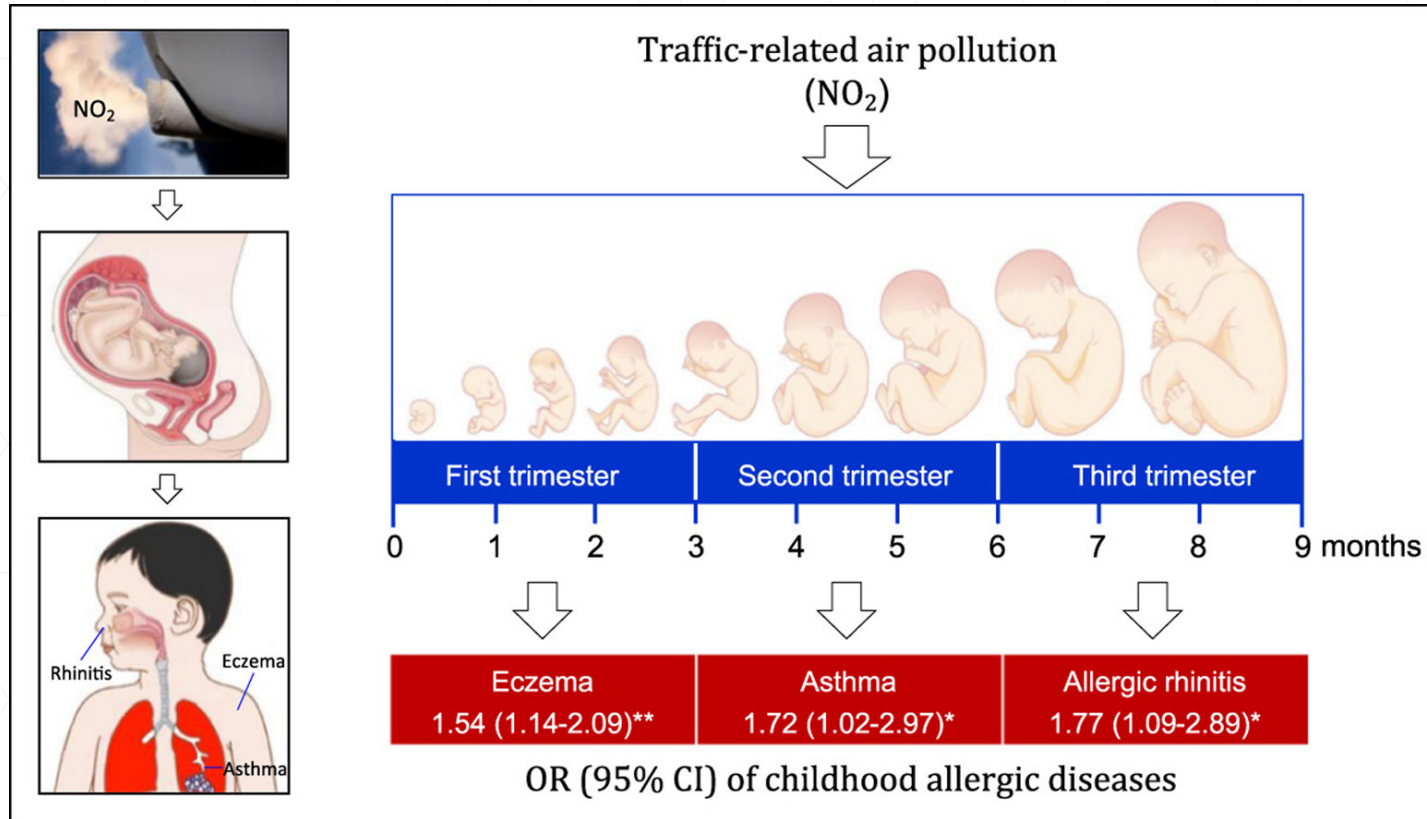
**Original Investigation** | Environmental Health

# Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US A Systematic Review

Bruce Bekkar, MD; Susan Pacheco, MD; Rupa Basu, PhD; Nathaniel DeNicola, MD, MSHP

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# “Exposure to outdoor air pollution during trimesters of pregnancy and childhood asthma, allergic rhinitis, and eczema”





## Exposure to Air Pollution (prenatal and postnatal) Increases Childhood Leukemia

- Increased risk of childhood leukemia: Benzene, NO<sub>2</sub> (pre and post natal)
- TRAP, benzene exposure: AML in children





Environmental Pollution

Volume 278, 1 June 2021, 116856



# Autism spectrum disorder and air pollution: A systematic review and meta-analysis

Frédéric Dutheil <sup>a</sup> <sup>1</sup> , Aurélie Comptour <sup>b, 1</sup>, Roxane Morlon <sup>c</sup>, Martial Mermillod <sup>d</sup>, Bruno Pereira <sup>e</sup>, Julien S. Baker <sup>f</sup>, Morteza Charkhabi <sup>g</sup>, Maëlys Clinchamps <sup>h</sup>, Nicolas Bourdel <sup>i</sup>



Air pollution Damages Children's Brain  
(Mexico city)

Neuroinflammation

Neurodegeneration

Structural and volumetric changes

Cognitive deficits

Brain tissue changes seen in patients with Parkinson and  
Alzheimer's disease



[Usfirstgov](#) at [English Wikipedia](#)



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## Environmental Research

journal homepage: [www.elsevier.com/locate/envres](http://www.elsevier.com/locate/envres)



### Traffic-related air pollution is associated with glucose dysregulation, blood pressure, and oxidative stress in children

Jennifer K. Mann, Co-first author<sup>a</sup>, Liza Lutzker, Co-first author<sup>a</sup>, Stephanie M. Holm<sup>a,h</sup>, Helene G. Margolis<sup>b</sup>, Andreas M. Neophytou<sup>a,c</sup>, Ellen A. Eisen<sup>a</sup>, Sadie Costello<sup>a</sup>, Tim Tyner<sup>d,e</sup>, Nina Holland<sup>a</sup>, Gwen Tindula<sup>a</sup>, Mary Prunicki<sup>f</sup>, Kari Nadeau<sup>f</sup>, Elizabeth M. Noth<sup>a</sup>, Fred Lurmann<sup>g</sup>, S. Katharine Hammond<sup>a</sup>, John R. Balmes<sup>a,h,\*</sup>

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<sup>h</sup> Department of Medicine, University of California, San Francisco, San Francisco, CA, USA





## Effects of Ambient Air Pollution on Blood Pressure Among Children and Adolescents: A Systematic Review and Meta-Analysis

Miao Huang, MD<sup>\*</sup> ; Jingyuan Chen, MD<sup>\*</sup> ; Yiping Yang, BM; Hong Yuan, MD, PhD; Zhijun Huang, MD  
 ; Yao Lu, MD, PhD 

# Particulate Matter Air Pollution and the Risk of Incident CKD and Progression to ESRD

## METHODS

Observational cohort of 2,482,737 US Veterans followed for 8.52 years

Fine particulate matter <2.5  $\mu\text{m}$  in aerodynamic diameter ( $\text{PM}_{2.5}$ ) exposure data:

EPA ground-based air monitoring stations



NASA satellites spaceborne sensors



## OUTCOMES

Increase in Risk of Kidney Outcomes for Every 10 Increase in  $\text{PM}_{2.5}$  ( $\mu\text{g}/\text{m}^3$ )



National Burden of Incident CKD Attributable to  $\text{PM}_{2.5}$  Exposure Above the EPA recommended level of 12  $\mu\text{g}/\text{m}^3$



**CONCLUSION** Our findings demonstrate a significant association between exposure to ambient  $\text{PM}_{2.5}$  and risk of incident CKD, eGFR decline, and ESRD.

[doi.org/10.1681/ASN.2017030253](https://doi.org/10.1681/ASN.2017030253)

**JASN**  
JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY





Long term exposure to air pollution (PM2.5) increases Alzheimer's disease and other types of dementia

## Stroke

Volume 45, Issue 5, May 2014; Pages 1264-1268  
<https://doi.org/10.1161/STROKEAHA.114.005227>



### ORIGINAL CONTRIBUTIONS

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## Cardiovascular Emergency Hospital Visits and Hourly Changes in Air Pollution

Takashi Yorifuji, MD, Etsuji Suzuki, MD, and Saori Kashima, PhD



International Journal of  
*Environmental Research  
and Public Health*



*Article*

## Ambient Air Quality and Emergency Hospital Admissions in Singapore: A Time-Series Analysis

Andrew Fu Wah Ho <sup>1,2,\*</sup>, Zhongxun Hu <sup>3</sup>, Ting Zhen Cheryl Woo <sup>4</sup>, Kenneth Boon Kiat Tan <sup>1</sup>, Jia Hao Lim <sup>1</sup>,  
Maye Woo <sup>5</sup>, Nan Liu <sup>3</sup>, Geoffrey G. Morgan <sup>6</sup>, Marcus Eng Hock Ong <sup>1,7</sup> and Joel Aik <sup>2,8</sup>

**RMD  
Open**

Rheumatic &  
Musculoskeletal  
Diseases

ORIGINAL RESEARCH

# Association between long-term exposure to air pollution and immune-mediated diseases: a population-based cohort study

Giovanni Adami ,<sup>1</sup> Marco Pontalti,<sup>1</sup> Giorgio Cattani,<sup>2</sup> Maurizio Rossini,<sup>1</sup> Ombretta Viapiana,<sup>1</sup> Giovanni Orsolini ,<sup>1</sup> Camilla Benini,<sup>1</sup> Eugenia Bertoldo,<sup>1</sup> Elena Fracassi,<sup>1</sup> Davide Gatti,<sup>1</sup> Angelo Fassio<sup>1</sup>

*Adami, G., et al. (2022). "RMD Open 8(1): e0020*

Rheumatoid arthritis  
Connective tissue disease  
Inflammatory bowel disease









Temperature  
elevations

Increase in negative birth outcomes  
(prematurity, LBW, stillbirth)



Maternal ambient heat exposure during early pregnancy in summer and spring and congenital heart defects – A large US population-based, case-control study

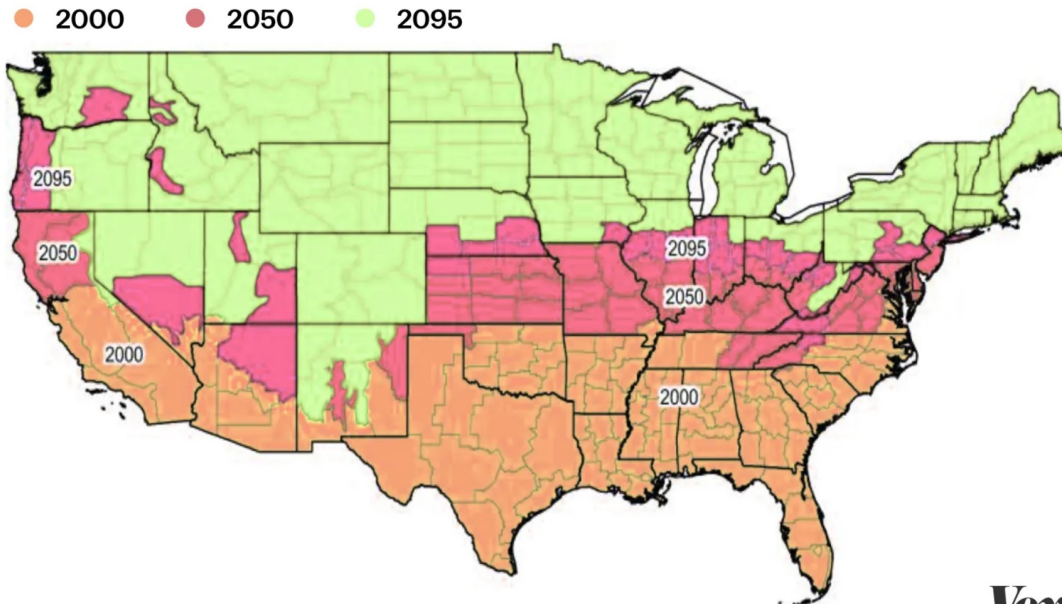


# Maternal Heat Exposure increases the Incidence of Congenital Heart Disease

*Lin, et. al., 2018*

*Zhang, et. al., 2019*

# Climate change may force the "kidney stone risk belt" north



Source: PNAS

Vox

## Perspective

### A New Era of Climate Medicine — Addressing Heat-Triggered Renal Disease

Cecilia Sorensen, M.D., and Ramon Garcia-Trabanino, M.D.

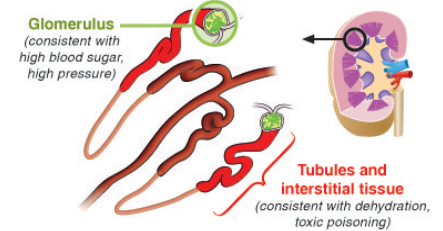
#### What's the Difference?

CKD	CKDu
Common Chronic Kidney Disease	Chronic Kidney Disease of Unknown Aetiology

#### Who Gets It?



#### Part of Kidneys Affected



#### Risk Factors



#### Proteins in Urine



#### Where in the World







Outdoor farmworkers (US)

**About 3 million total**

**400,000 – 500,000 children  
( 12 – 17 y) estimated to be  
working in U.S. agriculture**

<https://www.ers.usda.gov/topics/farm-economy/farm-labor/#size>

<https://afop.org/about/>



## High ambient temperatures and heat waves negatively affect mental health

Increased risk of:

Suicide

ER visits and mental health-related hospital admissions

(risks increased for any mental health condition)



Anxiety

Post-traumatic stress

Depression

Interpersonal and societal conflict

Family stress

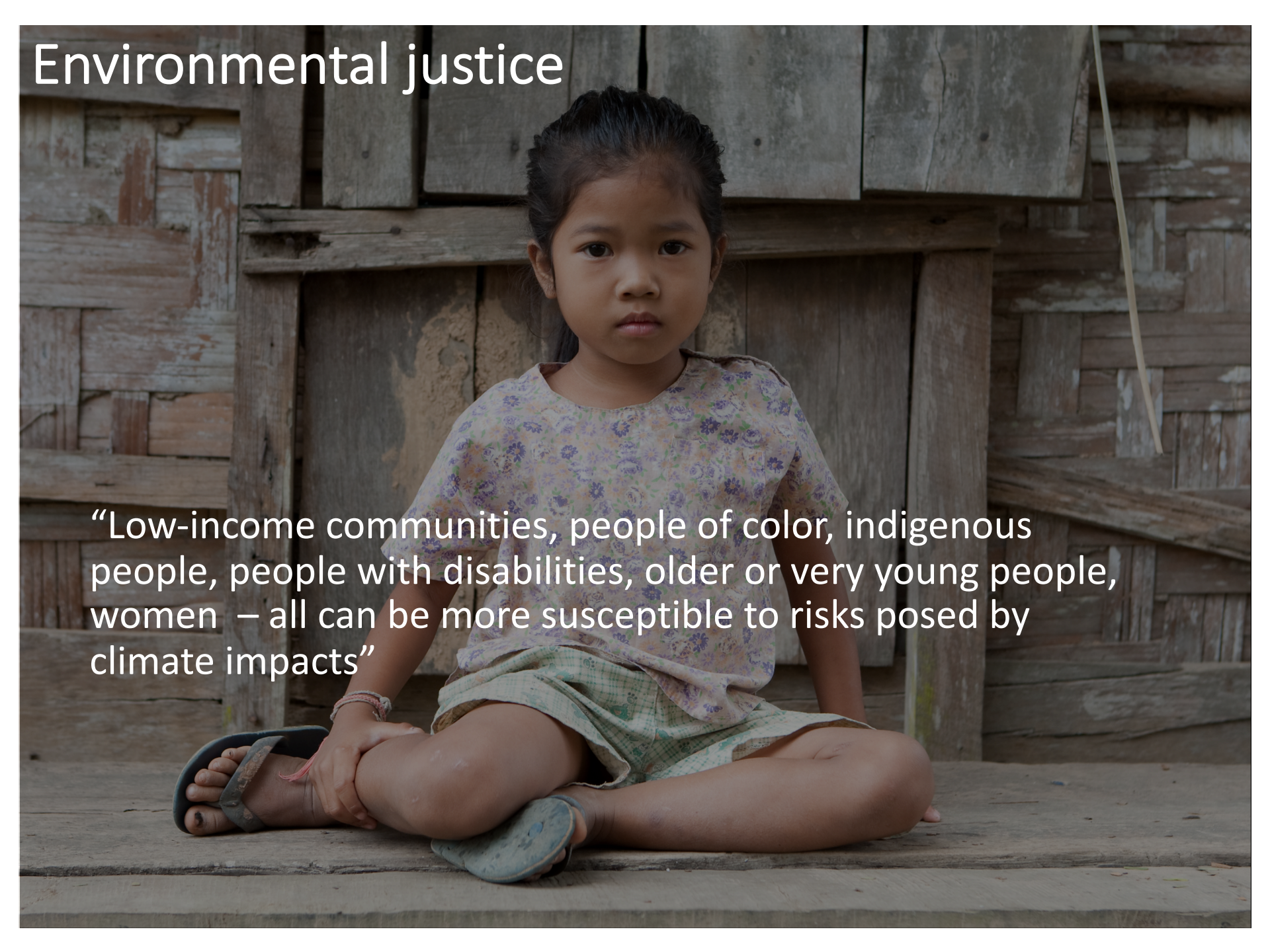
Persistent grief

Child behavioral problems

Academic decline



# Environmental justice

A young girl with dark hair pulled back, wearing a floral-patterned shirt and a green checkered skirt, sits cross-legged on a wooden porch. She is looking directly at the camera with a neutral expression. The background consists of a rustic wooden structure with weathered planks and a woven bamboo or rattan wall.

“Low-income communities, people of color, indigenous people, people with disabilities, older or very young people, women – all can be more susceptible to risks posed by climate impacts”

# a terrible unequal threat





## Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status

PM 2.5

**People living in poverty** had 1.35 times higher burden than did the overall population,

**Non-Whites** had 1.28 times higher burden.

**Blacks** had 1.54 times higher burden than did the overall population.





**“Proximity of US schools to major roadways: a nationwide assessment”  
(2005- 2006)**

**6.4 million US children attended schools within 250 m of a major roadway**

**Schools serving minority and underprivileged children were more likely to be located within 250 m of a major roadway**

*J Expo Sci Environ Epidemiol.*  
2014;24(3):253-9.



# Heat in US Counties

**Killer heat is already affecting communities unequally:**

Days with temperatures above 100F(38C)  
1971 and 2000 in US counties:

Over 25% Black residents: ~ 18 days/year

Over 25% Hispanic/Latinx residents: 13 days/year

Less than 25% African Americans: 7days/year

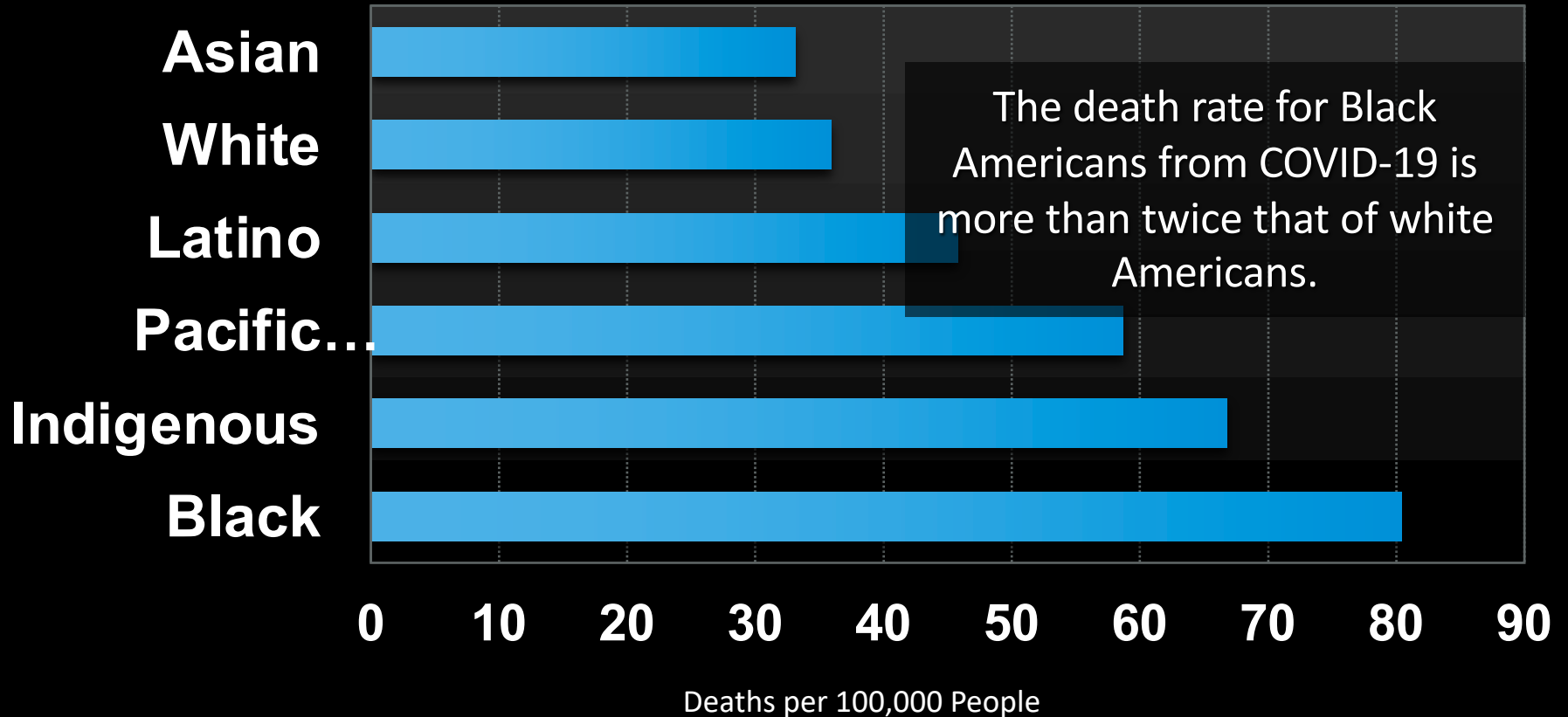


## **Long-Term Air Pollution Exposure and COVID-19 Mortality** A Patient-Level Analysis from New York City

③ Anne Bozack<sup>1,2,3</sup>, Stanley Pierre<sup>4</sup>, Nicholas DeFelice<sup>2</sup>, Elena Colicino<sup>2</sup>, Darby Jack<sup>5</sup>, Steven N. Chillrud<sup>6</sup>, Andrew Rundle<sup>7</sup>, Alfred Astua<sup>8</sup>, James W. Quinn<sup>7</sup>, Laura McGuinn<sup>2</sup>, Qiang Yang<sup>6</sup>, Keely Johnson<sup>9</sup>, Joseph Masci<sup>10</sup>, Lauren Lukban<sup>11</sup>, Duncan Maru<sup>11,12</sup>, and Alison G. Lee<sup>1</sup>

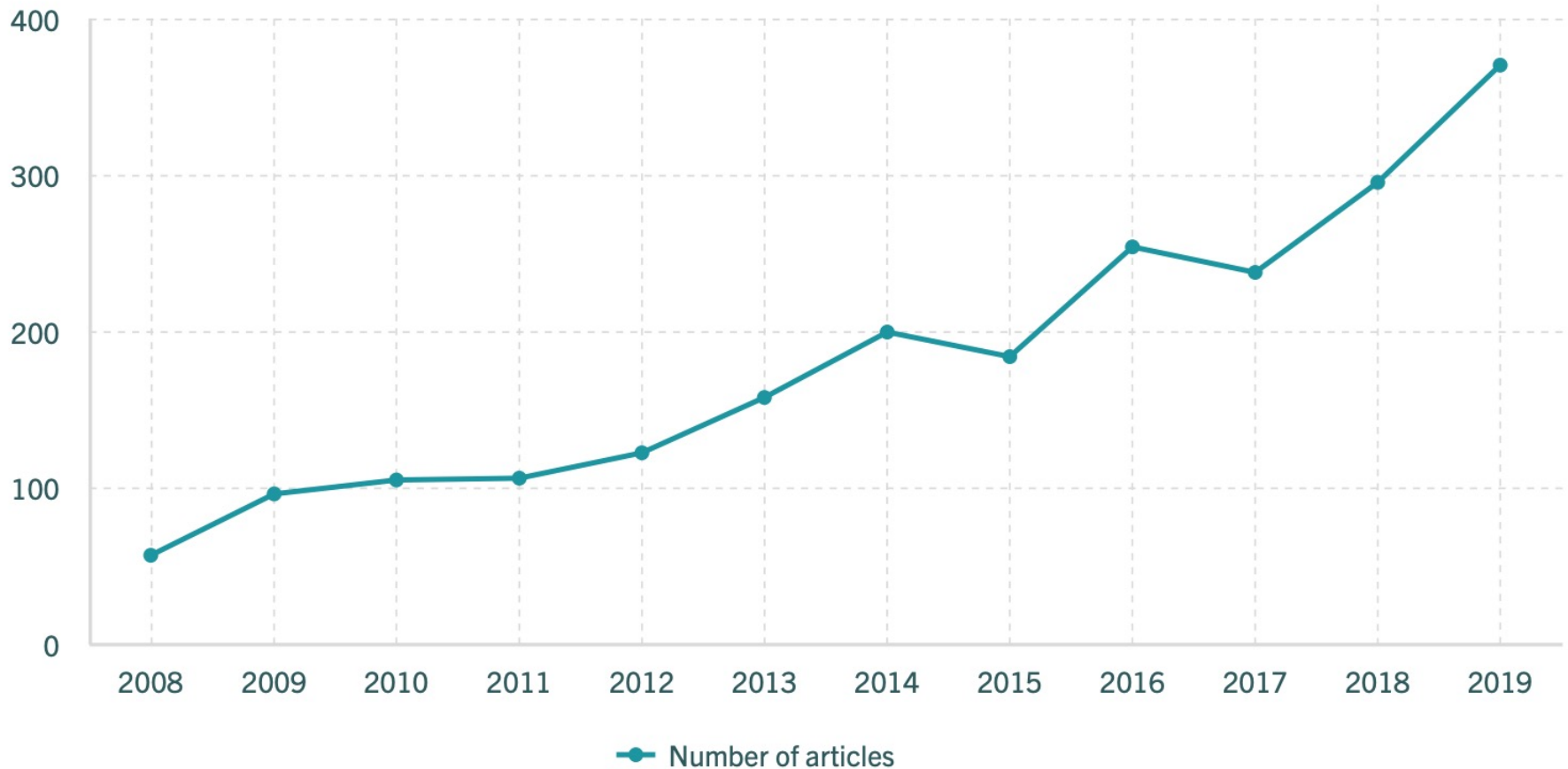
# U.S. COVID-19 Deaths, by Race

- Through August 4, 2020



# Climate Change and Health Research

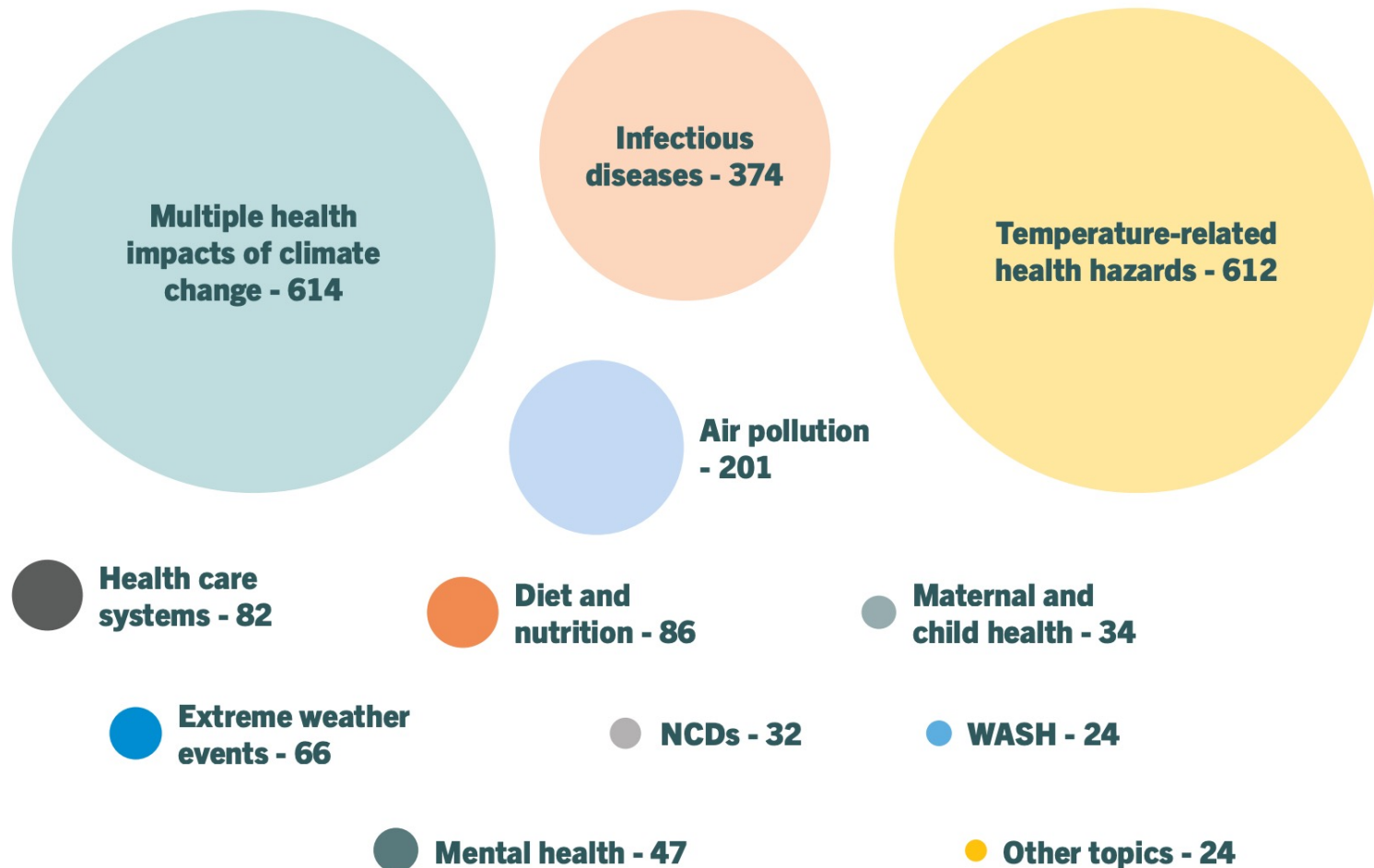
**Figure 2** Number of articles on climate change and health published by year



*Climate change and health research: current trends, gaps and perspectives for the future. Geneva: World Health Organization; 2021WHO 2021*

# Climate Change and Health Research

**Figure 4** Distribution of all articles by health field



# What can you do?

Reduce your CO2 footprint (home and work)

Change to renewable energy today



**Get involved in advocacy**

**Educate your patients about adaptation**

**Heat exposure**

**Air pollution**

**Disaster preparedness**

**Invest in resilience and mental health**

**Promote and protect science!**

**Get organized. We need your help!!!**





(Sedat Suna/EPA-EFE/Shutterstock)

# COP27 leaves world on dangerous warming path despite historic climate fund