Intra-day, inter-day and year-on-year trends in sodium intake using the National Diet & Nutrition Survey Rolling Programme

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Sodium and blood pressure

• High sodium consumption is a significant predictive risk factor for hypertension \(^1\)
• WHO guidelines recommend not to exceed 2000 mg/d \(^2\)
• The potential effect of timing of sodium intake on disease risk is unknown
• Knowledge of diurnal and weekly patterns of sodium intake may also be helpful in designing practical nutrition guidelines.
• Food diaries collected from adults participating in the UK NDNS RP specifically measure timings of food intake; subsequently converted to sodium

2. World Health Organization. WHO global sodium benchmarks for different food categories. 2021
The National Diet & Nutrition Survey Rolling Programme (NDNS RP)

The rolling programme started in 2008.

~1000 individuals per year across all the regions in the UK.

NDNS surveys food consumption & demographic data and collects blood & urine samples to determine nutritional status of the UK population.

- Times of food consumption, categorised into seven predefined time periods.
- Food consumption categorised in week & weekend.

Of particular interest: clinical BP, sociodemographic data and anthropometric measurements.

Research Aims

Using 10 consecutive years NDNS (2008-2018):

1. Intra-day patterns of sodium intake (*across the day*)

2. Inter-day patterns of sodium intake (*weekday v weekend*)

Methods
• Request submitted to UK Data Service to access NDNS files

• Extracted raw data sets as SPSS files

• Data required to match participant energy and body composition data were in different files and merge function in SPSS was used
Specific measurements......

Data extracted from the database included:

- Sodium intake measured by 3- or 4-day food diaries
- Time period in which food was consumed
- Valid weight and height data
Reliability of dietary data

• Misreporting is common in dietary assessment

• Misreporting of energy intake was assessed using an adaptation of the Goldberg cut off technique

\[ S = \sqrt{\frac{CV^2_{wEI}}{d}} + CV^2_{WB} + CV^2_{LP} \]

Lower cut off (> PAL x EXP(-2 x S/100√1))
Upper cut off (> PAL x EXP(2 x S/100√1))

• All unreliable reporters were excluded from analyses

5. Goldberg, 1998 & EFSA 2018
Data & statistical analysis

1. Intra-day
   - Diurnal changes in sodium intake are presented as trend data across the 24-hour day
   - 2016/2017 – 2018/2019
   - Split by sex

2. Inter-day
   - Weekday sodium intake was compared to weekend sodium intake (paired samples t-test)
   - Cohens D values were employed to show the effect size
   - 2016/2017 – 2018/2019
   - Split by age group and sex

3. Year-to-year
   - Sodium intake across the ten-year period is presented as trend data by year
   - One-Way ANOVA to assess significance of year-on-year trends
   - Total (Male + Female)
Results
Years 2016/2017 to 2018/2019 (n=3558)

Valid reporters (n=2009)

Participants > 18 years (n=1001)

Included in analyses (n=847)

Excluded:
- Misreports (n=1279)
- No valid weight data (270)
- < 18 years (n=1008)
- Taking antihypertensive drugs (154)
Intra-day patterns of sodium intake

Figure 1: Diurnal variation in sodium intake in UK adults (2016/2017 -2018/2019)
Inter-day patterns of sodium intake

Figure 2: Comparison of sodium intakes between weekend and weekdays across sex groups in the age group 19-64 years

Figure 3: Comparison of sodium intakes between weekend and weekdays across sex groups in the age group 65+ years

Figure 4: Trends in sodium intake from 2008-2019
Discussion
Lunchtime and evening meals combined accounted for half of all sodium consumed by males, while the contribution was 58% in females.

Sodium intake has decreased significantly from (2314 ± 872 mg/d) in 2008 to (1955 ± 756 mg/d) in 2018.

Sodium intake was not significantly different in either males or females between weekdays and weekends.

Key findings

1. Intra-day
   • Lunchtime and evening meals combined accounted for half of all sodium consumed by males, while the contribution was 58% in females.

2. Inter-day
   • Sodium intake was not significantly different in either males or females between weekdays and weekends.

3. Year-to-year
   • Sodium intake has decreased significantly from (2314 ± 872 mg/d) in 2008 to (1955 ± 756 mg/d) in 2018.

Monitor of progress of recent salt reduction campaigns led by FSA
Secondary analysis of NDNS

• Significant level of resource & investment → food diaries, urine collection, anthropometrics

• Public money used to generate primary data is being used to further interrogate trends and patterns of dietary analysis and non-communicable disease

• Enables hypotheses testing and trend analysis using diet, body composition and blood & urine markers
Covid-19; comparisons of past & present data

- Change of data collection method
- Interpretation of results
Acknowledgements

PhD student: Ciara Goland
TUS Supervisors: Dr Geraldine Cuskelly & Dr Trish Heavey

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