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Corresponding author(s): Yuming Guo, Shanshan Li

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Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our Editorial Policies and the Editorial Policy Checklist.

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a	Confirmed
☐	☒ The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
☐	☒ A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒ The statistical test(s) used AND whether they are one- or two-sided *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☐	☒ A description of all covariates tested
☐	☒ A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
☐	☒ A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
☐	☒ For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☒	☐ For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☒	☐ For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☒	☐ Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	No software was used.
Data analysis	All analyses were conducted using R (version 4.0.5) with packages of dlnm, survival, and mvmeta.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our policy

Publicly available data is found here: the global gridded Gross Domestic Product (GDP [https://doi.org/10.1038/sdata.2018.4]) and the Gridded Population of the World (GPW, version 4 [https://sedac.ciesin.columbia.edu/data/collection/gpw-v4]); surface temperature and ambient dewpoint temperature from ERA5 (https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5); Data support the GEOS-Chem model development and traffic-sourced PM2.5 simulation in this study could be found from MIX v1.1 Asian anthropogenic emissions (http://meicmodel.org.cn/?page_id=87&lang=en), Multi-resolution Emission Inventory for China

(http://meicmodel.org.cn/?page_id=125&lang=en), European Monitoring and Evaluation Program (https://www.emep.int/), DICE Africa inventory (https://www2.acom.ucar.edu/modeling/dice-africa) and National Emission Inventory of America (https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei). The authors do not have permission to directly share the health outcome data. Interested researchers should contact the corresponding author Y.G. (yuminmg.guo@monash.edu) on a case-by-case basis. Source data are provided with this paper. Analysis codes are available from the corresponding authors on request and shared on https://github.com/Yukieuuuuu/Traffic_PM25_short_term_cancer_mortality

Research involving human participants, their data, or biological material

Policy information about studies with human participants or human data. See also policy information about sex, gender (identity/presentation), and sexual orientation and race, ethnicity and racism.

Reporting on sex and gender	The term sex has been carefully used in this study. The information of sex has been collected and the findings apply to both females and males. Sex-based analyses were performed on the stratified analysis.
Reporting on race, ethnicity, or other socially relevant groupings	Not relevant
Population characteristics	The covariate-relevant population characteristics of the human research participants used is this study is age.
Recruitment	Participants in this study were death records in public and private hospitals in the countries/territories we studied.
Ethics oversight	This study has been approved by the Monash University Human Research Ethics Committee.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	We applied a time-stratified case-crossover design to estimate the impact of all-source PM2.5 and traffic-sourced PM2.5 exposure on site-specific cancer mortality across eight countries during 2000-2019. This study investigated the vulnerable populations to daily all-source and traffic-sourced PM2.5 exposure. This study quantified the cancer death counts attributable to all-source and traffic-sourced PM2.5 in eight countries and calculated the contribution of traffic source.
Research sample	In total, 9,223,612 cancer deaths were included in the analyses.
Sampling strategy	We collected individual cancer death records covering Australia, Brazil, Canada, South Korea, Mexico, New Zealand, Thailand, and Chile between 2000 and 2019. We extracted records with the primary death reason of cancer (ICD-10: C00–C97). Based on ICD-10 codes, we extracted 24 common sites of cancer death
Data collection	The death data for Australia were obtained from 2390 statistical level-2 areas (SA2) from the Cause of Death Unit Record File (COD URF) dataset, Australian Bureau of Statistics. Data for Brazil were obtained from 5570 municipalities from the Brazil Mortality Information System (Sistema de Informação sobre Mortalidade, SIM, Brazilian Ministry of Health). Data for Canada were from 293 second-level administrative divisions (regions or districts within the provinces and territories) from the Canadian Vital Statistics Deaths Database, Statistics Canada. Data for South Korea were from 17 provinces and metropolitan cities from the Microdata Integrated System (MDIS), Statistics Korea. Data for Mexico were 2457 cities from the Mexico Registered Deaths Statistics, National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía, INEGI). Data for New Zealand were from 66 territorial authorities from the Mortality Collection, New Zealand Ministry of Health. Data for Thailand were from 77 provinces from the Mortality Collection, Thailand Ministry of Public Health and data for Chile were from 345 third-level administrative divisions of Chile (ADM3) from Chilean Ministry of Health (MOH) Epidemiology Department. All datasets covered the whole population of the country.
Timing and spatial scale	The data for Australia is between 2009-2019; Brazil between 2000-2019; Canada between 2000-2015; Chile between 2016-2019; Korea between 2000-2019; Mexico between 2012-2019; New Zealand between 2000-2018; and Thailand between 2011-2019.
Data exclusions	No data were excluded from analyses.
Reproducibility	We have clearly documented our methods, assumptions, and potential sources of bias to ensure the reproducibility and validity of our findings.

Randomization	We aggregated the individual death records at the location level by sex (female and male), age (≤44 years old, 45-74 years old, and ≥ 75years old), and cancer sites.
Blinding	Blinding is not relevant to our ecological time-series study design since there are no individual participants or interventions involved.

Did the study involve field work? ☐ Yes ☒ No

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Plants

Seed stocks	Not relevant
Novel plant genotypes	Not relevant
Authentication	Not relevant