nature portfolio

Corresponding author(s): Derek Wildman

Last updated by author(s): Nov 15, 2025

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	Open-source software packages (e.g., FASTQC, Trim Galore, miRDeep2, CellCODE, PRSice-2)were used for data preprocessing
Data analysis	Open-source R scripts were used for statistical analysis and data visualization.

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 R scripts used for data analysis are available on GitHub at the following link: https://github.com/CharleyWang/miRNA_SocialAdversity_PTSS_Framework

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	Sex (male/female) was self-reported by participants and included as a covariate in statistical models. Analyses were not stratified by sex or gender due to limited statistical power in sex-specific subgroups. Future work with larger cohorts is needed to explore sex-specific effects.
Reporting on race, ethnicity, or other socially relevant groupings	Race/ethnicity was self-reported. The majority of participants (approximately 80%) identified as Black or African American. This variable was used to characterize the study population and was not used as a proxy for socioeconomic status. Analyses controlled for potential confounding by race where relevant. All demographic terms and categories align with DNHS survey standards.
Population characteristics	The study population was drawn from the Detroit Neighborhood Health Study, a longitudinal community-based cohort of adults (≥18 years old), predominantly Black or African American. Key characteristics included age, gender, race/ethnicity, socioeconomic status, and exposure to trauma and social adversity. PTSD symptom severity (PTSS) was assessed using the PCL-C scale.
Recruitment	Participants were recruited via structured telephone interviews conducted annually between 2008 and 2013 as part of the DNHS. Potential self-selection bias is acknowledged, as participants who remained across multiple waves were previously shown to report lower levels of trauma and psychiatric symptoms.
Ethics oversight	All study protocols were approved by the Institutional Review Boards at the University of Michigan and the University of North Carolina.

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

Behavioural & social sciences study design

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

Study description	This is a quantitative, observational study using longitudinal data from a community-based cohort to examine the relationship between social adversity, miRNA expression, and post-traumatic stress symptom severity (PTSS). Negative binomial regression and interaction modeling were applied to assess these associations.
Research sample	The research sample was drawn from the Detroit Neighborhood Health Study (DNHS), a population-based cohort of adults residing in Detroit, Michigan. The sample includes 483 participants, with demographic data including age, sex, and race/ethnicity (predominantly Black or African American). The cohort is representative of a high-risk urban population exposed to social adversity and trauma.
Sampling strategy	This study used a convenience sample of participants from the DNHS who had both complete survey data and available blood-derived RNA for miRNA profiling. No formal power calculation was performed; sample size was determined based on data availability. Analyses included 632 RNA-seq samples from 483 individuals across waves two and four. Statistical robustness was evaluated via 10-fold cross-validation and bootstrapping.
Data collection	Data were collected through structured telephone interviews administered annually between 2008 and 2013. Survey instruments captured trauma exposure, PTSD symptoms (via PCL-C), and social adversity measures. Blood samples were collected at select timepoints for RNA extraction and small RNA sequencing. Data collectors were trained personnel; blinding was not applicable as this was an observational study.
Timing	Data were collected over five waves (2008–2013), with miRNA data collected in waves 2 and 4. Social adversity and PTSS outcomes were assessed in adjacent waves (e.g., wave 2 exposures, wave 3 symptoms).
Data exclusions	Participants with missing data on key variables (e.g., trauma exposure, PTSS, or miRNA profiles) were excluded. Exact numbers of exclusions for each analysis are reported in Supplemental Tables and Figures. Exclusion criteria were based on data completeness.
Non-participation	Participant attrition across waves was noted. Individuals who did not complete follow-up interviews or did not provide biospecimens were excluded. Prior work has indicated that those who dropped out tended to report higher baseline trauma and psychiatric symptoms, introducing potential attrition bias.

Randomization	No randomization was used. This is a non-interventional, observational study. All analyses controlled for demographic and adversity-related covariates to address potential confounding.

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	NA
Novel plant genotypes	NA
Authentication	NA