**Short sleep duration is associated with inadequate hydration: Cross-cultural evidence from US and Chinese adults**

**Supplemental Material**

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Supplemental Table 1: Relationship between sleep duration on urine specific gravity and odds of inadequate hydration (Usg >1.020 g/ml) among US adults, NHANES 2007-2008.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
|  | Beta (SE) | Beta (SE) | Odds Ratio (95% CI) | Odds Ratio (95% CI) |
| VARIABLES | Usga,d (g/ml) | Usgb,d (g/ml) | inadequate hydrationa,c,d | inadequate hydrationb-d |
| Sleep |  |  |  |  |
| <5 hours sleep | 0.0006 | 0.0005 | 1.16 | 1.13 |
|  | (0.0005) | (0.0006) | (0.75 - 1.79) | (0.73 - 1.75) |
| 5-6 hours sleep | 0.0005\* | 0.0006\*\* | 1.17\*\* | 1.17\*\* |
|  | (0.0003) | (0.0003) | (1.04 - 1.32) | (1.02 - 1.35) |
| 7-8 hours sleep | Ref | Ref | 1 | 1 |
|  |  |  |  |  |
| ≥9 hours sleep | 0.0006 | 0.0007 | 1.06 | 1.06 |
|  | (0.0007) | (0.0007) | (0.69 - 1.65) | (0.68 - 1.67) |
|  |  |  |  |  |
| Observationse | 4,680 | 3,689 | 4,680 | 3,689 |
| R-squared | 0.17 | 0.17 |  |  |

Standard errors or 95% CI in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

aNot excluding adults with diabetes or diuretic use.

bExcluding adults with diabetes, diuretic use, and weak/failing kidneys.

cInadequate hydration is Usg>1.020 g/ml.

dAdjusted for age, race/Hispanic origin, sex, BMI, total water intake, alcohol intake, high caffeine intake (>400 mg), time of exam, physical activity level > 150 minutes of moderate/vigorous activity/week.

eUnweighted sample size

Supplemental Table 2: Relationship between sleep duration on urine osmolality and odds of inadequate hydration (>831 mosm/kg) among US adults, NHANES 2009–2012

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
|  | Beta (SE) | Beta (SE) | Odds Ratio (95% CI) | Odds Ratio (95% CI) |
| VARIABLES | Uosma,d (Mosm/kg) | Uosmb,d (Mosm/kg) | inadequate hydrationa,c,d | inadequate hydrationb-d |
| Sleep |  |  |  |  |
| <5 hours sleep | 17.78 | 10.70 | 0.95 | 0.92 |
|  | (18.57) | (23.25) | (0.71 - 1.26) | (0.62 - 1.37) |
| 5-6 hours sleep | 16.36\*\* | 19.63\*\*\* | 1.21\*\*\* | 1.20\*\*\* |
|  | (6.25) | (6.78) | (1.09 - 1.33) | (1.05 - 1.36) |
| 7-8 hours sleep | Ref | Ref | 1 | 1 |
|  |  |  |  |  |
| ≥9 hours sleep | 7.97 | 9.25 | 0.89 | 0.91 |
|  | (12.26) | (14.77) | (0.65 - 1.23) | (0.66 - 1.27) |
|  |  |  |  |  |
| Observations | 9,599 | 7,664 | 9,599 | 7,664 |
| R-squared | 0.15 | 0.15 |  |  |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

aNot excluding adults with diabetes or diuretic use.

bExcluding adults with diabetes, diuretic use, and weak/failing kidneys.

cInadequate hydration is Uosm > 831 mOsm/kg.

dAdjusted for age, race/Hispanic origin, sex, BMI, total water intake, alcohol intake, high caffeine intake (>400 mg), time of exam, physical activity level > 150 minutes of moderate/vigorous activity/week.

eUnweighted sample size

Supplemental Table 3: Relationship between sleep duration on urine specific gravity and odds of inadequate hydration (>1.020 g/ml) among Chinese adults in the Kailuan Study, 2012.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
|  | Beta (SE) | Beta (SE) | Odds Ratio (95% CI) | Odds Ratio (95% CI) |
| VARIABLES | Usga,d (g/ml) | Usgb,d (g/ml) | inadequate hydrationa,c,d | inadequate hydrationb-d |
| Sleep |  |  |  |  |
| <5 hours sleep | 0.0006\*\* | 0.0008\*\* | 1.42\*\*\* | 1.56\*\*\* |
|  | (0.0003) | (0.0003) | (1.16 - 1.75) | (1.21 – 2.03) |
| 5-6 hours sleep | 0.0004\*\*\* | 0.0004\*\*\* | 1.28\*\*\* | 1.32\*\*\* |
|  | (0.0001) | (0.0001) | (1.18 - 1.40) | (1.20 - 1.46) |
| 7-8 hours sleep | Ref | Ref | 1 | 1 |
|  |  |  |  |  |
| ≥9 hours sleep | -0.0009\* | -0.0014\*\* | 0.76 | 0.71 |
|  | (0.0005) | (0.0006) | (0.53 - 1.09) | (0.47 - 1.09) |
|  |  |  |  |  |
| Observations | 11,903 | 8,766 | 11,903 | 8,766 |
| R-squared | 0.03 | 0.04 |  |  |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

aNot excluding adults with diabetes or diuretic use.

bExcluding adults with diabetes, diuretic use, and weak/failing kidneys.

cInadequate hydration is Usg>1.020 g/ml.

dAdjusted for age, sex, BMI, physical activity level status, and alcohol drinking status.