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The development of metabolite biomarkers of energy-dense nutrient-poor foods and takeaway (fast) food dietary patterns

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An unbalanced diet and physical inactivity are risk factors for many chronic health conditions and an increase in obesity prevalence, which imposes a huge financial burden on UK healthcare systems. Accurate measurement of habitual food consumption, particularly energy-dense nutrient-poor foods using self-reported dietary assessment tools can be subject to participant bias[(1)]. Recent research has demonstrated that metabolites derived from individual foods present in urine samples provide biomarkers of dietary exposure, the measurement of which could improve the limitations of traditional dietary assessment methodologies. Several reports have described the analysis, in human biofluids, of specific metabolites known to be derived from foods of high public health significance[(2,3)], but lesser so for takeaway or fast foods[(4)].

The current study investigated the dietary patterns of adult takeaway food consumers (n = 151) in Merseyside using a modified version of the EPIC-Norfolk food frequency questionnaire (FFQ)[(5)] and 3 × 24-hour dietary recalls (24HR). Dietary patterns were identified through principal component analysis (PCA) using both self-assessment tools. Additionally, participants collected spot First Morning Void urine samples after each 24HR. Metabolite fingerprints were created from urines using flow infusion electrospray (FIE) ionisation high resolution (HR) mass spectrometry (MS) and analyzed with machine learning data techniques, including Random forest[(3,4)]. Ultra High Performance Liquid Chromatography-High Resolution MS (UHPLC-HRMS) and Tandem mass spectrometry (MS^n) was used for structural identification of putative biomarkers.

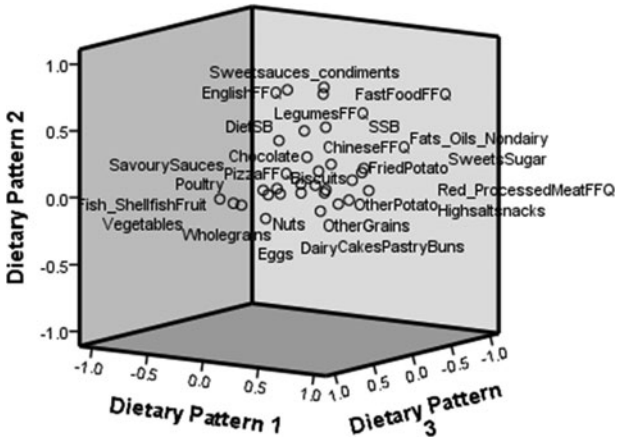

Fig. 1. Dietary patterns produced using PCA on food frequency questionnaire data.

PCA produced three dietary patterns from the FFQ data, these were classified as; 1) 'Convenience and takeaway', 2) 'Prudent' and 3) 'English and fast food' (Fig. 1). Using FIE-HRMS coupled with machine learning we identified urinary biomarkers associated each dietary pattern. UHPLC-HRMS and MS^n allowed further structural identification of biomarkers associated with takeaway spices and essential oils. Urine biomarkers indicative of exposure to foods ranging from healthy to unhealthy will be integrated into a diagnostic population screening method in order to objectively measure food exposure and calorie intake.

1. Shim J-S, Oh K & Kim HC (2014) *Epidemiol Health* **36**, e2014009–0.
2. Lloyd A, Favé G, Beckmann M *et al.* (2011) *Am J Clin Nutr* **94**, 981–991.
3. Beckmann M, Lloyd A, Halder S *et al.* (2013) *Proc Nutr Soc* **72**, 352–361.
4. Beckmann M, Joosen AM, Clarke MM *et al.* (2016) *Mol Nutr Food Res* **60**, 444–457.
5. Janssen H, Davies I, Richardson L *et al.* (2018) *Proc Nutr Soc* **77**, E18.