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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	All data were prepared using R software (Version 4.0.0)
Data analysis	All statistical analyses were performed using R software (Version 4.0.0, R Project for Statistical Computing) and "survival", "splines", "gWQS", and "qgcomp" packages.

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

All data supporting the findings described in this manuscript are available in the article and in the Supplementary Information. The disease onset data was obtained from the Chinese Cardiovascular Association (CCA) Database-Chest Pain Center. Due to data management requirements and patients' privacy considerations, access to the disease onset data can be obtained by contacting the corresponding author, Haidong Kan (kanh@fudan.edu.cn), and requests will be addressed within 12 weeks. The air pollution data were obtained from Tracking Air Pollution in China (TAP) dataset, accessible at http://tapdata.org.cn. Meteorological data were

sourced from the fifth generation atmospheric reanalysis product (ERA5), accessible at https://cds.climate.copernicus.eu/cdsapp#!/search?type=dataset. Source data are provided with this paper.

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	We collected individual onset records of acute coronary syndrome from the Chinese Cardiovascular Association Database-Chest Pain Center between January 1, 2015 and December 31, 2021. Information on demographic characteristics such as age and sex, date of ACS onset, and clinical diagnosis was obtained.
Reporting on race, ethnicity, or other socially relevant groupings	We collected individual onset records of acute coronary syndrome from the Chinese Cardiovascular Association Database-Chest Pain Center between January 1, 2015 and December 31, 2021. Information on demographic characteristics such as age and sex, date of ACS onset, and clinical diagnosis was obtained.
Population characteristics	A total of 2,113,728 cases from 2,096 hospitals were finally included in the analysis (Supplementary Fig. 1–2). Among them, 758,464 (35.9%) were diagnosed with ST-segment-elevation myocardial infarction (STEMI), 449,161 (21.2%) non-ST-segment-elevation myocardial infarction (NSTEMI), and 906,103 (42.9) unstable angina (UA) (Supplementary Table 1). Half of the patients were older than 65 years and 67.7% were male.
Recruitment	We applied a time-stratified case-crossover study design. The case day was defined as the day of ACS onset and were matched with 3 or 4 control days, which were selected from the days that were in the same year, month, and day of the week with the case day to control for time trends and seasonality.
Ethics oversight	The Institutional Review Board at the School of Public Health, Fudan University approved the study protocol (IRB#2021-04-0889), and waived the requirement for informed consent because the study involved analysis of deidentified data. None of the authors were involved in the collection of data from the participants. Our study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

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

Life sciences study design

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

Sample size	Acute coronary syndrome (ACS) cases were extracted from the Chinese Cardiovascular Association (CCA) Database-Chest Pain Center. The database was a national registry established in China since 2015 covering all patients visiting chest pain centers in Chinese mainland. In the present analysis, we included patients diagnosed with ST-segment-elevation myocardial infarction, non-ST-segment-elevation myocardial infarction, and unstable angina in the CCA Database-Chest Pain Center between January 1, 2015 and December 31, 2021, and identified them as ACS patients. A total of 2,113,728 patients from 2,096 hospitals were finally included in the analysis.
Data exclusions	Patients with no information on symptom onset date and those being transferred from other hospitals were excluded to ensure proper matching with environmental exposure data.
Replication	Our results are generated from the statistical analyses described in the methodology section. The programming code will be available upon request from the authors.
Randomization	This is an individual-level, time-stratified, case-crossover study. This kind of design could minimize the confounding effect of all individual-level, time-invariant risk factors through a self-matching strategy and automatically excludes temporal trends (e.g., seasonality) by selecting controls within a month. And there was no experimental design or group allocation involved in this study.
Blinding	There was no experimental design or group allocation involved in this study.

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	We declare that no specific seed stocks or other plant materials were utilized for the purpose of this study.
Novel plant genotypes	No novel plant genotypes were produced as part of our study.
Authentication	Given that no seed stocks or novel plant genotypes were involved in the study, there are no authentication procedures to describe.