

Summarising important health effects of air pollution across the life-course: Cancer

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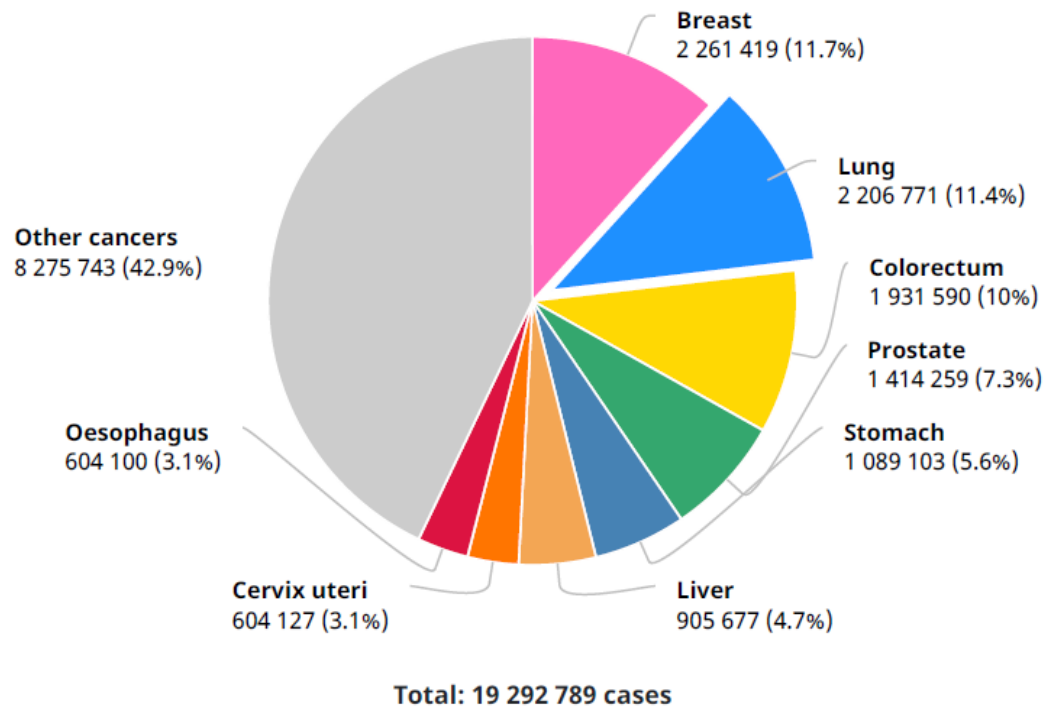
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Lung

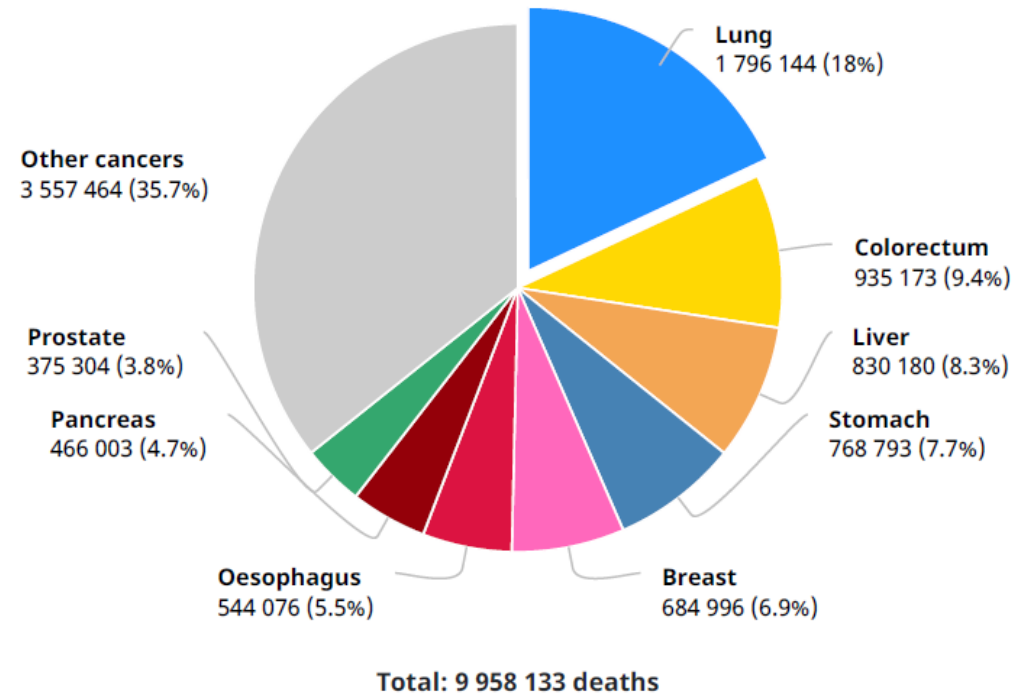
Source: Globocan 2020

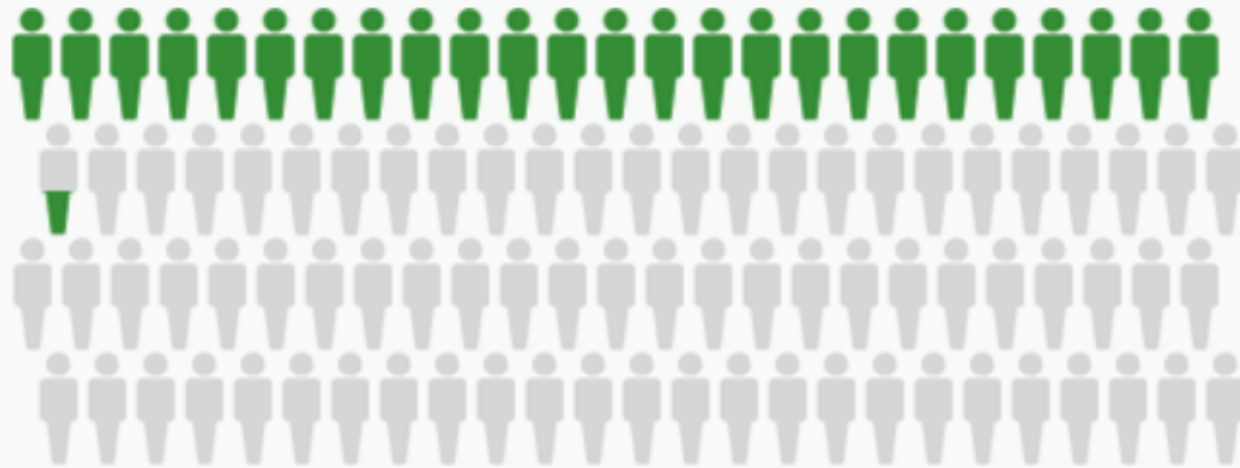


Number of new cases in 2020, both sexes, all ages



Number of deaths in 2020, both sexes, all ages



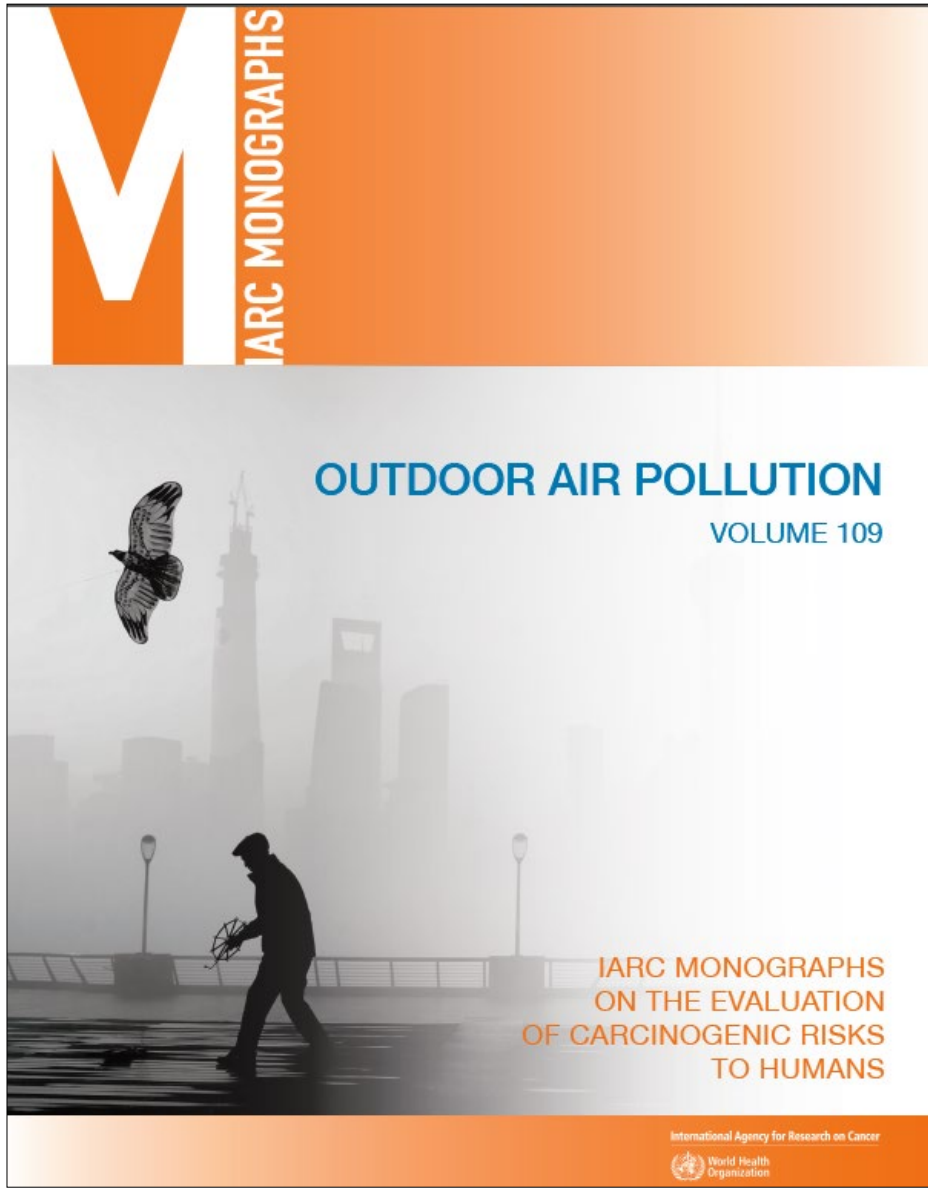


5-Year
Relative Survival

25.4%

Based on data from SEER 22 (Excluding IL/MA) 2013–2019. Gray figures represent those who have died from lung and bronchus cancer. Green figures represent those who have survived 5 years or more.

Both sexes	Global	Low SDI	Low-middle SDI	Middle SDI	High-middle SDI	High SDI	Central Asia	Central Europe	Eastern Europe	Australasia	High-income Asia Pacific	High-income North America	Southern Latin America	Western Europe	Andean Latin America	Caribbean	Central Latin America	Tropical Latin America	North Africa and Middle East	South Asia	East Asia	Oceania	Southeast Asia	Central sub-Saharan Africa	Eastern sub-Saharan Africa	Southern sub-Saharan Africa	Western sub-Saharan Africa
Occupational exposure to beryllium	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Occupational exposure to cadmium	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Occupational exposure to chromium	14	14	14	14	14	14	14	14	14	13	13	13	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Occupational exposure to polycyclic aromatic hydrocarbons	13	13	13	13	13	12	13	13	13	12	12	12	13	12	13	13	13	13	13	13	13	13	13	13	13	13	13
Occupational exposure to nickel	12	11	11	11	12	11	11	11	11	10	10	11	11	10	12	12	11	11	11	11	11	11	11	11	11	11	11
Occupational exposure to arsenic	11	12	12	12	11	9	12	10	9	9	9	9	12	9	11	11	12	12	12	12	12	12	12	12	12	12	12
Occupational exposure to diesel engine exhaust	10	10	10	10	10	10	10	12	12	11	11	10	9	11	9	10	10	10	9	10	10	10	10	10	10	10	10
Occupational exposure to silica	9	9	9	9	8	8	8	8	8	7	7	8	6	8	8	8	8	7	7	9	9	9	8	8	8	9	9
Diet low in fruits	8	5	7	7	7	6	7	7	6	4	5	6	8	7	7	7	7	8	8	5	7	6	6	5	6	5	5
Household air pollution from solid fuels	7	2	3	5	9	13	9	9	10	14	14	14	10	13	5	6	6	9	10	3	5	2	3	2	2	6	2
Residential radon	6	6	8	8	6	5	4	6	3	8	8	4	7	5	6	9	5	6	6	8	6	8	9	7	7	7	6
Secondhand smoke	5	8	5	4	5	7	5	5	7	5	6	7	5	6	10	4	9	5	5	7	3	5	5	9	9	8	7
High fasting plasma glucose	4	4	4	3	3	3	3	3	5	3	4	3	4	3	3	2	3	2	3	4	4	3	4	3	3	4	4
Occupational exposure to asbestos	3	7	6	6	4	2	6	4	4	2	2	2	3	2	4	5	4	3	4	6	8	4	7	6	5	2	8
Ambient particulate matter pollution	2	3	2	2	2	4	2	2	2	6	3	5	2	4	2	3	2	4	2	2	2	7	2	4	4	3	3
Smoking	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1



Outdoor air pollution is carcinogenic to humans (Group 1)

- Causes lung cancer
- Positive associations with bladder cancer

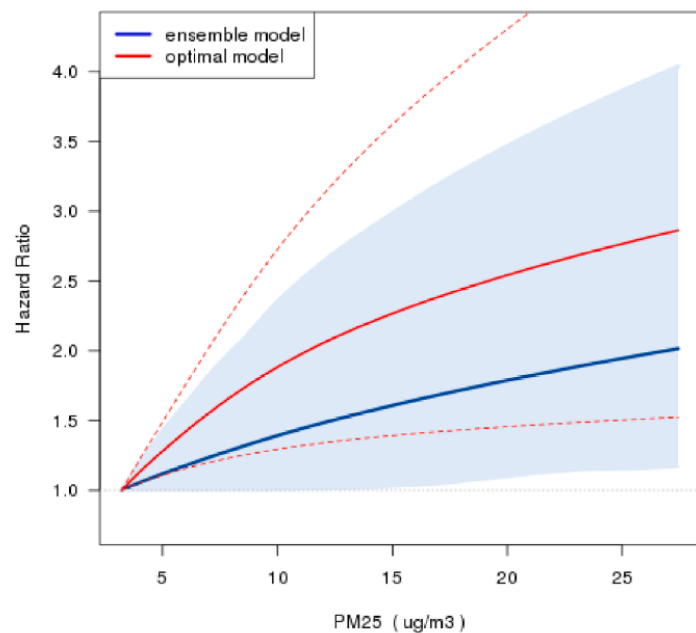
Particulate matter in outdoor air pollution is carcinogenic to humans (Group 1)

- Causes lung cancer

Strongly supported by documented genetic and related effects in humans and experimental animals (increases in genetic damage, promotes cancer progression)

Long-term low-level ambient air pollution exposure and risk of lung cancer – A pooled analysis of 7 European cohorts

Ulla Arthur Hvidtfeldt^{a,*}, Gianluca Severi^{b,c}, Zorana Jovanovic Andersen^d, Richard Atkinson^e, Mariska Bauwelinck^f, Tom Bellander^{g,h}, Marie-Christine Boutron-Ruault^b, Jørgen Brandt^{i,j}, Bert Brunekreef^k, Giulia Cesaroni^l, Jie Chen^k, Hans Concin^m, Francesco Forastiere^{n,o}, Carla H. van Gils^p, John Gulliver^q, Ole Hertel^l, Gerard Hoek^k, Barbara Hoffmann^r, Kees de Hoogh^{s,t}, Nicole Janssen^u, Karl-Heinz Jöckel^v, Jeanette Thering Jørgensen^d, Klea Katsouyanni^{w,x}, Matthias Ketzel^{i,y}, Jochem O. Klompmaker^{k,u}, Norun Hjertager Krog^z, Alois Lang^{aa}, Karin Leander^g, Shuo Liu^d, Petter L.S. Ljungman^{g,ab}, Patrik K.E. Magnusson^{ac}, Amar Jayant Mehta^{ad,ae}, Gabriele Nagel^{af,m}, Bente Oftedal^z, Göran Pershagen^{g,h}, Raphael Simon Peter^{af}, Annette Peters^{ah,ai}, Matteo Renzi^l, Debora Rizzuto^{aj,ak}, Sophia Rodopoulou^w, Evangelia Samoli^w, Per Everhard Schwarze^{al}, Torben Sigsgaard^{am}, Mette Kildevæld Simonsen^{an}, Massimo Stafoggia^{l,g}, Maciek Strak^{k,u}, Danielle Vienneau^{s,t}, Gudrun Weinmayr^{af}, Kathrin Wolf^{ah}, Ole Raaschou-Nielsen^{a,i,1}, Daniela Fecht^{ao,1}



Conclusions: Long-term ambient $\text{PM}_{2.5}$ exposure is associated with lung cancer incidence even at concentrations below current EU limit values and possibly WHO Air Quality Guidelines.

Review article

Long-term exposure to PM and all-cause and cause-specific mortality: A systematic review and meta-analysis

Jie Chen*, Gerard Hoek

Institute for Risk Assessment Sciences, Utrecht University, the Netherlands

Table 2

Pooled effect estimates for all pollutant-outcome combinations.

	$\text{PM}_{2.5}$			
	N	pooled RR per 10 $\mu\text{g}/\text{m}^3$	I^2 (%)	Prediction interval
Natural-cause	25	1.08 (1.06, 1.09)	88.9	(1.05, 1.11)
Circulatory	21	1.11 (1.09, 1.14)	72.1	(1.06, 1.17)
IHD	22	1.16 (1.10, 1.21)	77.5	(1.04, 1.29)
Stroke	16	1.11 (1.04, 1.18)	84.7	(0.98, 1.25)
Respiratory	17	1.10 (1.03, 1.18)	83.6	(0.95, 1.29)
COPD	11	1.11 (1.05, 1.17)	49.6	(1.02, 1.21)
ALRI	4	1.16 (1.01, 1.34)	83.0	(0.88, 1.54)
Lung cancer	15	1.12 (1.07, 1.16)	39.4	(1.05, 1.18)

N = number of studies

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TUMOUR PROMOTION

Air pollution drives lung cancer in non-smokers

Treatment boost
The push to create a new generation of Alzheimer's therapies

Warming waters
Define marine heatwaves to help coastal communities

Dark of the Moon
Lunar eclipse records shed light on medieval volcanic activity

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Lung adenocarcinoma promotion by air pollutants

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 Check for updates

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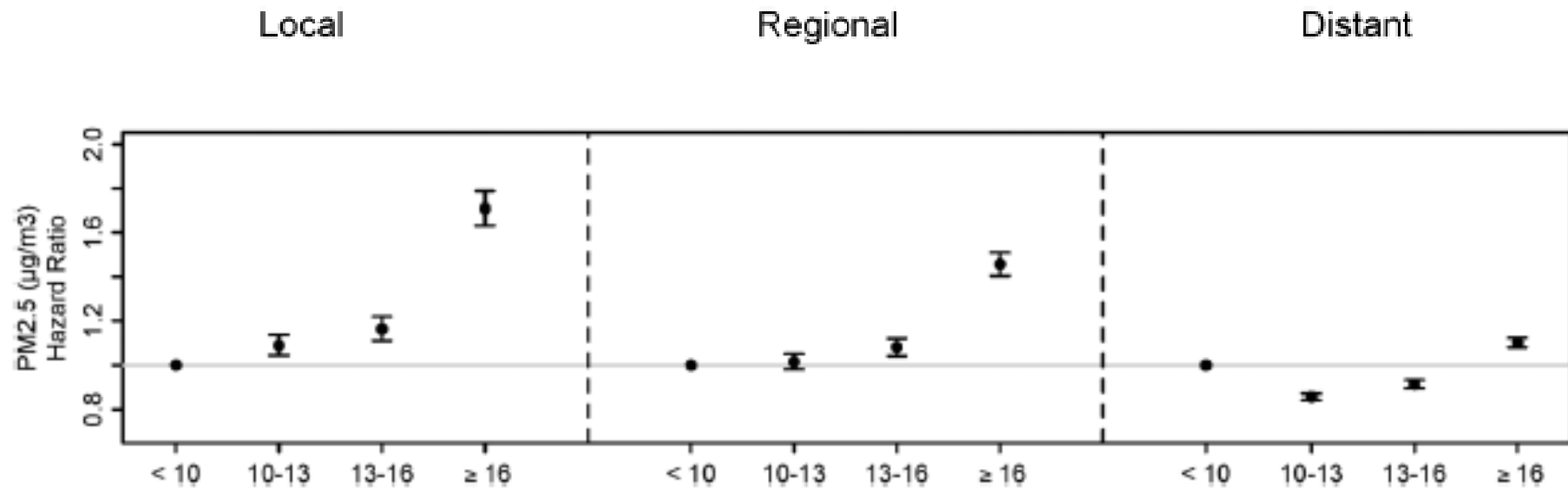
Collectively, these data, combined with published evidence⁶, indicate that there is an association between the estimated incidence of *EGFR*-driven lung cancer and of PM_{2.5} exposure levels and that 3 years of air pollution exposure may be sufficient for this association to manifest.

In conclusion, our data suggest a mechanistic and causative link between air pollutants and lung cancer, as previously proposed⁴⁵, and substantiate earlier findings on tumour promotion¹, providing a public health mandate to restrict particulate emissions in urban areas.



ORIGINAL ARTICLE

Air pollution affects lung cancer survival

Sandra P Eckel,¹ Myles Cockburn,¹ Yu-Hsiang Shu,^{1,2} Huiyu Deng,¹
Frederick W Lurmann,³ Lihua Liu,¹ Frank D Gilliland¹



Outdoor Air Pollution and Cancer: An Overview of the Current Evidence and Public Health Recommendations

Michelle C. Turner, PhD ^{1,2,3,4}; Zorana J. Andersen, PhD ⁵; Andrea Baccarelli, MD, MPH, PhD ⁶; W. Ryan Diver, MSPH ⁷;
Susan M. Gapstur, PhD ⁷; C. Arden Pope, III, PhD ⁸; Didier Prada, MD, PhD ^{6,9}; Jonathan Samet, MD, MS¹⁰;
George Thurston, ScD ¹¹; Aaron Cohen, DSc^{12,13}

- There is clear and substantial evidence of a link between outdoor ambient air pollution, and particularly PM in outdoor air, with lung cancer
- This is an urgent worldwide public health challenge requiring multiple multilevel public health and policy interventions for cancer prevention
- Expanding literature on air pollution and other cancers

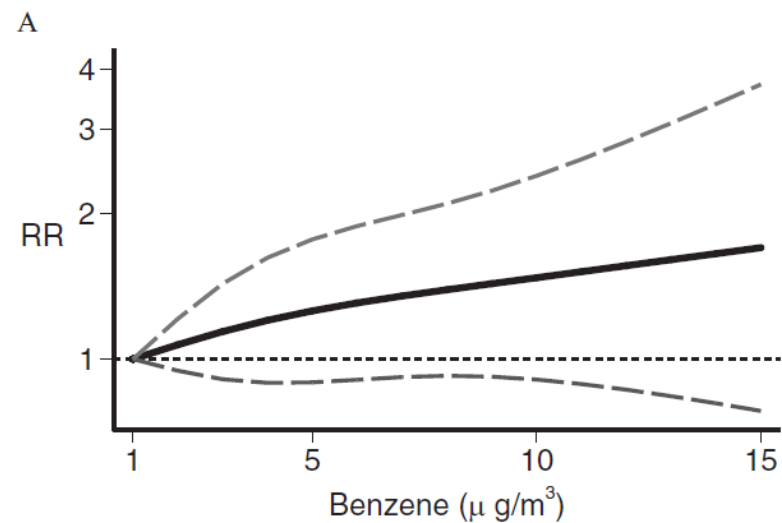
Ambient Air Pollution and Cancer Mortality in the Cancer Prevention Study II

Breast Cancer Incidence in Relation to Long-Term Low-Level Exposure to Air Pollution in the ELAPSE Pooled Cohort

Long-term exposure to ambient air pollution and bladder cancer incidence in a pooled European cohort: the ELAPSE project

Long-term exposure to air pollution and liver cancer incidence in six European cohorts

Association between Outdoor Air Pollution and Childhood Leukemia: A Systematic Review and Dose-Response Meta-Analysis



Thank you
