**ONLINE SUPPLEMENT**

**Full title:** Trends in blood pressure and usual dietary sodium intake among children and adolescents, NHANES 2003-2016

Katherine J. Overwyk,1,2 Lixia Zhao,1,2 Zefeng Zhang,1 Jennifer L. Wiltz,1,3 Elizabeth K. Dunford,4 Mary E. Cogswell1

1 Division for Heart Disease and Stroke Prevention, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA 30341, USA.

2 IHRC, Inc. Atlanta, GA 30346, USA.

3 United States Public Health Service, Atlanta, GA 30341, USA.

4 Food Policy Division, The George Institute for Global Health, University of New South Wales, Sydney, NSW 2042, Australia.

**Correspondence:** Katherine J. Overwyk, MPH, Division for Heart Disease and Stroke Prevention, Centers for Disease Control and Prevention, 4770 Buford Highway NE, MS-F73, Atlanta, GA 30341, F: 770-488-8151, T: 404-718-6614, E: yfr6@cdc.gov

**Short title:** Trends in youth blood pressure and sodium intake

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**Methods**

**Usual Sodium & Nutrient Intake**

Consumption of tap and bottled water was collected during the 24-hr recall from 2003-2004 through 2015-2016. However, this information was included in estimates of individual sodium intake starting in 2005. To be consistent with individual sodium intake estimates from 2005 forward, in 2003-2004, we added the sodium content of water (quantified using the USDA Food and Nutrient Database for Dietary Studies (FNDDS) 2.0) to individual sodium intake from other sources.1 Starting in 2009, a data processing step to adjust participants’ salt intake based on responses to selected questions was discontinued. To be consistent with methods used to estimate sodium in FNDDS 2009-2016, we used the 2003-2008 FNDDS unadjusted data files where the salt content of specific foods was not adjusted downward for individuals who reported not adding salt or adding it only occasionally during home food preparation.2 In NHANES, the amount of nutrients consumed from each food or beverage was calculated by multiplying the nutrient concentration of the food (e.g., mg/100g) by the estimated amount consumed in grams.

The National Cancer Institute’s method uses non-linear mixed effects models to estimate best linear unbiased predictors of usual dietary intake and is described in detail elsewhere.3 Briefly, at least two dietary recalls are needed on a proportion of the population (in this analysis 90%) to separate the within-person from the between-person variation in intake and adjustment for covariates is available with this method. We ran MIXTRAN and INDIVNT SAS macros4 (version 2.1) for each sex separately as males mean sodium intake was substantially larger than females based on exploratory analyses. For replicability of results, we used one-part amount only models, specified nsim\_mc parameter =100, and used continuous age in years, race and Hispanic origin, survey cycle, and weight status as covariates in the model. As these variables were included in the models used to estimate usual sodium intake, they were also included in least squares linear regression models used to estimate mean usual intake for each survey cycle and temporal trends over the time period. Similar methods were used to estimate individual usual sodium density, energy, potassium, and sodium-to-potassium ratio.

**Blood Pressure**

Minor changes in BP measurement took place over the time course of the study and were not anticipated to affect BP estimates. In 2005-2006 the Littman™ Cardiology III stethoscope was used in place of the Littman™ Classic II pediatric stethoscope (utilized in all other years) and starting in 2007-2008, the protocol was modified to ensure that participants were seated all the way back in the chair with a straight spine. An average of up to 3 systolic and diastolic BP readings were used to obtain participants systolic BP and diastolic BP. In this analysis, for 86% of individuals, 3 available BP measurements were used; for 7%, the average of 2 BP measurements; and for an additional 7%, one.

**Frequency of Salt at the Table, Poverty Income Ratio, and Physical Activity (Covariates used in Sensitivity Analyses)**

 Self-reported frequency of salt added at the table, income, and physical activity data were included in sensitivity analyses among those participants with available data. Self-reported frequency of salt added at the table was categorized as “none” based on that response to the question “What type of salt do you usually add to your food at the table?” Among those who chose ordinary salt, use was categorized as “rarely”, “occasionally”, or “very often” based on response to the follow-up question “How often do you add ordinary table salt to food at the table?” Income was assessed using poverty income ratio (PIR), which represents the ratio of household family income by poverty guidelines for the specific years of the survey. PIR was categorized based on the cut-off point for participation in the Supplemental Nutrition Assistance Program.5 Physical activity was assessed in the MEC for participants aged 12 years and older. From 2003-2006, participants were asked if they did any vigorous activities- or moderate- activities for at least 10 minutes that caused heavy/slight sweating or large/moderate to slight increases in breathing/heart rate over the past 30 days. From 2007-2014, participants were asked if they did any vigorous-intensity- or moderate-intensity- sports, fitness, or recreational activities that cause large/small increases in breathing or heart rate like running or basketball for at least 10 minutes continuously. Due to changes in survey questions over time, we adopted the approach used in a previous study to assess physical activity and classified participants as inactive if they reported neither moderate nor vigorous activity for at least 10 minutes per week.6

We explored temporal trends in self-reported frequency of salt added at the table, PIR, and physical activity (Table S6). We also conducted sensitivity analyses using logistic regression analyses with EBP/HTN or HTN as the outcome, usual sodium intake as the predictor, and adjusting for survey cycle, sociodemographic characteristics, weight status, and for each of the following variables in separate models; 1) frequency of salt added at the table (among those with frequency of salt use data); 2) PIR (among those with PIR data), and 3) physical activity (among persons aged ≥12 years with physical activity data). For each of the logistic regression models, the Best Linear Unbiased Predictors (BLUPs) for usual sodium intake accounted for all covariates as appropriate.

**Least Squares Linear Regression and Multinomial Logistic Regression Models**

For all analyses, survey period (e.g., 2003-2004) was re-coded as an equally spaced ordinal variable from 1-7. Temporal trends in usual sodium intake and other nutrients were evaluated using least squares linear regression. The LS means statement was used to output model-adjusted mean nutrient intake for each survey period. Effects statements were used to test for linear and quadratic trends using orthogonal contrast statements (see below). Temporal trends in sociodemographic characteristics, weight status, EBP/HTN, and HTN were assessed using multinomial or binary logistic regression models. Generalized logit models were used for nominal responses (e.g. race and Hispanic origin) and the cumulative logit models were used for ordinal responses (e.g. weight status groups). The PREDMARG statement was used to request the predicted marginal proportion (i.e., model-adjusted risk) for each survey period. PRED\_EFF statements were used to test for linear and quadratic trends using orthogonal contrast matrices (see below).

EFFECTS / PRED\_EFF cycle = (-3 -2 -1 0 1 2) / name=”linear trend over survey years”;

EFFECTS / PRED\_EFF cycle = (5 0 -3 -4 -3 0 5) / name=”quadratic trend over survey years”;

**Supplemental References**

1. Cogswell ME, Zhang Z, Carriquiry AL, Gunn JP, Kuklina EV, Saydah SH, Yang Q, Moshfegh AJ. Sodium and potassium intakes among US adults: NHANES 2003-2008. Am J Clin Nutr. 2012; 96:647-657.
2. Sebastian RS, Enns CW, Steinfeldt LC, Goldman JD, Moshfegh AJ. Monitoring sodium intake of the US populations: Impact and implications of a change in What We Eat in America, National Health and Nutrition Examination Survey Dietary Data Processing. J Acad Nutr Diet. 2013; 113:942-949. DOI:10.1016/j.jand.2013.02.009.
3. Herrick KA, Rossen LM, Parsons R, Dodd KW. Estimating usual dietary intake from National Health and Nutrition Examination Survey data using the National Cancer Institute method. National Center for Health Statistics. Vital Health Stat 2(178). 2018.
4. NIH. National Cancer Institute. Usual dietary intakes: SAS macros for the NCI method. Last updated August 25, 2015. <https://epi.grants.cancer.gov/diet/usualintakes/macros.html>. Last accessed March 1, 2018.
5. Department of Human Services. SNAP Eligibility: Income requirements. <https://dhs.dc.gov/service/snap-eligibility>. Last accessed May 3, 2018.
6. Zhang Z, Cogswell ME, Gillespie C, Fang J, Loustalot F, Dai S, Carriquiry A, Kuklina EV, Hong Y, Merritt R, Yang Q. Association between usual sodium and potassium intake and blood pressure and hypertension among U.S. adults: NHANES 2005-2010. PLoS One. 2013; 8(10):e75289. doi:10.1371/journal.pone.0075289
7. Flynn JT, Kaelber DC, Baker-Smith CM, et al. Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. *Pediatrics*. 2017;140(3):e20171904.
8. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. *Pediatrics*. 2004; 114(2, suppl 4th report):555-576

**Table S1.** Thresholds for blood pressure categories among children and adolescents aged 8-17 years, using the 2017 American Academy of Pediatrics (AAP) guidelines and the 2004 National Institute of Health’s/National Heart Lung and Blood Institute’s (NIH/NHLBI) guidelines

|  |  |  |
| --- | --- | --- |
| **Categories of BP** | **2017 AAP Guidelines7,\***  | **2004 NIH/NHLBI Guidelines8,**†  |
| **Normal Blood Pressure** | SBP or DBP <90th percentile for their age, sex, and height | SBP or DBP <90th percentile for their age, sex, and height |
| **Elevated Blood Pressure (EBP)** †  | SBP or DBP ≥90th percentile but <95th or ≥120/80 mm Hg to <95th (whichever is lower) | SBP or DBP ≥90th percentile but <95th percentile or if BP exceeds 120/80 mmHg even if <90th percentile up to <95th percentile |
| **Hypertension (HTN)**‡ | SBP or DBP ≥ 95th percentileor SBP≥130 mm Hg or DBP ≥80 mm Hg (whichever is lower) | SBP or DBP ≥95th percentile  |
| **Combined EBP/HTN** | Grouping those with EBP and HTN together to reflect any elevation in BP | Grouping those with EBP and HTN together to reflect any elevation in BP |

Abbreviations. BP, blood pressure, DBP, diastolic blood pressure; SBP, systolic blood pressure.

\* We used percentile-based values (for all individuals aged 8-17 years) as recommended by the guidelines to aid in a more precise classification of BP.

† Formerly known as “pre-hypertensive” group using the language from the 2004 NIH/NHLBI guidelines.

‡ Both the 2017 AAP7 and the 2004 NIH/NHLBI8 guidelines recommend initiating pharmacologic therapy to reduce SBP or DBP <90th percentile only after children or adolescents remain hypertensive despite lifestyle modifications. In NHANES, antihypertensive medication use data is only available in adolescents aged 16-17 years of whom 7 (<1%) reported use. These adolescents were classified as hypertensive in both guidelines.

**Table S2**. Characteristics of participants by analytic inclusion criteria\*

|  |  |  |  |
| --- | --- | --- | --- |
| **Population Groups** | ***P* value** | **Included,****N (%)†** | **Excluded,****N (%)‡** |
| Sex | 0.485 |  |  |
| Male |  | 6,174 (50.3%) | 1,032 (51.2%) |
| Female |  | 6,075 (49.7%) | 982 (48.8%) |
| Age, years | **<0.001** |  |  |
| 8-12 |  | 5,938 (48.5%) | 1,245 (61.8%) |
| 13-17 |  | 6,311 (51.5%) | 769 (38.2%) |
| Mean Age |  | 12.6 (0.04) | 12.4 (0.3) |
| Race and Hispanic Origin | **<0.001** |  |  |
| Non-Hispanic White |  | 3,422 (27.9%) | 480 (23.8%) |
| Non-Hispanic Black |  | 3,404 (27.8%) | 601 (29.8%) |
| Mexican-American |  | 3,239 (26.4%) | 465 (23.1%) |
| Other |  | 2,184 (17.8%) | 468 (23.2%) |
| BMI | **<0.001** |  |  |
| Underweight |  | 326 (2.7%) | 165 (8.2%) |
| Normal |  | 7,145 (58.3%) | 857 (42.6%) |
| Overweight |  | 2,120 (17.3%) | 238 (11.8%) |
| Obese |  | 2,658 (21.7%) | 754 (37.4%) |
| Mean BMI (kg/m2) |  | 21.7 (0.1) | 21.5 (0.5) |

*\**The sample size (N) and the column percent are unweighted. Excluded participants were persons missing one or more variables (see methods) including, but not limited to, a reliable dietary recall and/or a first day (initial) dietary sample weight. *P* values are based on chi-square tests for overall differences in the frequencies of the specified characteristic for included vs. excluded participants. Boldface indicates statistical significance (p<0.05).

† Included participants were those NHANES respondents who had complete information on all variables of interest (N=12,249)

‡ Excluded participants were those NHANES respondents who did not have complete information on variables of interest (N=2,014)

**Table S3.** Unweighted sample sizes (N) for children and adolescents aged 8-17 years by 2-year survey cycle and selected covariates

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Survey Cycles** | **2003-2004** | **2005-2006** | **2007-2008** | **2009-2010** | **2011-2012** | **2013-2014** | **2015-2016** | **Total** |
| **Population Groups, N** |
| Overall | 2,130 | 2,172 | 1,550 | 1,654 | 1,563 | 1,581 | 1,599 | 12,249 |
| Age |  |  |  |  |  |  |  |  |
| 8-12 years | 821 | 916 | 847 | 872 | 848 | 804 | 830 | 5,938 |
| 13-17 years | 1,309 | 1,256 | 703 | 782 | 715 | 777 | 769 | 6,311 |
| Sex |  |  |  |  |  |  |  |  |
| Boys | 1,072 | 1,068 | 782 | 858 | 789 | 798 | 807 | 6,174 |
| Girls | 1,058 | 1,104 | 768 | 796 | 774 | 783 | 792 | 6,075 |
| Race and Hispanic origin\* |  |  |  |  |  |  |  |  |
| White, NH | 567 | 576 | 484 | 537 | 366 | 420 | 472 | 3,422 |
| Black, NH | 762 | 698 | 401 | 344 | 459 | 393 | 347 | 3,404 |
| Mexican-American | 648 | 723 | 391 | 457 | 297 | 379 | 344 | 3,239 |
| Weight Status |  |  |  |  |  |  |  |  |
| Underweight or Normal | 1,297 | 1,350 | 913 | 1,027 | 984 | 952 | 948 | 7,471 |
| Overweight | 401 | 336 | 273 | 277 | 251 | 276 | 306 | 2,120 |
| Obese | 432 | 486 | 364 | 350 | 328 | 353 | 345 | 2,658 |
| How often do you add salt to food at the table? † |  |  |  |  |  |  |  |  |
| None | 544 | 643 | 520 | 469 | 548 | 493 | 421 | 3,638 |
| Rarely | 794 | 823 | 565 | 655 | 597 | 659 | 682 | 4,775 |
| Occasionally | 475 | 469 | 321 | 356 | 325 | 310 | 349 | 2,605 |
| Very often | 315 | 236 | 144 | 173 | 93 | 117 | 145 | 1,223 |
| Poverty Income Ratio‡ |  |  |  |  |  |  |  |  |
| ≤130% | 850 | 760 | 622 | 669 | 653 | 683 | 585 | 4,822 |
| >130% | 1,190 | 1,326 | 819 | 845 | 806 | 797 | 892 | 6,675 |
| Physical Activity§ |  |  |  |  |  |  |  |  |
| Active | 1,318 | 1,326 | 671 | 741 | 645 | 725 | 713 | 6,139 |
| Inactive | 193 | 151 | 144 | 166 | 197 | 196 | 186 | 1,233 |

Abbreviations. NH, non-Hispanic.

\* Data on combined “Other-multiracial” and “Other-Hispanic” not presented (n=2,184)

† Data on frequency of table salt use was only available in a subset of participants (missing n=8).

‡ Data on poverty income ratio was only available in a subset of participants (missing n=752), for definition, see methods.

§ Physical activity questions were only asked to participants aged 12 years or older. Sample sizes presented are for those with available data (missing n=4,877). For definitions of active versus inactive, see methods.

**Table S4.** Mean usual daily sodium density (mg/1000 kcal), energy intake (kcal), sodium-to-potassium ratio (mmol/mmol), and potassium (mmol) among children and adolescents aged 8-17 years by 2-year survey cycle, NHANES 2003-2004 through 2015-2016 (N=12,249)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Nutrient Indicator,\* mean (SE)** | **2003-2004** | **2005-2006** | **2007-2008** | **2009-2010** | **2011-2012** | **2013-2014** | **2015-2016** | **Adjusted change per 2-y cycle (95% CI) †** | ***P* Value Linear trend†** | ***P* Value Quadratic trend†** |
| Sodium density (mg/ 1000 kcal)  | 1581 (3) | 1618 (5)  | 1632 (3) | 1644 (4) | 1648 (6) | 1668 (3) | 1677 (3) | 14 (13, 16) | <0.001 | <0.001 |
| Energy (kcal) | 2174 (12) | 2142 (18) | 2043 (6) | 2031 (19) | 2004 (11) | 1961 (19) | 1949 (15) | -38 (-44, -33) | <0.001 | 0.008 |
| Na/K ratio (mmol/mmol) | 2.72 (0.02) | 2.78 (0.01) | 2.77 (0.01) | 2.71 (0.01) | 2.69 (0.02) | 2.71 (0.01) | 2.73 (0.01) | -0.01 (-0.01, -0.00) | 0.013 | 0.885 |
| Potassium (mmol) | 58.81 (0.64) | 58.15 (0.48) | 55.93 (0.45) | 57.30 (0.58) | 57.06 (0.46) | 56.03 (0.46) | 55.25 (0.51) | -0.50 (-0.70, -0.29) | <0.001 | 0.674 |

Abbreviations. Na/K ratio, sodium-to-potassium ratio; SE, standard error. The unweighted sample size (N) for the overall sample by survey cycle can be found in Table S3. Mean estimates and standard errors account for the complex survey design and sample weights based on probabilities of selection, oversampling, and nonresponse.

\* Mean (SE) of usual nutrient intake accounting for within person day-to-day variation in intake, day of the week of the 24-hour dietary recall, age in years, sex, race and Hispanic origin, and weight status groups.

† β-coefficients’ (adjusted change in the specified nutrient indicator per 2-year survey cycle) were estimated using linear regression adjusting for age in years, sex, race and Hispanic origin, and weight status groups. The reported population group means, standard errors, and P values for linear and quadratic trends were tested by requesting the estimated least squares mean for each level of survey cycle (treated as an ordinal variable). P<0.05 is considered significant.

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**Table S5**. Temporal trends in the proportion of children and adolescents aged 8-17 years with EBP/HTN and HTN using the 2004 NIH/NHLBI guidelines by 2-year survey cycle, NHANES 2003-2016 (N=12,249)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Survey Cycles** | **2003-2004** | **2005-2006** | **2007-2008** | **2009-2010** | **2011-2012** | **2013-2014** | **2015-2016** | **AOR (95% CI)**† | ***P* Value Linear trend \*** | ***P* Value Quadratic trend \*** |
| % EBP/HTN (SE) | 14.2 (1.6) | 14.4 (2.3) | 12.8 (1.1) | 9.7 (1.1) | 11.1 (1.2) | 6.8 (1.0) | 10.7 (1.1) | 0.91 (0.86, 0.96) | <0.001 | 0.258 |
| % HTN (SE) | 3.9 (1.1) | 4.3 (1.0) | 2.3 (0.4) | 1.8 (0.3) | 2.5 (0.7) | 1.9 (0.5) | 2.2 (0.4) | 0.88 (0.79, 0.98) | 0.026 | 0.158 |

Abbreviations. EBP/HTN, either elevated blood pressure or hypertension; HTN, hypertension only. Definitions for how categories of blood pressure were defined can be found in Table S1. The unweighted sample size (N) for the overall sample can be found in Table S3. Percentages and standard errors (shown in parentheses) account for the complex survey design and sample weights based on probabilities of selection, oversampling, and nonresponse.

\* Logistic models adjusted for age in years were used to examine temporal trends in categories of blood pressure. Linear and quadratic temporal trends were tested by requesting the predicted marginal proportions for each level of survey cycle (treated as an ordinal variable). P<0.05 is considered significant.

†Adjusted Odds Ratios (AOR) are presented for EBP/HTN and HTN per survey cycle.

**Table S6.** Frequency of table salt use, household income to poverty ratio, and physical activity status among children and adolescents aged 8-17 years, by 2-year survey cycle, NHANES 2003-2004 through 2015-2016

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Survey Cycle** | **2003-2004** | **2005-2006** | **2007-2008** | **2009-2010** | **2011-2012** | **2013-2014** | **2015-2016** | **Adjusted change per 2-y cycle (95%CI)**  | ***P* Value Linear trend\*** | ***P* Value Quadratic trend\*** |
| **Covariates, % (SE)** |
| How often add salt to food at the table? |
| None | 24.9 (1.9) | 28.5 (2.0) | 28.5 (1.5) | 25.7 (1.1) | 28.9 (2.1) | 27.4 (2.3) | 22.6 (1.3) | 0.98 (0.95, 1.02) | 0.314 | 0.011 |
| Rarely | 34.9 (1.6) | 38.0 (1.9) | 37.2 (1.7) | 39.2 (1.8) | 38.3 (2.2) | 41.2 (1.7) | 42.3 (1.5) | 1.05 (1.02, 1.07) | 0.001 | 0.883 |
| Occasionally | 29.3 (1.8) | 24.0 (1.4) | 23.2 (1.5) | 24.2 (2.0) | 26.6 (2.2) | 23.7 (2.0) | 26.2 (1.5) | 0.99 (0.96, 1.02) | 0.502 | 0.053 |
| Very often | 10.9 (0.7) | 9.7 (0.9) | 11.1 (1.7) | 11.0 (1.3) | 6.2 (1.0) | 7.7 (0.9) | 8.9 (1.3) | 0.94 (0.89, 0.99) | 0.010 | 0.788 |
| PIR |  |  |  |  |  |  |  |  |  |  |
| ≤130% | 30.6 (1.9) | 24.9 (2.7) | 32.8 (2.9) | 31.9 (3.0) | 34.3 (4.8) | 33.3 (4.3) | 29.5 (3.5) | 1.02 (0.97, 1.08) | 0.379 | 0.322 |
| >130% | 69.4 (1.9) | 75.1 (2.7) | 67.2 (2.9) | 68.1 (3.0) | 65.7 (4.8) | 66.7 (4.3) | 70.5 (3.5) | 0.98 (0.92, 1.03) | 0.379 | 0.322 |
| Physical Activity |
| Inactive | 8.5 (1.3) | 9.2 (1.0) | 14.2 (0.9) | 16.7 (2.0) | 23.1 (2.5) | 17.4 (1.9) | 18.5 (2.2) | 1.16 (1.11, 1.23) | <0.001 | 0.010 |
| Active | 91.5 (1.3) | 90.8 (1.0) | 85.8 (0.9) | 83.3 (2.0) | 76.9 (2.5) | 82.6 (1.9) | 81.5 (2.2) | 0.86 (0.82, 0.90) | <0.001 | 0.010 |

Abbreviations. CI, confidence interval; PIR, poverty income ratio; SE, standard error. The unweighted sample size (N) for each subgroup can be found in Table S3. Percentages and standard errors (shown in parentheses) account for the complex survey design and sample weights based on probabilities of selection, oversampling, and nonresponse.

\* Multinomial logistic regression was performed adjusting for age in years. Linear and quadratic temporal trends were tested by requesting the predicted marginal proportions for each level of survey cycle (treated as an ordinal variable). P<0.05 is considered significant and are bolded.

**Table S7**. Adjusted OR for EBP/HTN and HTN per 1000 mg difference in usual sodium intake, NHANES 2003-2016

|  |  |  |  |
| --- | --- | --- | --- |
| **Usual Sodium (1000 mg)** | **N** | **EBP/HTN** | **HTN** |
| **AOR (95% CI)** | ***P* Value** | **AOR (95% CI)** | ***P* Value** |
| Model 1\* | 12,241 | 1.18 (1.03, 1.35) | 0.020 | 1.20 (0.96, 1.50) | 0.103 |
| Model 1A\* | 12,241 | 1.13 (0.87, 1.47) | 0.344 | 1.28 (0.92, 1.78) | 0.143 |
| Model 2 † | 11,497 | 1.18 (1.02, 1.36) | 0.027 | 1.20 (0.95, 1.51) | 0.120 |
| Model 2A † | 11,497 | 1.18 (1.02, 1.36) | 0.029 | 1.20 (0.95, 1.51) | 0.118 |
| Model 3 ‡ | 7,372 | 1.13 (0.95, 1.35) | 0.153 | 1.20 (0.92, 1.58) | 0.180 |
| Model 3A ‡ | 7,372 | 1.12 (0.95, 1.31) | 0.181 | 1.18 (0.91, 1.52) | 0.209 |

Abbreviations. AOR, adjusted odds ratio; CI, confidence interval; EBP/HTN, either elevated blood pressure or hypertension; HTN, hypertension only; PIR, poverty income ratio. Logistic models were used to examine temporal trends in EBP/HTN and HTN. *P* values presented are Satterthwaite test values and a p<0.05 is considered significant.

\* Model 1 is adjusted for survey cycle, age, sex, race and Hispanic origin, and weight status. Analysis is limited to participants with data on table salt use.

\* Model 1A is adjusted for survey cycle, age, sex, race and Hispanic origin, weight status, and table salt use.

† Model 2 is adjusted for survey cycle, age, sex, race and Hispanic origin, and weight status. Analysis is limited to participants with data on PIR.

† Model 2A is adjusted for survey cycle, age, sex, race and Hispanic origin, weight status, and PIR.

‡ Model 3 is adjusted for survey cycle, age, sex, race and Hispanic origin, and weight status. Analysis is limited to participants with data on physical activity.

‡ Model 3A is adjusted for survey cycle, age, sex, race and Hispanic origin, weight status, and physical activity.

**Table S8**. Adjusted odds ratios for EBP/HTN and HTN per 2-year survey cycle among children and adolescents aged 8-17 years with the variable in question, NHANES 2003-2016

|  |  |  |  |
| --- | --- | --- | --- |
| **Models** | **N** | **EBP/HTN** | **HTN** |
| **AOR (95% CI)** | **β-Coeff.** | ***P* Value** | **AOR (95% CI)** | **β-Coeff.** | ***P* Value** |
| Model 1\* | 12,241 | 0.91 (0.86, 0.96) | -0.095 | <0.001 | 0.88 (0.82, 0.95) | -0.123 | 0.001 |
| Model 1A\* | 12,241 | 0.92 (0.84, 0.99) | -0.088 | 0.034 | 0.87 (0.78, 0.96) | -0.140 | 0.008 |
| Model 2†  | 11,497 | 0.92 (0.87, 0.96) | -0.087 | 0.001 | 0.89 (0.83, 0.96) | -0.119 | 0.001 |
| Model 2A† | 11,497 | 0.92 (0.87, 0.97) | -0.082 | 0.002 | 0.89 (0.83, 0.96) | -0.112 | 0.003 |
| Model 3‡ | 7,372 | 0.90 (0.85, 0.95) | -0.108 | <0.001 | 0.86 (0.79, 0.93) | -0.154 | <0.001 |
| Model 3A‡ | 7,372 | 0.90 (0.85, 0.96) | -0.104 | 0.001 | 0.86 (0.80, 0.93) | -0.148 | <0.001 |

Abbreviations. AOR, adjusted odds ratio; CI, confidence interval; Coeff., coefficient; EBP/HTN, either elevated blood pressure or hypertension; HTN, hypertension only; PIR, poverty income ratio. Logistic models were used to examine temporal trends in EBP/HTN and HTN. *P* values presented are Satterthwaite test values and a p<0.05 is considered significant.

\* Model 1 is adjusted for survey cycle, age (years), sex, race and Hispanic origin, weight status, and table salt use

\* Model 1A is adjusted for the same variables as Model 1 plus usual daily sodium intake (mg).

† Model 2 is adjusted for survey cycle, age (years), sex, race and Hispanic origin, weight status, and PIR.

† Model 2A is adjusted for the same variables as Model 2 plus usual daily sodium intake (mg).

‡ Model 3 is adjusted for survey cycle, age (years), sex, race and Hispanic origin, weight status, and physical activity (among persons ≥12 years).

‡ Model 3A is adjusted for the same variables as Model 3 plus usual daily sodium intake (mg)

14,263 potential examined participants aged 8-17 years

13,128 participants

12,309 participants

12,249 US participants aged 8-17 years included for analyses

Missing BP measurements

n=1,135

Missing sodium intake or unreliable intake from first dietary recall

n=819

Missing Body Mass Index

n=60

**Figure S1**. Flow Diagram of Exclusion Criteria