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Dietary value for money? Investigating how the monetary value of diets in the National Diet and Nutrition Survey (NDNS) relate to dietary energy density

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Estimating the monetary value of individuals' diets allows investigation into how costs relate to dietary quality. A number of studies[1–2], including one in Scotland[3], have reported a strong negative relationship between diet costs and energy density. Most studies of this type neglect to address the issue of mathematical coupling, where energy is both the numerator in the energy density variable (kJ/g) and the denominator in energy-adjusted diet cost (e.g. €/10 MJ). As a result, the findings could be reflecting a mathematical relationship[4].

This study investigated how estimated diet costs of NDNS adults relate to dietary energy density using the 'residuals' regression method to account for energy. Diet diary information from 2008–2010 was matched to an in-house database of national average (2004) food prices (the DANTE cost database) to assign a cost to each food and non-alcoholic beverage consumed. Mean daily diet costs and costs per 10 MJ were calculated for each participant. Energy density (g/kJ) was derived from foods and milk.

The sample median diet cost was £2.84 per day (IQR £2.27, £3.64), or £4.05 per 10MJ (£3.45, £4.82). Values for energy density, food energy, and diet costs by quintiles of dietary energy density (1 = least energy dense) are presented in the table. Adjusted linear regression found a strong negative relationship: additional standard deviation above the diet cost expected for a given energy intake (the residual), there was an associated decrease in energy density of 0.46kJ/g (95% CI −0.53, −0.38, $p<0.001$).

	Quintile of dietary energy density				
n = 1014	1	2	3	4	5
Mean energy density (kJ/g)	4.5	5.6	6.3	7.1	8.4
Mean food energy (kJ)	6012	6776	7424	7728	8278
Median daily diet cost (£ d^{-1})	2.87	2.74	2.89	2.91	2.82
Age-, sex- and energy-adjusted mean daily diet cost (£ d^{-1})	3.44	3.24	3.03	2.83	2.63
Diet cost per 10 MJ (£ 10 MJ^{-1})	4.93	4.28	3.87	3.85	3.42
Age- and sex-adjusted mean diet cost (£ 10 MJ^{-1})	4.48	3.73	3.39	3.36	3.03

This is the first time individual-level diet costs have been characterized for a representative British population. These diet costs represent the inherent value of the diet, and are not comparable to UK expenditure data. The analyses confirm a diet cost-energy density link that is not due to mathematical artefact, and suggest that those consuming more energy-dense diets are achieving more kilojoules for their money.

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