

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
<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. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P 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 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 for collecting the data |
| Data analysis | The software Microsoft Excel was used to enter the data, the software R was used for analysing the data and the software qGIS was used for producing the map in the manuscript. |

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](#)

Datasets have been uploaded in code ocean.

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research.](#)

Reporting on sex and gender

Use the terms sex (biological attribute) and gender (shaped by social and cultural circumstances) carefully in order to avoid confusing both terms. Indicate if findings apply to only one sex or gender; describe whether sex and gender were considered in study design whether sex and/or gender was determined based on self-reporting or assigned and methods used. Provide in the source data disaggregated sex and gender data where this information has been collected, and consent has been obtained for sharing of individual-level data; provide overall numbers in this Reporting Summary. Please state if this information has not been collected. Report sex- and gender-based analyses where performed, justify reasons for lack of sex- and gender-based analysis.

Population characteristics

Describe the covariate-relevant population characteristics of the human research participants (e.g. age, genotypic information, past and current diagnosis and treatment categories). If you filled out the behavioural & social sciences study design questions and have nothing to add here, write "See above."

Recruitment

Describe how participants were recruited. Outline any potential self-selection bias or other biases that may be present and how these are likely to impact results.

Ethics oversight

Identify the organization(s) that approved the study protocol.

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 measured the relative abundance of questing *I. ricinus* nymphs and their infections with *B. burgdorferi* s.l. in 160 sites across 16 cities covering most of the UK. To limit confounding effects of city size, and to allow inclusion of Scottish cities (most of which are small) which helped broaden the range of hinterland land covers, we used urban areas defined as "small cities" with a population size of 50,000 - 100,000. Ten sites in and around each city were surveyed: five were urban green spaces within each city and five were in the hinterland woodlands between 5 and 10 km of the city centre.

Research sample

We assessed the density of *Ixodes ricinus* ticks and collected questing *Ixodes ricinus* nymphs, which are the main vector of *Borrelia burgdorferi* s.l. (causing Lyme disease) in the UK.

Sampling strategy

Each site (160 sites, ten per city) was visited twice during the *Ixodes ricinus* questing season (May-September). The density of *Ixodes ricinus* was measured using standard blanket drag transects where each transect consisted of dragging a 1 m x 1 m square blanket material for 10 m. All nymphal ticks on the blanket were counted, collected and stored in 70% ethanol in 1.5ml Eppendorf tubes for later pathogen analysis. Screening for presence of the bacteria *B. burgdorferi* s.l. in each individual ticks was done using standardised molecular methods. Because temperature and relative humidity affect the proportion of ticks that are active, surveys were conducted only when the temperature was more than 10°C, transects were not conducted in the rain. Ground vegetation height and a density index were measured using a sward stick at the start (0 m), middle (5 m) and end (10 m) of each transect. The sward stick had coloured bands every 5cm and the vegetation density index was the number of these coloured bands that were hidden by the vegetation when the sward stick was placed vertically in the vegetation at arm's length.

Data collection

Data were collected by experimented surveyors (the authors) as well as by undergraduate and graduate students, under the supervision of an experimented surveyor. Surveyors used printed, standardised data sheet to fill in the field and data were subsequently entered into a Microsoft Excel spreadsheet.

Timing and spatial scale

Data were collected in the field during the tick questing season (May-September) each year of 2022 and 2023. Ticks were collected along 10 m linear transects (15 transects per sites), across 16 cities in the UK (160 sites in total).

Data exclusions

No data were excluded from the analyses.

Reproducibility

We did not conduct an experiment in this study and instead, we conducted ecological surveys. We sampled ten sites in each of the 16 cities (160 sites) surveyed and each location was surveyed twice, which ensures that the study was robust.

Randomization

Our survey strategy was to select cities that had between 50,000 and 100,000 inhabitants, that had a wide range of hinterland land covers. Within each town, we selected sites to get a wide range of green space type (small to large urban greenspace), which was

stratified and representative of the city. As we needed the urban and rural habitats to be as comparable as possible, we conducted the transects in similar habitats (under canopy) as each site. We chose this sampling strategy to control such covariates (habitat type). For analyses on the density of tick, data were analysed at the transect level and not aggregated. To control for potentially biasing covariates, we included vegetation and weather data (rainfall) in the statistical models. For the analyses focusing on the density of infected ticks, we aggregated the data at the site/visit level as we obtained the proportion of ticks infected at the site/visit level after pathogen screening.

Blinding

N/A - we did ecological surveys

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions

Fieldwork was carried out between May and September 2022 and 2023 under dry condition (ground vegetation dry), when the temperature was above 10 degrees celcius. This was to ensure that tick activity would be similar across all sites as well as control the effects of weather on tick activity.

Location

The cities surveyed in the UK were Burnley (latitude:53.80196, longitude:-2.23228), Cannock (latitude:52.69274, longitude:-1.99954), Carlisle (latitude:54.9065, longitude:-2.91977), Dunfermline (latitude:56.06747, longitude:-3.43277), Durham (latitude:54.77482, longitude:-1.57472), Falkirk (latitude:56.00268, longitude:-3.78761), Halifax (latitude:53.72263, longitude:-1.85506), Harrogate (latitude:53.99171, longitude:-1.53457), Inverness (latitude:57.46753, longitude:-4.20735), Keighley (latitude:53.86565, longitude:-1.91431), Kilmarnock (latitude:55.6129, longitude:-4.50695), Kings Lynn (latitude:52.75049, longitude:0.39862), Macclesfield (latitude:53.25868, longitude:-2.12849), Perth (latitude:56.39599, longitude:-3.4405), Scarborough (latitude:54.28066, longitude:-0.41269), Wrexham (latitude:53.04861, longitude:-2.99392)

Access & import/export

Permission to access each site was obtain prior to conducting field work. No import/export of samples was done in this study.

Disturbance

The field sites were in public parks and woodlands accessible by members of the public. The method used (blanket dragging method) consist in dragging a blanket over the vegetation and has a minimal impact on the environment. In addition, the survey did not take more than an hour at each site.

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

Methods

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

Animals and other research organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research, and [Sex and Gender in Research](#)

Laboratory animals

The study did not involve laboratory animals

Wild animals

Wild Ixodes ricinus ticks were collected using a standard blanket dragging methods. Ticks were frozen until pathogen screening.

Reporting on sex

A total of 3,750 Ixodes ricinus nymphs were tested for pathogens. Sex unknown for nymphal tick stage.

Field-collected samples

Ticks collected were frozen immediately after being collected.

Ethics oversight

No ethics needed as the organisms collected are ticks.

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