



# 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 <sup>1</sup>
- WHO guidelines recommend not to exceed 2000 mg/d<sup>2</sup>
- 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

1. Mente A, et al. Assessment of Dietary Sodium and Potassium in Canadians Using 24-Hour Urinary Collection. *Can J Cardiol* 2016;32(3):319–26.

2. World Health Organization. *WHO global sodium benchmarks for different food categories*. 2021



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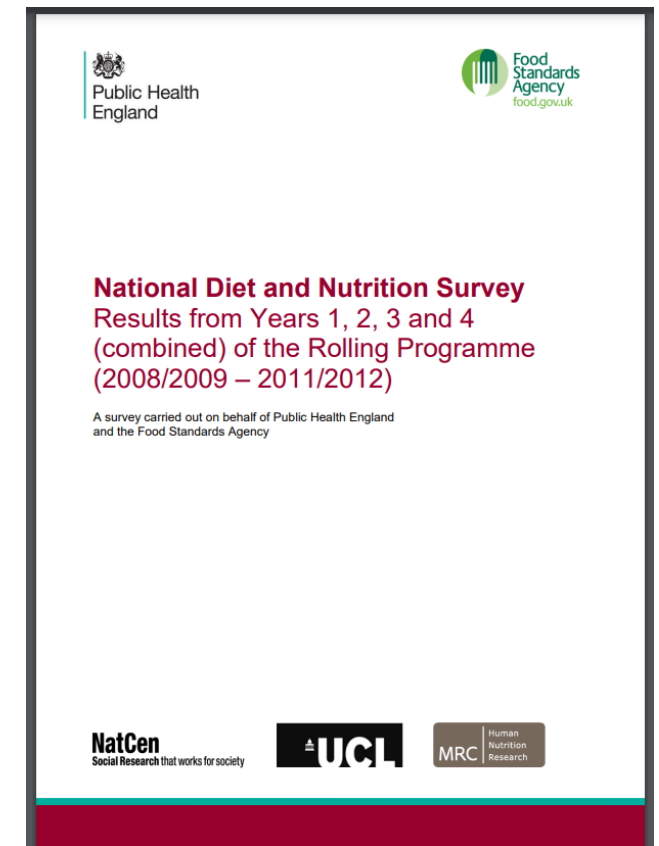
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# NDNS Rolling Programme



- The National Diet & Nutrition Survey Rolling Programme (NDNS RP)
- The rolling programme started in 2008<sup>3</sup>
- ~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 pre-defined time periods
  - Food consumption categorised in week & weekend
- Of particular interest: clinical BP, sociodemographic data and anthropometric measurements



3. Whitton C et al. Br J Nutr. 2011 Dec;106(12):1899–914.



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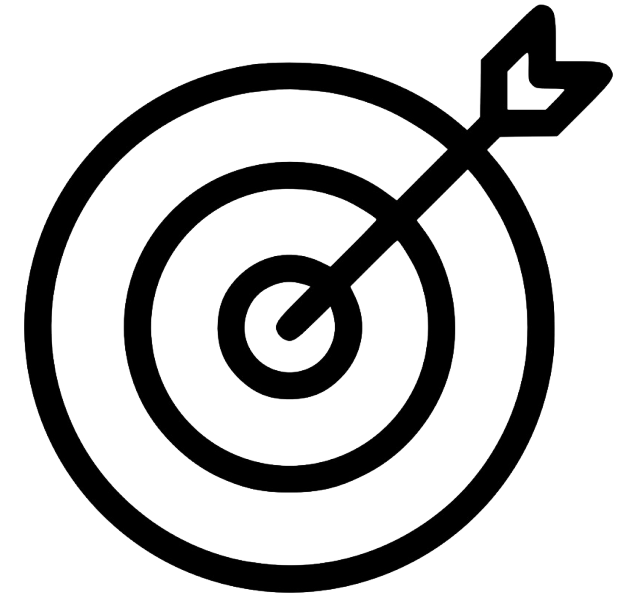
# Research Aims

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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*)
3. Trends in dietary sodium intake in the UK across a ten-year period (2008-2018)



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# Methods

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- 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



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# Specific measurements.....

Data extracted from the database included:

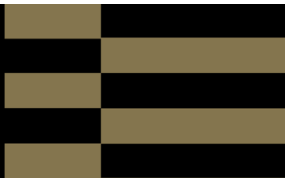
- Sodium intake measured by 3- or 4-day **food diaries**
- **Time period** in which food was consumed
- Valid **weight and height** data



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# Reliability of dietary data

- Misreporting is common in dietary assessment <sup>4</sup>
- Misreporting of energy intake was assessed using an adaptation of the Goldberg cut off technique <sup>5</sup>

$$S = \sqrt{\frac{CV^2_{wEI}}{d} + CV^2_{wB} + CV^2_{tP}}$$

Lower cut off (> PAL x EXP(-2 x S/100v1)

Upper cut off (> PAL x EXP(2 x S/100v1)

- All unreliable reporters were excluded from analyses

4. Black AE. Int J Obes Relat Metab Disord. 2000 Sep;24(9):1119–30.

5. Goldberg, 1998 & EFSA 2018



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# 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
- 2008/2009 – 2018/2019
- Total (Male + Female)



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# Results

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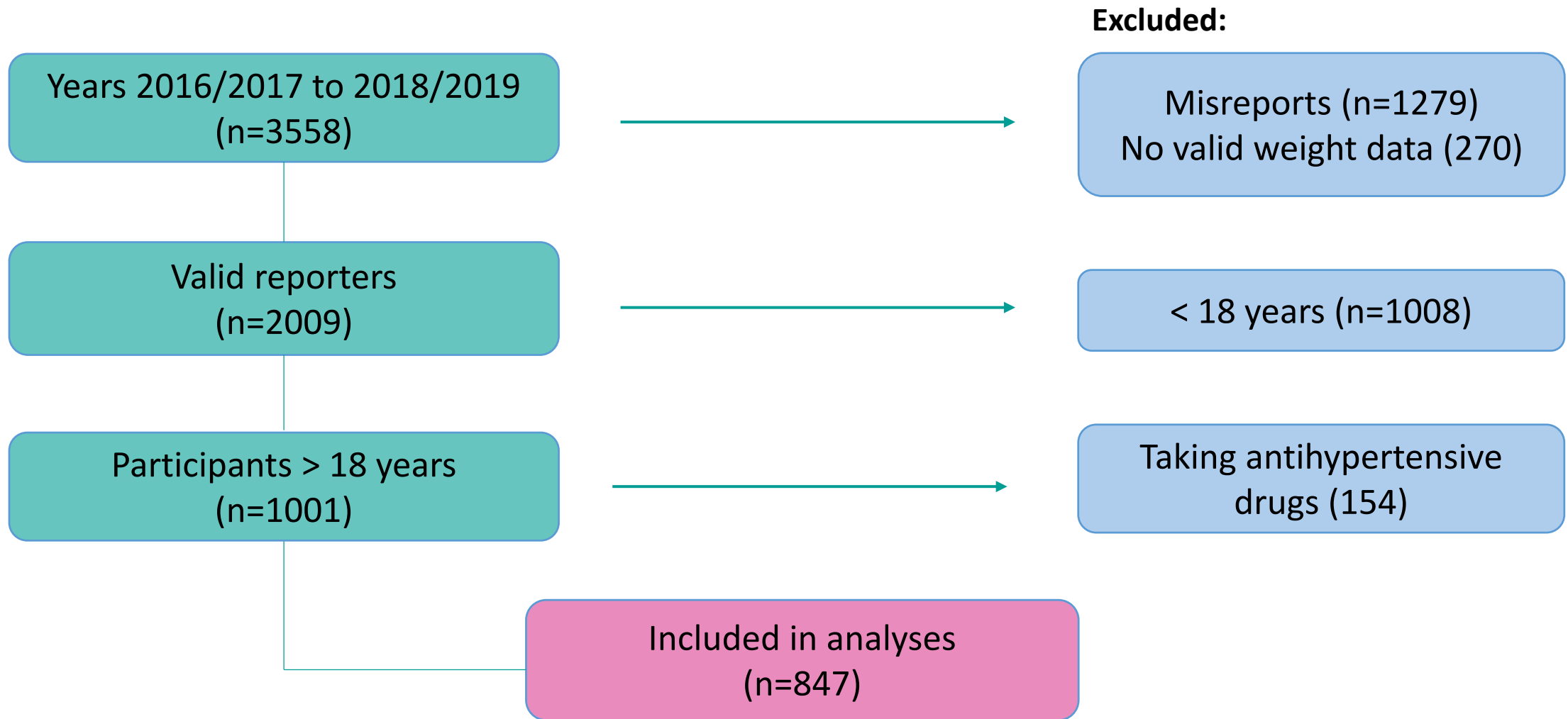
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# Flow chart of exclusion of participants



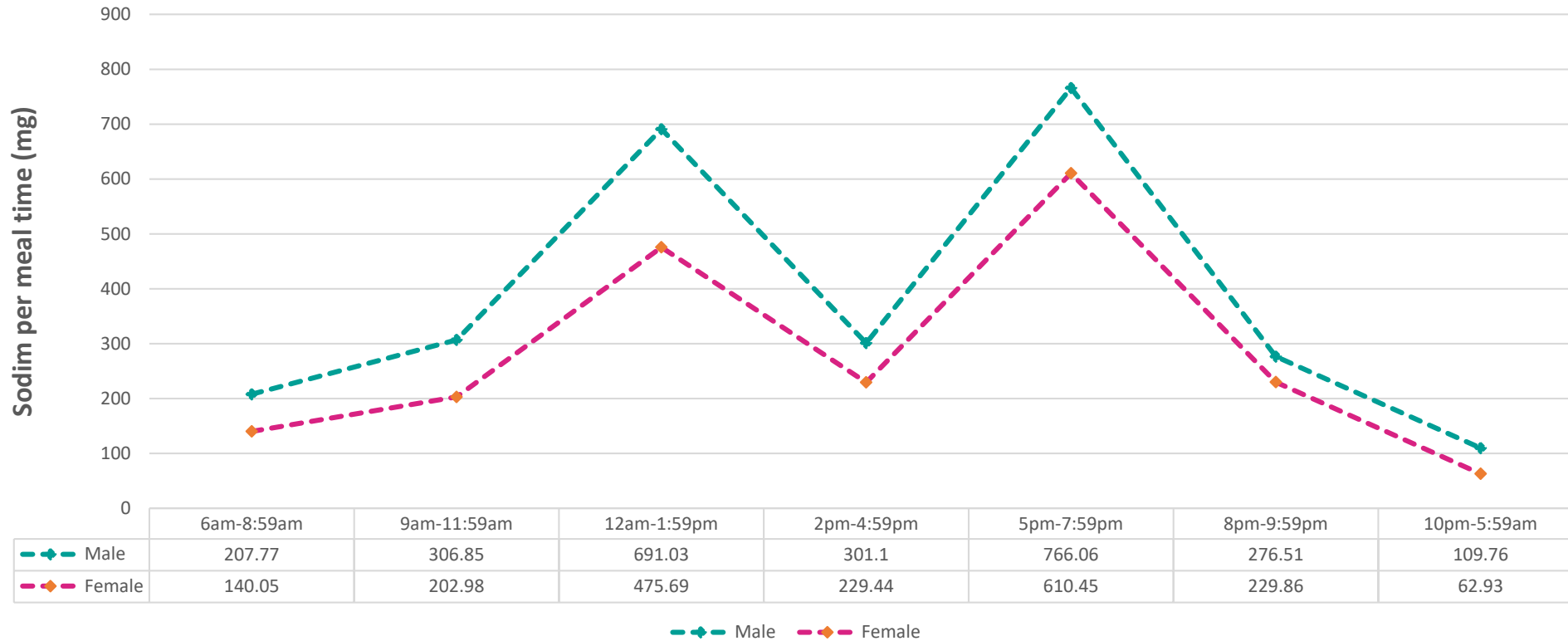
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# Intra-day patterns of sodium intake

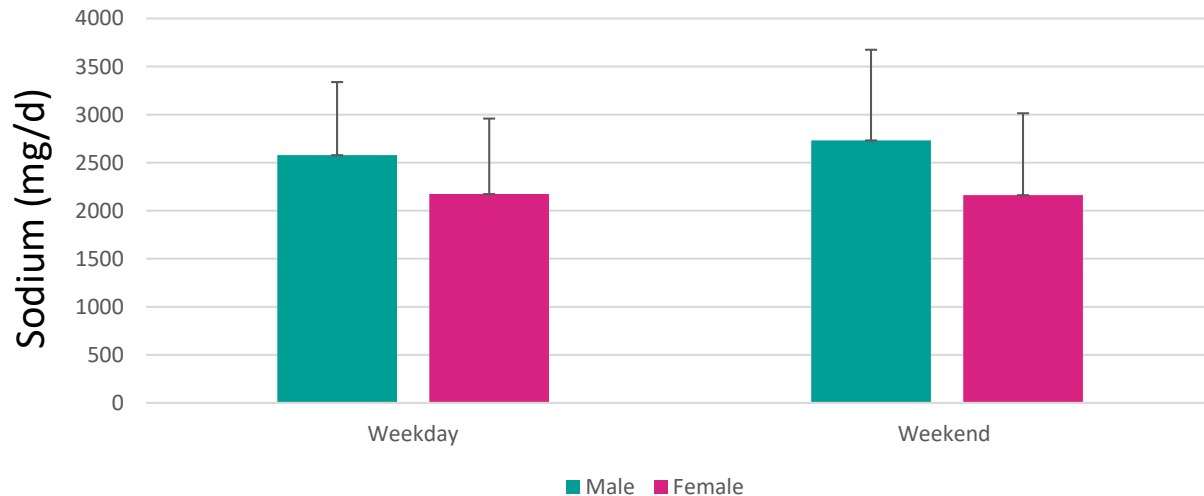


**Figure 1: Diurnal variation in sodium intake in UK adults (2016/2017 -2018/2019)**

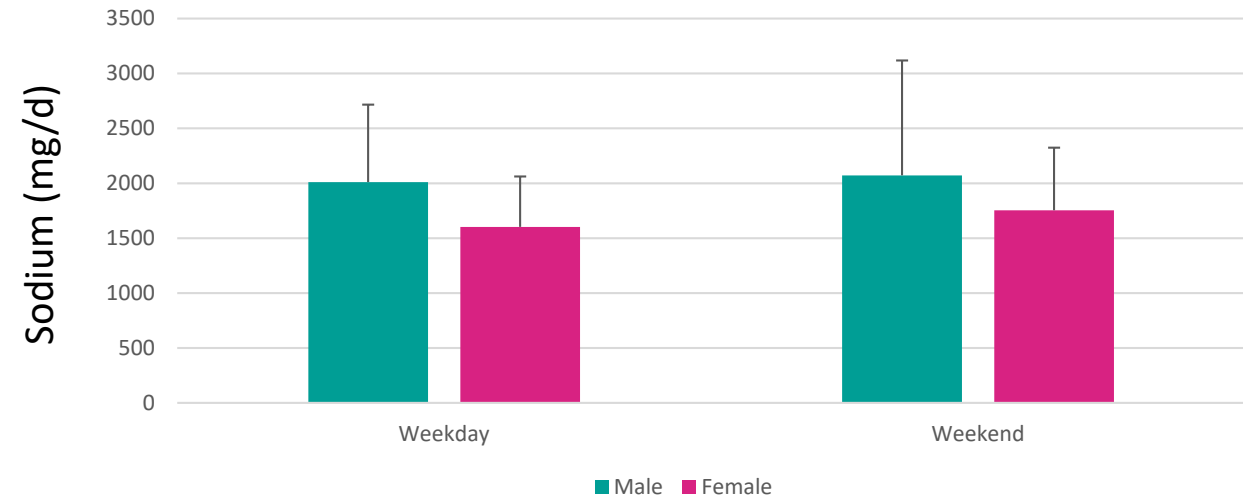


# Inter-day patterns of sodium intake

Total sodium intake (mg/d)  
Age group: 19-64 years



Total sodium intake (mg/d)  
Age group: 65+ years



**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**



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# Annual trends in sodium intake (2008 – 2018)

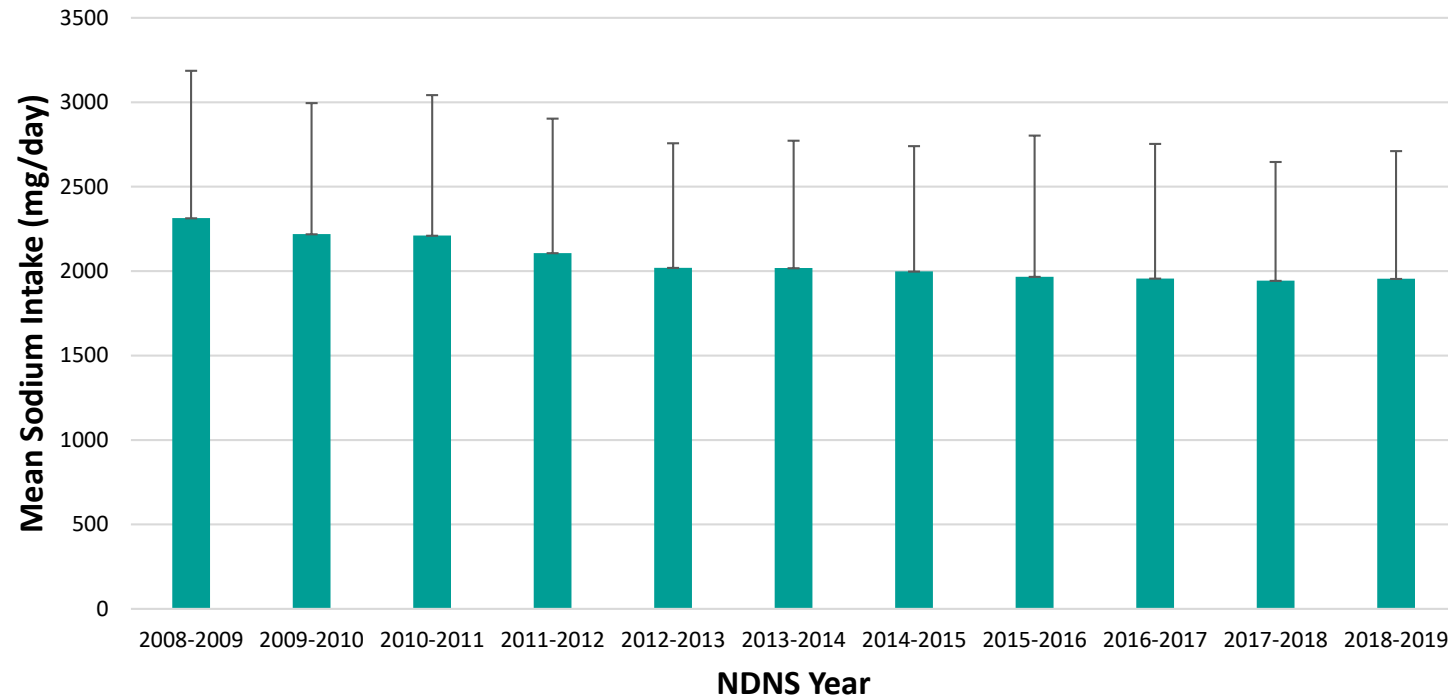


Figure 4: Trends in sodium intake from 2008-2019



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# Discussion

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# 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.

*target sodium reduction*

## 2. Inter-day

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

*target sodium reduction patterns*

## 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*



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# Secondary analysis of NDNS

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- 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



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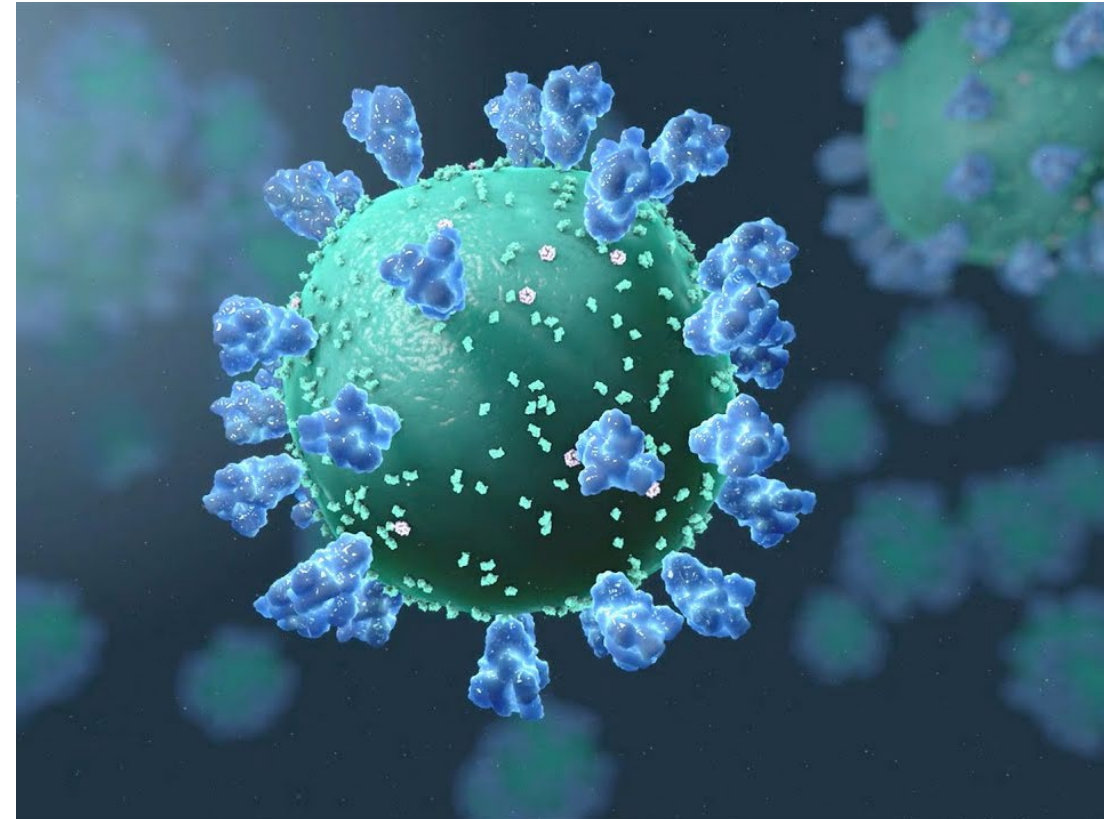
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# Covid-19; comparisons of past & present data

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- Covid-19 Pandemic (2020 – 2022)
- Change of data collection method
- Interpretation of results



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# Acknowledgements

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# Questions

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