

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 The GSOD data are accessed using GSODR package in R studio (based on R 4.2.3). Other data are downloaded from multiple sources (see the details in data availability statement) in the forms as they are and processed in R.

Data analysis The major data processing, all the regression analysis, and figure production are conducted in R studio (based on R 4.2.3). All custom code is available upon request.

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 Retail Scanner data is provided by Nielsen Company and restricted by non-disclosure terms of use but can be purchased from Nielsen. According to the official website at <https://www.chicagobooth.edu/research/kilts/datasets/nielseniq-nielsen/subscribing>, accessing the data would first require a subscription contract

between a researcher's institution and Chicago Booth. The FNDDS data is available from <https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fndds/>. The GSOD data are accessed using GSODR package in R and can also be retrieved from <https://www1.ncdc.noaa.gov/pub/data/g sod/>. The code for data download can be found at <https://github.com/hepannju/Does-the-weather-change-the-energy-efficiency-gap>. The CMIP6 climate projections are available from <https://esgf-node.ipsl.upmc.fr/search/cmip6-ipsi/>.

Human research participants

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

Reporting on sex and gender	The sex and gender information of the household are collected by Nielsen company. The sample has been anonymized before our use to avoid the risk of individual identification.
Population characteristics	The study is based on second-hand purchase data provided by Nielsen company, which does not include individual-level population characteristics information.
Recruitment	No recruitment is conducted for this study.
Ethics oversight	The study is based on second-hand purchase data provided by Nielsen company. We did not conduct primary data collection involves human subjects. Ethics oversight is not applicable.

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)

Behavioural & social sciences study design

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

Study description	Investigate the relationship of weather and the consumption of added sugar at the household level. The study is quantitative.
Research sample	General purchase outcomes provided by Nielsen Company. It is adopted as it provides a high-resolution purchase records that enable us to quantify the added-sugar content of food items and thus the consumption of households. The details of the purchase date and the geographical identifier also allow us to link this data to the meteorological records to explore the relationship between temperature and the consumption. It is also adopted as the sampling framework is of national representativeness. The home scanner dataset contains information from approximately 40,000-60,000 U.S. households with sample sizes varying by year. The same households are tracked for multiple years before replacement and thus constitute a longitudinal panel. The purchase records contain detailed transaction information including the UPC (Universal Product Code) code, product name, quantity, price, and promotions of each product purchased, as well as the date of the trip and the county of store location. The food items cover all retail outlets across the U.S. except Alaska and Hawaii, though the consumption data at restaurants are not included. The dataset also collects the demographic and socio-economic characteristics of the households such as the income, education, and occupation of male and female heads, as well as age, sex, and ethnic group of each member, county of the residence, etc. The panel is nationally representative with the sampling weight applied.
Sampling strategy	General purchase outcomes provided by Nielsen Company. Sampling strategy is controlled by Nielsen. The sampling is based on a randomization strategy to obtain a nationally representative sample for the households in the United States which provides decent reflection on consumer behaviour.
Data collection	Individual food consumption data are collected by Nielsen by requesting the participating household to report their purchases. Nielsen requests that all purchases made by all household members be recorded, with the receipt of purchase uploaded to the data collection system. Information captured include the quantity, price, and unit of the commodities purchased; the type and geographical information of the store; and the date of the trip. The demographical information of the households are also collected including the household income, household size, the educational level of the female & male head, the ethnic groups of the female & male head, etc. The researchers are blinded to experimental condition and/or the study hypothesis.
Timing	The data collection started in 2004 and is updated every year. There is no gap between collection periods, sate, and dates. At the time of analysis, the data are available for 2004-2023 and thus we included the data of 2004-2019 in the analysis to exclude the consumption records during the COVID period.
Data exclusions	No data are excluded.
Non-participation	There is no non-participation at the consumer level as once a store agrees to participate in the data collection, the purchase data is

Non-participation

recorded automatically.

Randomization

Randomization is not used in this study as it is a secondary-hand data analysis. For the original sample, randomization is conducted in the quota sampling process by the Nielsen Company.

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 |