

# Self-reported food intake decreases over recording period in the National Diet and Nutrition Survey.

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Running head: Food intake decreases over recording period

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## Abstract

From 2008 the UK's National Diet and Nutrition Survey (NDNS) changed the method of dietary data collection from a 7-d weighed diary to a 4-d unweighed diary, partly to reduce participant burden. This study aimed to test whether self-reported energy intake changed significantly over the 4-d recording period of the NDNS rolling programme. Analyses used data from the NDNS years 1 (2008/2009) to 8 (2015/2016) inclusive, from participants aged 13 y. and older. Dietary records from participants who reported unusual amounts of food and drink consumed on one or more days were excluded, leaving 6932 participants. Mean daily energy intake was 7107kJ (1698kcal), and there was a significant decrease of 164kJ (39kcal) between days one and four ( $P < 0.001$ ). There was no significant interaction of sex or low-energy reporter status (estimated from the ratio of reported energy intake to BMR) with the change in reported energy intake. The decrease in reported energy intake on day four compared to day one was greater ( $P < 0.019$ ) for adults with higher BMIs ( $> 30\text{kg/m}^2$ ) than it was for leaner adults. Reported energy intake decreased over the 4-d recording period of the NDNS rolling programme suggesting that participants change their diet more, or report less completely, with successive days of recording their diet. The size of the effect was relatively minor, however.

## Introduction

The burden on participants of completing food diaries has long been recognized. In one of the earliest dietary studies to use the weighed intake method, conducted a hundred years ago, Moss commented that "It is extremely difficult to induce even the best men to undertake the required task for seven to ten days" <sup>(1)</sup>. Despite the advantages of seven-day dietary records capturing a complete cycle of human behaviour <sup>(2)</sup>, shorter recording periods are frequently used because of the lesser commitment needed from study participants, and because it is assumed that recording completeness diminishes as the recording period progresses <sup>(3)</sup>. Indeed, there is some evidence that calculated energy intake from self-reported food intakes decreases over a seven-day recording period. In an earlier examination of the effect of recording period on low-energy reporting in the National Diet and Nutrition Survey (NDNS), mean reported energy intake decreased by 49kJ (12kcal) ( $se \pm 22\text{kJ}$ ) per day between day two and day seven ( $P = 0.026$ ) after accounting for the effect of day of the week on reported energy intake <sup>(4)</sup>. Until 2003 the NDNS used a seven-day weighed intake diary method, with recording starting on different days of the week. From 2008, the NDNS became a rolling programme of annual surveys using four-day estimated food diaries, which were considered much less burdensome for participants <sup>(5)</sup>. In year one of the rolling programme (2008/2009) participants started recording their food intake on Thursdays, Fridays or Saturdays, resulting in an unbalanced representation of days of the week and no recording on Wednesdays. This was addressed in the following years of the

programme with the first recording day being balanced over all days of the week. Data collection for the rolling programme differs significantly from the earlier NDNS and is less work for participants to complete, and this may reduce the effect of decreasing reported energy intake over the recording period.

The current study aimed to compare the effects of recording period on reported energy intake in the NDNS rolling programme data, and specifically to test whether reported energy intake decreased as recording period progressed, and whether any effect was different for males vs. females, or between low-energy reporters and presumed valid reporters.

## Methods

Data from the NDNS rolling programme years one (2008/2009) to eight (2015/2016) <sup>(6,7)</sup> were used to test for any effects of day of recording of dietary intake on reported energy intake. Participants in the NDNS rolling programme complete an unweighed food diary, recording household measures or weights of foods from labels for four consecutive days. Participants are a representative sample from the UK and were aged from 1 to 96 years.

Parents or carers completed the food diaries of children aged 12 years and younger <sup>(7)</sup>, and these were not included in this study.

Food diary data were examined to identify any that were likely to have been unusual. Data from some participants were excluded where participants had only three day's dietary data ( $n = 160$ ), or had recorded for non-consecutive days ( $n = 5$ ). When completing the diet record, participants note if they ate or drank, more or less than usual, and the reason why this was so. Participants were excluded from these analyses where they reported unusual intakes because of illness or medical reasons ( $n = 699$ ), observing Ramadan ( $n = 3$ ), conscious effort such as being on a weight-loss diet ( $n = 197$ ) or reported an unusual intake but gave no reason ( $n = 175$ ). Of the remaining 6932 participants, 4060 reported an unusual intake on at least one of the four days, but the reason given was considered part of the normal day-to-day variability in food and drink consumption, such as "at friends", "working", "with family" and "weekend". These data were not excluded and four-day diet records from 6932 participants were analysed.

Body Mass Index was calculated from height and weight measurements taken by NDNS interviewers using standard protocols. Adults ( $\geq 18$  years old) were classified into six groups by BMI <sup>(8)</sup>.

Basal Metabolic Rate (BMR) was estimated using the equations of Henry <sup>(9)</sup>, using sex, age and body weight and, where a measurement was performed during the NDNS interview ( $n = 6877$ ), height.

Low energy reporters were identified where the mean reported energy intake from the four-day food record was less than  $1.06 \cdot \text{BMR}^{(10)}$ .

## Statistics

Daily energy intake data were analysed by fitting a linear mixed model with fixed effect terms for the recording day (day one to day four), day of the week (Monday to Sunday), sex (male or female), age group and low-energy reporter status as a categorical variable (low-energy reporters or assumed valid reporters) and random effect terms for variation between and within individuals. Two-way interactions between fixed effects were also included. Significance of fixed effects was assessed by F tests with estimated denominator degrees of freedom. Change in reported energy intake between day one and day four across groups by BMI category were compared using ANOVA, and Least Squares Distance *post hoc* tests. Analyses were conducted using Genstat 17<sup>th</sup> Edition.

## Results

Reported energy intake differed by day of the week ( $P < 0.001$ ), and by recording day ( $P < 0.001$ ) (table 1). Reported energy intake decreased significantly with progressive day of recording after accounting for the day of the week effect, with the mean difference in adjusted energy intake between day one and day four being  $-164\text{kJ}$  ( $-39\text{kcal}$ ).

Mean daily reported energy intake was  $7107\text{kJ}$  ( $1698\text{kcal}$ ), equal to  $1.18 \cdot \text{BMR}$ , and 2509 (36.2%) respondents were identified as low-energy reporters. Mean reported energy intake of the low-energy reporters was, obviously, lower than that of the presumed valid reporters ( $5759\text{kJ}$  ( $1376\text{kcal}$ ) and  $8703\text{kJ}$  ( $2080\text{kcal}$ ) respectively,  $P < 0.001$ ), and there was no significant interaction between low-energy reporter status and the difference in reported energy intake over the recording period. The mean difference in adjusted energy intake between recording days one and four was  $-116\text{kJ}$  ( $-28\text{kcal}$ ) and  $-124\text{kJ}$  ( $-30\text{kcal}$ ) ( $P = 0.144$ ), equal to  $-3.7\%$  and  $-2.4\%$  ( $P = 0.182$ ) of mean daily energy intake, for low-energy reporters and assumed valid reporters respectively.

There was no significant interaction between sex and recording day on reported energy intake between males and females ( $P = 0.702$ ).

The interaction between age group and recording day on reported energy intake was statistically significant ( $P < 0.001$ ). The youngest age group (13-20 years) had the biggest decrease, while the older adults ( $>61$  years) generally increased energy intake over the recording period. Table 2 shows the mean unadjusted reported energy intake values by age group and sex.

Finally, there was a statically significant, but quantitatively negligible, association between body weight status and the change in reported energy intake over the recording period. Participants with lower BMIs tended to have a more negative difference in reported energy intakes on day four compared to day one than did participants with higher BMIs. The correlation between BMI and difference in reported energy intake between recording days one and four was  $R^2 = 0.001$  ( $P = 0.014$ ). BMI is not a good measure of body weight status in children and excluding participants  $< 18$  years old removed the correlation ( $R^2 = 0.000$ ,  $P = 0.870$ ). Grouping adults ( $\geq 18$  years old) by BMI category, however, suggested that those with higher BMIs reduced their energy intake, or reported less energy, over the recording period to a greater extent than did leaner adults ( $P = 0.019$ ) (Table 3).

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## Discussion

This analysis of self-reported food and drink consumption in the NDNS Rolling Programme suggests that changing to a shorter recording period and an easier (for participants) recording method has not removed the tendency for energy intake to decrease over the recording period seen in 7-d weighed food records. The effect is still present but remains quantitatively minor at around 2% of mean daily energy intake over four days.

Reported energy intake was significantly lower on day one than on other days in the 2000/2001 NDNS and decreased by 49kJ (12kcal) per day between days two and seven <sup>(4)</sup>. The adjusted energy intake was 350kJ (84kcal) higher on day four compared to day one, whereas in the current analysis it was 164kJ (39kcal) lower. Therefore, the magnitude of any effect of recording period (and the change in recording method from weighed to unweighed) on reported energy intake appears to have decreased slightly between the NDNS and NDNS Rolling Programmes, mainly because of lower intakes on day one in the 2000/2001 NDNS. When recording their food intake using food diaries study participants tend to change their diets. They also mis-report the foods that they consume, to varying degrees depending on the recording method <sup>(11)</sup>. If asked, around half will admit to altering their diet for various reasons, when completing a 7-day weighed food record, including being more conscious of what they were eating <sup>(12)</sup>. Quantifying this effect is difficult because of the need to record food intake without the participants' awareness. In one study that achieved this by using covert weighing of subjects' food when they were resident in the Rowett's Human Nutrition Unit under conditions that were as close to free-living as practicable, subjects ate less when recording their diets compared to when they were not recording their diets, to the extent that energy intake decreased by 5% (the observation <sup>(11)</sup> or reactivity <sup>(13)</sup> effect). Reported energy intake was an additional 5.1% lower than actual energy intake when participants recorded their intakes using a weighed dietary record (the recording effect). The decrease in reported energy intake over the four-day period of the NDNS was relatively small, and comes from an increase in the observation effect, or an increase in the recording effect (or both) over the recording period. This decrease in the completeness of dietary recording over time is an additional error to the combined observation and recording effects that may need to be considered in study design to avoid introducing bias <sup>(4)</sup>.

Although the size of change in reported energy intake is similar in the 2000/2001 NDNS and combined NDNS Rolling Programme (2008/2016), reported energy intakes, and energy intakes relative to estimated energy requirements, in the current analysis appear to have fallen between the two. Mean daily reported energy intake was 8368kJ (2000kcal), equivalent to 1.29•BMR (BMR recalculated using the equations of Henry <sup>(9)</sup>) in our previous analysis <sup>(4)</sup> compared to 7107kJ (1698kcal) (1.18•BMR) in the current study. However, our previous study did not include participants

<19 years old or >64 years old, and this difference in energy intake between the two studies decreased when the current analysis was repeated using the same age range as in the previous study, being a mean of 7705kJ (1842kcal) per day (1.19•BMR). When comparing nutrient intakes of the first year of the NDNS rolling programme with the 2000/2001 NDNS and 1997 NDNS of young people, Whitton et al. <sup>(14)</sup> found no significant differences in reported energy intakes. However, the authors did not exclude records from participants reporting unusual days because of illness, *etc.* Additionally, year one of the NDNS rolling programme always included both weekend days in the four-day diet recording, which will have tended to elevate reported energy intakes, a feature that was acknowledged and addressed in subsequent years of the rolling programme. Numerous studies have reported an association between higher BMI and an increased likelihood of low-energy reporting <sup>(e.g. 15,16)</sup>. The prevalence of low-energy reporting in studies with similar methodology to the NDNS was 12%-16% for 3-d records, 31% for 4-d records and 21%-37% for 7-d records. Across the NHANES, which assesses diet by 24-hr recalls, from 2003 to 2012 the prevalence of low-energy reporting was 17% for underweight adults, 14% for normal weight, 23% for overweight and 37% for obese adults <sup>(17)</sup>. However, the few studies that have used a covertly measured food intake as the reference, rather than estimated or measured energy expenditure, have produced inconsistent findings, with no effect of BMI on the degree of misreporting <sup>(18,19)</sup>, that obese subjects are more accurate in reporting their food intake than are overweight or lean subjects <sup>(20)</sup>, or that obese subjects are less accurate <sup>(21)</sup>. The difference in the apparent effect of BMI on the degree of misreporting when using estimated energy requirements compared to actual food intake may reflect a difficulty in estimating energy requirements in individuals with higher BMIs. BMR is often estimated using well established linear regression equations <sup>(9,22)</sup>, which tend to over-estimate at higher body weights. Overestimating BMR will lower the ratio of reported energy intake to BMR, and result in subjects with higher BMIs being more likely to be identified as low-energy-reporters than are lean subjects. Despite this, the overweight and obese still appear more likely to be classified as low-energy-reporters than others after accounting for differences in body composition by estimating BMR from estimated fat-free-mass <sup>(23)</sup>. Irrespective of whether or not overweight people under-report their food intake more, or change their diet more while recording it, than do lean people, the current study provides some evidence that the obese (BMI > 30kg/m<sup>2</sup>) do change their diet, or under report more, over the recording period. This is consistent with participants becoming more conscious of their diet as they record it. A greater concern with social approval, or social desirability, appears related to increased under-reporting of food intake, probably through the biased under-reporting of less-healthy foods <sup>(24)</sup>. The effect is reported across most common dietary assessment methods, including food diaries, and tends to be greater in females than males. It is possible that social desirability is related to a greater decrease in reporting over the recording period.

Asking overweight people to record their food intake is a method used to help change behaviour and food choice to create a negative energy balance <sup>(25,26)</sup>. Completing a food diary results in a significant weight loss over seven-days even in participants who are not aiming to lose weight <sup>(27,28)</sup>. The results of this study suggest that the effect is similar in lean people also.

The results of this study might be interpreted as evidence that even shorter recording periods, such as 24-hour recalls, would reduce the prevalence of low-energy-reporting in dietary surveys. The benefit of less inaccurate diet records must be balanced against the need to capture intakes of foods that are infrequently consumed, such as oil-rich fish <sup>(29)</sup> and nutrients with large day-to-day variations in intake <sup>(30)</sup>. Additionally, seven-days is a full cycle of eating behaviour <sup>(2)</sup> and energy and macronutrient intakes vary over the days of the week <sup>(31,32)</sup>.

It is possible that the observation and recording effects on reported energy intake vary over the recording period. Some participants may have eaten less than usual on each of the four-days, but with the same reporting accuracy (food records were an accurate description of an atypical diet), or food intake may have not greatly changed but recording accuracy decreased over the recording period (food records were an inaccurate record of a typical diet). Weighing participants before and after completing the diet records could be used to elucidate this, although change in body weight is not a good indicator of change in energy balance over such a short period. The data collection of the NDNS Rolling Programme does not allow these two effects to be separated.

Using ratios of reported energy intakes to estimated energy requirements to identify probable low-energy reporters is not without its problems, and participants with relatively high energy intakes may have changed their diet and under-reported their food intake to some degree.

The strengths of this study come from the strengths of the NDNS, which has amassed dietary data from a large nationally representative sample of the UK population, and which is broadly representative of the UK population for Socio-Economic Classification. Because diet records were started on different days of the week the current study was able to separate the effects of day of the week, and recording day, on reported energy intake.

The results of this study show that estimated energy intake from self-reported food intake decreased by a mean of 164kJ (39kcal) over the four-day recording period of the NDNS rolling programme, suggesting that participants change their diet or report less completely over time.

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### Conflict of Interest

The authors have no conflicts of interest to declare.

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## References

1. Moss NK (1923) Some effects of high air temperature and muscular exertion upon colliers. *Proceedings of the Royal Society B* **95**, 181–200.
2. McCarthy S (2014) Weekly patterns, diet quality and energy balance. *Physiol Behav* **134**, 55–59.
3. Young CM & Trulsson MF (1960) Methodology for dietary studies in epidemiological surveys. II-strengths and weaknesses of existing methods. *Am J Public Health* **50**, 803–814.
4. Whybrow S, Horgan G & Stubbs RJ (2008) Low-energy reporting and duration of recording period. *Eur. J. Clin. Nutr.* **62**, 1148–1150.
5. Ashwell M, Barlow S, Gibson S, et al. (2006) National Diet and Nutrition Surveys: the British experience. *Public Health Nutr.* **9**, 523–530.
6. Bates B, Cox L, Nicholson S, et al. (2016) *National Diet and Nutrition Survey Results from Years 5 and 6 (combined) of the Rolling Programme (2012/2013–2013/2014)*. London, UK: Public Health England.
7. Bates B, Lennox A, Prentice A, et al. (2014) National Diet and Nutrition Survey Results from Years 1, 2, 3 and 4 (combined) of the Rolling Programme (2008/2009 – 2011/2012). .
8. (2000) *Obesity: preventing and managing the global epidemic. Report of a WHO consultation*. i–xii, 1–253. Switzerland: .
9. Henry CJK (2005) Basal metabolic rate studies in humans: measurement and development of new equations. *Public Health Nutr.* **8**, 1133–1152.
10. Goldberg GR, Black AE, Jebb SA, et al. (1991) Critical-evaluation of energy-intake data using fundamental principles of energy physiology .1. Derivation of cutoff limits to identify under-recording. *Eur J Clin Nutr* **45**, 569–581.
11. Stubbs RJ, O'Reilly LM, Whybrow S, et al. (2014) Measuring the difference between actual and reported food intakes in the context of energy balance under laboratory conditions. *Br J Nutr* **111**, 2032–2043.
12. Macdiarmid JI & Blundell JE (1997) Dietary under-reporting: what people say about recording their food intake. *Eur. J. Clin. Nutr.* **51**, 199–200.
13. Thompson FE, Subar AF, Loria CM, et al. (2010) Need for technological innovation in dietary assessment. *J. Am. Diet. Assoc.* **110**, 48–51.
14. Whitton C, Nicholson SK, Roberts C, et al. (2011) National Diet and Nutrition Survey: UK food consumption and nutrient intakes from the first year of the rolling programme and comparisons with previous surveys. *Br J Nutr* **106**, 1899–1914.
15. Poslusna K, Ruprich J, de Vries JH, et al. (2009) Misreporting of energy and micronutrient intake estimated by food records and 24 hour recalls, control and adjustment methods in practice. *Br. J. Nutr.* **101 Suppl 2**, S73-85.
16. Wehling H & Lusher J (2017) People with a body mass index  $\geq 30$  under-report their dietary intake: A systematic review. *J Health Psychol* **24**, 2042–2059.

17. Murakami K & Livingstone MBE (2015) Prevalence and characteristics of misreporting of energy intake in US adults: NHANES 2003-2012. *Br J Nutr* **114**, 1294–1303.
18. Poppitt SD, Swann D, Black AE, et al. (1998) Assessment of selective under-reporting of food intake by both obese and non-obese women in a metabolic facility. *Int. J. Obes.* **22**, 303–311.
19. Conway JM, Ingwersen LA & Moshfegh AJ (2004) Accuracy of dietary recall using the USDA five-step multiple-pass method in men: an observational validation study. *J. Am. Diet. Assoc.* **104**, 595–603.
20. Conway JM, Ingwersen LA, Vinyard BT, et al. (2003) Effectiveness of the US Department of Agriculture 5-step multiple-pass method in assessing food intake in obese and nonobese women. *Am. J. Clin. Nutr.* **77**, 1171–1178.
21. Schebendach JE, Porter KJ, Wolper C, et al. (2012) Accuracy of self-reported energy intake in weight-restored patients with anorexia nervosa compared with obese and normal weight individuals. *International Journal of Eating Disorders* **45**, 570–574.
22. Schofield WN (1985) Predicting Basal Metabolic Rate, new standards and review of previous work. *Hum. Nutr. Clin. Nutr.* **39**, 5–41.
23. Gemming L & Ni Mhurchu C (2016) Dietary under-reporting: what foods and which meals are typically under-reported? *Eur. J. Clin. Nutr.* **70**, 640–641.
24. Maurer J, Taren DL, Teixeira PJ, et al. (2006) The psychosocial and behavioral characteristics related to energy misreporting. *Nutr.Rev.* **64**, 53–66.
25. Elfhag K & Rössner S (2005) Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obes. Rev.* **6**, 67–85.
26. Hollis JF, Gullion CM, Stevens VJ, et al. (2008) Weight Loss During the Intensive Intervention Phase of the Weight-Loss Maintenance Trial. *American Journal of Preventive Medicine* **35**, 118–126.
27. Milne A, McNeill G & Zakary A (1991) Weight change as an indicator of energy imbalance during 7 day weighed food intake studies. *Ecology of food and nutrition* **26**, 281–289.
28. Whybrow S, Mayer C, Kirk TR, et al. (2007) Effects of two-weeks' mandatory snack consumption on energy intake and energy balance. *Obes. Res.* **15**, 673–685.
29. de Roos B, Sneddon AA, Sprague M, et al. (2017) The potential impact of compositional changes in farmed fish on its health-giving properties: is it time to reconsider current dietary recommendations? *Public Health Nutrition* **20**, 2042–2049.
30. Palaniappan U, Cue RI, Payette H, et al. (2003) Implications of day-to-day variability on measurements of usual food and nutrient intakes. *J Nutr* **133**, 232–5.
31. Fyfe CL, Stewart J, Murison SD, et al. (2010) Evaluating energy intake measurement in free-living subjects: when to record and for how long? *Public Health Nutr.* **13**, 172–180.
32. de Castro JM & Plunkett S (2002) A general model of intake regulation. *Neurosci. Biobehav. Rev.* **26**, 581–595.

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## Tables

Table 1. Mean unadjusted and adjusted reported energy intakes by day-of-week and by recording day.

	Proportion of diaries started on this day (%)	Proportion of total number of recorded days (%)	Unadjusted energy intake (kJ/d (kcal))	Adjusted energy intake <sup>1</sup> (kJ/d (kcal))
Monday	12	14	7240 (1730)	6920 (1654)
Tuesday	14	13	7398 (1768)	7054 (1686)
Wednesday	13	13	7352 (1757)	6983 (1669)
Thursday	18	14	7363 (1760)	7002 (1674)
Friday	16	15	7767 (1856)	7169 (1713)
Saturday	13	15	8122 (1941)	7536 (1801)
Sunday	14	15	7534 (1801)	7078 (1692)
Recording day 1			7627 (1823)	7186 (1717)
Recording day 2			7593 (1815)	7108 (1699)
Recording day 3			7572 (1810)	7108 (1699)
Recording day 4			7419 (1773)	7022 (1678)

<sup>1</sup> The adjusted daily energy intake has accounted for effects of sex, age group, low-energy reporter status as a categorical variable, and recording day (for the day of week means) or day of the week (for the recording day means).

Table 2. Mean unadjusted reported energy intake kJ (kcal), and difference in reported energy intake between day four and day one by age group and sex.

Age group (years)	Female					Male				
	Day 1	Day 2	Day 3	Day 4	Difference	Day 1	Day 2	Day 3	Day 4	Difference
13-20	6960 (1663)	6828 (1632)	6685 (1598)	6479 (1549)	-481 (-115)	8746 (2090)	8503 (2032)	8547 (2043)	8251 (1972)	-495 (-118)
21-30	6895 (1648)	6832 (1633)	7045 (1684)	6866 (1641)	-29 (-7)	9431 (2254)	9426 (2253)	9244 (2209)	9146 (2186)	-285 (-68)
31-40	6870 (1642)	6975 (1667)	6910 (1652)	6672 (1595)	-198 (-47)	9263 (2214)	8999 (2151)	9265 (2214)	8947 (2138)	-316 (-76)
41-50	6914 (1652)	6905 (1650)	6739 (1611)	6838 (1634)	-76 (-18)	9017 (2155)	9172 (2192)	8952 (2140)	8714 (2083)	-303 (-72)
51-60	6767 (1617)	6677 (1596)	6801 (1625)	6721 (1606)	-46 (-11)	8754 (2092)	8696 (2078)	8739 (2089)	8466 (2023)	-288 (-69)
61-70	6383 (1526)	6666 (1593)	6655 (1591)	6554 (1566)	171 (41)	8520 (2036)	8572 (2049)	8435 (2016)	8454 (2021)	-66 (-16)
71-80	6121 (1463)	6142 (1468)	6207 (1484)	6215 (1485)	94 (22)	7596 (1815)	7676 (1835)	7649 (1828)	7676 (1835)	80 (19)
81-90	6210 (1484)	6242 (1492)	5978 (1429)	6069 (1451)	-141 (-34)	7503 (1793)	7278 (1739)	7686 (1837)	7186 (1717)	-317 (-76)
91-100	4456 (1065)	4632 (1107)	4453 (1064)	4540 (1085)	84 (20)	6010 (1436)	6612 (1580)	6718 (1606)	6639 (1587)	629 (150)

Table 3. Mean daily energy intake and difference in energy intake between day one and day for by BMI category.

BMI group	n	Mean daily energy intake (kJ)	Difference in daily energy intake between day one and day four (kJ)
Underweight <18.5 kg/m <sup>2</sup>	85	7346 (1756)	63 (15)
Normal weight 18.5 – 24.9 kg/m <sup>2</sup>	1701	7720 (1845) abc	-282 (-67) a
Pre-obesity 25 – 29.9 kg/m <sup>2</sup>	1874	7632 (1824) def	19 (4) ab
Obesity class I 30 – 34.9 kg/m <sup>2</sup>	954	7368 (1761) ad	-80 (-19) c
Obesity class II 35 – 39.9 kg/m <sup>2</sup>	357	7071 (1690) be	-163 (-39)
Obesity class III ≥ 40 kg/m <sup>2</sup>	135	7147 (1708) cf	-635 (-152) bc

Values in the same column with the same letter are statistically different (P < 0.05).

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