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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	No custom code
Data analysis	No custom code was developed for this project. All analyses were performed using STATA v18. Researchers interested in the analytic code can contact the corresponding author (email to eselvin@jh.edu). Requests should include a description of the goals and rationale of the research project and the analyses researchers plan to conduct. Review for code requests may take up to approximately 1 month.

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

Requests for access to the DASH4D data may be submitted to the DASH4D Publications Committee according to establish study procedures. This includes submission of a completed manuscript proposal to the Publications Committee (email to eselvin@jh.edu). The Publications Committee will evaluate all proposals for

scientific merit, and access will be granted following approval of the proposal and completion of data transfer agreement. Review of proposals may take up to approximately 1 month.

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 was self-reported and sex-specific estimates are provided in the manuscript
Reporting on race, ethnicity, or other socially relevant groupings	Race and ethnicity were self-reported. Race and ethnicity were considered social groupings for the purposes of this study
Population characteristics	From June 2021 to December 2023, the parent trial enrolled 105 adults (aged 18 years or older) from the Baltimore metropolitan area with type 2 diabetes, systolic blood pressure between 120-159 mmHg, and diastolic blood pressure <100 mmHg. Type 2 diabetes was defined as an HbA1c (point-of-care) ≥6.5% or current use of glucose-lowering medications. Key exclusion criteria included a history of severe hypoglycemia in the past year; use of short-acting insulin; or HbA1c>9%. The mean age in the DASH4D-CGM study was 67 years, 67% were female, and 88% were Non-Hispanic Black. At baseline, 54% of participants were using 2 or more glucose-lowering medications, mean HbA1c was 7%, mean CGM sensor glucose was 130.7 mg/dL, mean time-in-range was 84.1%, and mean coefficient of variation was 26.3%. Baseline rates of CGM-detected hypoglycemia were low (mean percentage of time below 70 mg/dL: 3.3%).
Recruitment	The DASH4D Study was conducted at Johns Hopkins ProHealth Clinical Research Unit, at the community-based research center in Baltimore. Participants were primarily recruited through mass mailings of brochures, letters to prior study participants, electronic health record messages, newspaper advertisements, and word-of-mouth. Participants were largely from the local area (Baltimore Maryland) because the trial required ongoing face-to-face interaction with staff at the research site (Johns Hopkins ProHealth Clinical Research Unit). This may influence the generalizability of the findings to the broader population with type 2 diabetes.
Ethics oversight	Johns Hopkins IRB

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	The Dietary Approaches to Stop Hypertension for Diabetes (DASH4D) Study was crossover, controlled feeding trial (NCT04286555). This trial aimed to assess the effects of the DASH4D diet (a DASH-style diet optimized for persons with type 2 diabetes) and sodium reduction on blood pressure in adults with type 2 diabetes. In this ancillary study (DASH4D-CGM), our objective was to examine the effect of the DASH4D diet (versus a typical American diet) on short-term glycemic control and glucose variability assessed by CGM. All analyses for the DASH4D-CGM were quantitative.
Research sample	102 adults with type 2 diabetes were enrolled in the parent trial. Among these, 89 participants consented and were enrolled in the DASH4D-CGM ancillary study. The mean age in the DASH4D-CGM study was 67 years, 67% were female, and 88% were Non-Hispanic Black ethnicity. Complete information about baseline characteristics are presented in Table 1 of the manuscript. Compared to the general population with type 2 diabetes in the US, the study population was older and more likely to be Non-Hispanic Black. Thus the population may not fully representative of the persons with type 2 diabetes in the general population. The parent trial selected participants from the local area (Baltimore Maryland) because the trial design required ongoing face-to-face interaction with staff at the research site (Johns Hopkins ProHealth Clinical Research Unit).
Sampling strategy	Participants were recruited at Johns Hopkins ProHealth Clinical Research Unit, at the community-based research center in Baltimore using convenience sampling. Participants were primarily recruited through mass mailings of brochures, letters to prior study participants, electronic health record messages, newspaper advertisements, and word-of-mouth. The parent trial determined the a sample size of 100 was required detect a difference of 4.7 mm Hg in systolic blood pressure with 90% power and a two-sided alpha of 0.05. The trial assumed that mean systolic blood pressure has a standard deviation of 14 mm Hg and a within-person correlation of 0.5. This sample size was fixed for the DASH4D-CGM study.
Data collection	Dietary intervention Study participants were fed four diets (DASH4D diet with higher sodium, DASH4D diet with lower sodium, comparison diet with

higher sodium, and comparison diet with lower sodium) in a random order. Each feeding period lasted five weeks and was separated by a break of at least one week (median length of breaks: 14 days). Participants consumed their own food and beverages during breaks.

The DASH4D diet is similar to the original DASH diet but set a lower target for carbohydrates (45% of total calories). The DASH4D diet also had lower potassium and higher targets for unsaturated fat to better align with dietary recommendations for persons with type 2 diabetes. The comparison diet was developed following a similar process used in the original DASH trial; this diet was based on national survey data and reflects consumption patterns of the general population of US adults, as well as US adults with diabetes. The lower sodium intake target (1,500 mg/day at 2,000 kcal) was based on a prior sodium reduction trial,8 and higher sodium (3,700 mg/day at 2,000 kcal) was estimated based on average consumption in US adults.
All meals, snacks and most beverages were prepared in a metabolic kitchen and provided to participants during the feeding periods. Participants consumed three meals per week at the study center, and all other food was eaten offsite. Participant caloric targets were set to minimize weight change, and caloric levels were adjusted as needed to maintain a stable weight.

Adherence to study diets was self-reported daily during each feeding period. Adherence was defined as self-reporting eating all study foods and abstaining from eating outside food or unallowed beverages each day. Investigators and staff were blinded to the intervention assignment.

Continuous glucose monitoring

The Abbott FreeStyle Libre Pro was used for CGM assessments. The Libre Pro is a masked CGM system (participants cannot see glucose values), comes factory calibrated (does not require calibration with fingerstick testing), and measures glucose every 15 minutes for up to 14 days. Trained research staff placed the Libre Pro on the back of the upper arm during a screening visit (baseline) and the third or fourth week of each feeding period. CGM sensors that were dislodged or accidently removed before the completion of the 14-day wear period were replaced. The Libre Pro is a blinded device (partcipants and investigators do now know the glucose values).

Timing

Recruitment occurred from June 2021 to December 2023. Data collection was completed June 2024.

Data exclusions

Major exclusion criteria for the parent trial were type 1 diabetes; HbA1c >9.0% (75 mmol/mol); use of rapid acting insulin; estimated glomerular filtration rate (eGFR) <30 mL/min/1.73m2; potassium supplementation; serum potassium ≥5.2 or <3.5 mmol/L; recent weight loss or gain of >5.0% of body weight; medications with major effects on body weight. Among enrolled participants, those with a contraindication for CGM were excluded from the the DASH4D-CGM study. A full list of study criteria are included in the Methods section of the study.

Non-participation

Among the 102 participants enrolled in the parent trial, 89 were included in the CGM ancillary study. 3 randomized did not provide consent; 8 provided consented but changed their mind during the beginning of the first feeding period; and 2 had contraindications.

Randomization

Randomization
Using a computer algorithm, participants were randomized with equal probability to one of 24 four-diets sequences, with a block size of one. Investigators were masked diet assignment and all study team members were blinded to CGM measurements.

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

Clinical data

Policy information about clinical studies

All manuscripts should comply with the ICMJE guidelines for publication of clinical research and a completed CONSORT checklist must be included with all submissions.

Clinical trial registration

NCT04286555

Study protocol	Full study protocol is included with the publication.
Data collection	Study participants came to Johns Hopkins ProHealth Clinical Research Unit several times a week to pick up study meals and for clinical examinations. The participants in the DASH4D-CGM study, CGM were placed during the third or fourth week of each feeding period and collected up to 14 days of data. Particpants returned CGM sensors to study staff after 14 days of wear.
Outcomes	CGM outcomes: All CGM outcomes were calculated over the entire 14-day CGM assessment period and reflect glycemic control and variability at the end of each feeding period. Outcomes were selected based on clinical guidelines and recommendations from a consensus statement on CGM endpoints for clinical trials. The primary outcomes were CGM mean glucose, percentage of time spent with glucose between 70 to 180 mg/dL (time-in-range), and glucose coefficient of variation (glucose standard deviation divided by mean glucose). Secondary outcomes were glucose standard deviation, the percentage of time with hyperglycemia (glucose above 180 mg/dL and 250 mg/dL, respectively); and the percentage of time with hypoglycemia (glucose below 70 mg/dL and 54 mg/dL, respectively). Exploratory continuous outcomes were percentage of time between 70 and 140 mg/dL and percentage of time above 140 mg/dL. Exploratory binary outcomes included meeting targets for time-in-range (>70% time), coefficient of variation (<36%), time above 180 mg/dL (<25% time), time above 250 mg/dL (<5% time), time below 70 mg/dL (<4% time), time below 54 mg/dL (<1% time). Post-hoc outcomes were the Glucose Management Indicator and Glycemia Risk Index. Both post-hoc outcomes were calculated used previously published equations.17,18

Plants

Seed stocks	N/A
Novel plant genotypes	N/A
Authentication	N/A