

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 (<i>n</i>) 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 <i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i>
☐	☒ 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. <i>F</i> , <i>t</i> , <i>r</i>) with confidence intervals, effect sizes, degrees of freedom and <i>P</i> value noted <i>Give P values as exact values whenever suitable.</i>
☐	☒ 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 <i>d</i> , Pearson's <i>r</i>), 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	The Epigraphic (EDH) dataset was collected from a Zenodo archive and processed with R (4.4.1) using the httr (1.4.7) package.
Data analysis	All data were analyzed in R (4.4.1) or with Python (3.12.1). The entire package environment, including versions, is available along with all the code and data required for replication in the GitHub repository: https://github.com/wccarleton/urbanscale . This repository has been archived with Zenodo under the DOI: https://doi.org/10.5281/zenodo.10925901 . The following R packages (and versions) were used: nimble(1.0.0), tidyverse(2.0.0), ggplot2(3.5.1), readxl(1.4.2), patchwork(1.1.2), coda(0.19-4), dplyr(1.1.2), httr(1.4.5), jsonlite(1.8.4), geosphere(1.5-18), RColorBrewer(1.1-3), loo(2.8.0). The following Python libraries (with version numbers) were used: mesa(2.2.0), plotly_express(0.4.1), matplotlib-base(3.8.2), networkx (3.2.1), numpy(1.26.4), pandas(2.2.0).

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](#)

The data necessary to reproduce our efforts along with full results and all plots are available on GitHub (<https://github.com/wccarleton/urbanscale>) and archived with Zenodo (<https://doi.org/10.5281/zenodo.10925901>). Data were collected from 3 online sources and 2 organizational providers. Online sources include: OxREP: <http://oxrep.classics.ox.ac.uk/databases/cities/>; EDH: <https://edh.ub.uni-heidelberg.de/home>; Simple Maps: <https://www.simplemaps.com>. Providers include: Henley and Partners: <https://www.henleyglobal.com> and The Council on Tall Buildings and Urban Habitat: <https://www.ctbuh.org/>

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	n/a
Reporting on race, ethnicity, or other socially relevant groupings	n/a
Population characteristics	n/a
Recruitment	n/a
Ethics oversight	n/a

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](https://www.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	Quantitative study of urban scaling involving ancient and modern cities.
Research sample	Previously published archaeological and historical datasets and modern data on urban centres.
Sampling strategy	Convenience, effectively, given that we used the only available appropriate data.
Data collection	Downloaded from online sources and provided directly by one private organization (CTBUH)
Timing and spatial scale	The archaeological and historical data pertain primarily to the Roman Imperial Period (ca. 100 BC -- 300 CE) and modern data pertain primarily to the 20th and 21st centuries.
Data exclusions	n/a
Reproducibility	all programming scripts are provided in the GitHub repo associated with and referenced within the manuscript.
Randomization	n/a
Blinding	n/a

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

Palaeontology and Archaeology

Specimen provenance	Various. We used a previously compiled database available online.
Specimen deposition	n/a
Dating methods	n/a
☐ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.	
Ethics oversight	n/a

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

Plants

Seed stocks	n/a
Novel plant genotypes	n/a
Authentication	n/a