Consultation to the UK Nutrient Profiling Model 2018 review: Individual responses I-J

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19. Incorporated Society of British Advertisers

About ISBA

1. ISBA represents the UK's advertisers. We champion the needs of marketers through advocacy and offer our members thought leadership, consultancy, a programme of capability building and networking. We influence necessary change, speaking with one voice to all stakeholders including agencies, regulators, platform owners and government.

2. ISBA is one of the tripartite stakeholders that make up The Advertising Association, which represents advertisers, agencies and media owners. We are the only trade organisation representing advertisers exclusively and play a unique advocacy role, ensuring our members' interests are clearly understood and are reflected in the decision-making of media owners and platforms, media agencies, regulators and Government.

3. Our members represent over 3,000 brands across a range of sectors, including the majority of the UK biggest advertisers and best loved brands old and new, in the private, public and third sectors.

4. We seek to:

    1. Champion improved standards in digital media to create a transparent, responsible and accountable market which serves the needs of advertisers;
    2. Promote innovation in advertising and new ways of working to improve effectiveness and ROI for advertisers;
    3. Promote a diverse, high quality media environment, offering choice for advertisers; and
    4. Champion the freedom to advertise responsibly and effective industry self-regulation

5. ISBA represents advertisers on the Committee of Advertising Practice (CAP) and the Broadcast Committee of Advertising Practice (BCAP) - sister organisations of the Advertising Standards Authority - which are responsible for writing the Advertising Codes. We are also members of the World Federation of Advertisers (WFA) and use our leadership role in such bodies to set and promote high industry standards as well as a robust, independent self-regulatory regime.

6. This submission focuses on the areas of interest to our members and supports the submissions by both The Advertising Association and Food and Drink Federation.

7. We note the reference to further consultation by the code writing bodies should the recommendations of this review be accepted by government. However, the complexity of the current landscape, with multiple consultations - either concluded,

currently underway or due to be launched - covering different administrative areas and with varying potential impacts require us to raise areas of concern at this juncture.

Overview

8. ISBA support the stated aim of the Government, devolved administrations and London Mayor to tackle the issue of childhood obesity. As is universally understood, childhood obesity is a multi-dimensional issue. It requires a multi-dimensional response.

9. ISBA therefore support an approach which is holistic in nature. One led by evidence, proportionate in nature and best measured and calculated to tackle the issue. We feel strongly that policy measures should be individually measured and independently assessed to ensure that their efficacy is clear to policy makers, civil society and the general public.

10. Moreover, as part of that holistic approach to tackling childhood obesity, we support the shared aim of proportionately reducing children's exposure to HFSS advertising. This should equally be evidence-led and properly measured to ensure that any measures are addressing childhood obesity levels.

11. Today, CAP and BCAP provide wide-ranging cross-media standards on HFSS advertising. The rules are comprehensive and prevent any advertisement for HFSS products being targeted at children under 16 through any medium, not just children's channels. They apply across all forms of media, whether broadcast, online, on the street or on public transport. As such, the UK is recognised as upholding among the strictest rules in the world.

12. As an evidence-based regulator, in recognition of changes in children's viewing habits, the rules were extended in July 2017 to provide a comprehensive ban on the advertising of HFSS products in all children's non-broadcast media. This covers print, cinema, online - including TV-like content online, such as video sharing platforms - and social media. The rules also apply to social influencers, in-game advertising and advergames subject to the 25% child audience test.

13. These rules are underpinned by the Nutrient Profile Model (NPM).

NPM and Advertising

14. As mentioned above, the NPM is used by CAP and BCAP to identify HFSS products and to ensure that children are prevented from seeing advertisements for these products in children's media, and in any media where children make up more than 25% of the audience. In that sense the purpose of the NPM is primarily technical. However, it should also be noted that – primarily due to the tone of

public debate – the NPM also has gained public awareness as a framework which defines what is and what is not “junk food”.

15. As such, we have a number of concerns with the proposed model and its’ implications for advertising directly and broader policy objectives should it be applied to the advertising codes. We’ll address these concerns in turn.

16. Firstly, as we understand it, as dietary impacts beyond sugars and fibre were not considered in the development of the proposed model, there are a number of products which are important contributors to children’s diets which would likely fail the new model. These include high fibre breakfast cereals, yogurts, no added sugar fruit juices and smoothies. Logically, this would categorise them as HFSS, lead to advertising restrictions under the CAP and BCAP codes and restrict the ability of companies to market these products. We strongly support the responses from the FDF, BSDA and the BFJA in this regard.

17. Secondly, the public debate has been characterised and framed by the term; “junk food”. The determination of so-called “junk food” is viewed through the prism of the NPM. As described above, an unintended consequence of extending the categorisation of products covered by the NPM and therefore subject to advertising restrictions, would be to label a variety of products contained within the 5-a-day, Eatwell Guide and Change-4-Life messaging as “junk food”. Once again, we strongly support the FDF response in this regard and the examples cited.

18. Additionally, the proposed model would capture products which are rightly thought to be part of a balanced diet, such as peanut butter, condensed milk, pasta sauces, cheese and pure fruit juice. Or products which it could be reasonably said are predominantly or exclusively aimed at adults such as butter, olive oil, cheddar cheese (including half fat versions), Marmite, some pasta sauces, and mayonnaise (including low calorie).

19. The cumulative impact would be to create a deeply confusing picture for consumers, regulators and industry alike. This confusion is only compounded by the range of measures being proposed or considered across the UK and their reliance on the – current – NPM.

Practical Implications

20. As already set out and accepted, the NPM is central to CAP and BCAP in determining what can and cannot be advertised to children. This is its primary objective and based on science. However, it must also be practical. Both for food companies using it as a basis for product innovation and regulators using it as the assumed model for policy development.

21. On the point of practicality for food companies, we would defer to the FDF and support their submission. However, it is the point of practicality when applying the

proposed model to the mixed range of advertising and marketing restrictions currently being considered across the UK that we will focus on.

22. At the time of writing, the UK Government, Scottish Government, Mayor of London and the Welsh Assembly are all either consulting on – or believed to be considering - new proposals which relate to the restriction of advertising of HFSS products. All of these proposals are based on the current NPM or the expectation that the proposed new model will only further strengthen the products they consider – separately and with divergence – "junk food".

23. Taking into account the examples cited above and more fully in the submissions of the FDF, BDSA and BFJA the proposed model would disproportionately and fundamentally extend the definition to include products that could not reasonably deemed to be "junk food" and limit the ability of companies to shift consumer behaviour.

24. Taking high fibre cereal as an example, we echo the FDF's concern that this would not only limit companies' ability to move consumers from high sugar, lower fibre to lower sugar, higher fibre products but also have a negative impact on children's micronutrient intake.

25. We would therefore support calls by the AA and others for any decisions based on the NPM to be delayed until PHE has finalised the new NPM so that both the science and practicality of the new model can be fully understood. Moreover, PHE should reiterate that the model is to be applied to advertising only, with any extension to areas such as packaging and promotions subject to both a full impact assessment and further consultation.

Conclusion

26. ISBA believes that there are a number of unintended consequences arising as a result of the proposed new model. In summary:

a. It fundamentally changes the impacts of marketing and advertising restrictions currently under consideration – or thought to be under consideration – by the UK Government, Scottish Government, Mayor of London and Welsh Assembly;
b. It risks confusing and undermining key public health messaging contained in the 5-a-day, Eatwell Guide and Change-4-Life campaigns;
c. It will extend the definition of "junk food" in the eyes of the public to products which are reasonably part of a balanced diet; and
d. It will lose sight of the primary focus of childhood obesity and instead encroach on products which are exclusively or primarily consumed by adults;

27. Finally, there have been a number of steps taken by government which impact the food and drink sector, including reformulation and the Soft Drinks Industry Levy. We would echo the concern of the FDF that companies have devoted considerable resource into reformulation programmes. Yet, the model as proposed sets the bar at a level that would not enable these products to be advertised. In our view this may act as a disincentive to

further engagement with the programme and cut across a further objective of government policy.

20. Individual 1

Fibre - Extending Fibre Modification
The draft 2018 Nutrient Profiling Model (NPM) is an improvement with regard to the increased fibre intake recommendation. But only to a limited extent. I note peer reviewers (3 and 5) highlighted this, and whilst I appreciate the Expert Group response, believe the model could be improved to deliver an enhanced outcome.

Fibre was allocated an 8 point scale (3n) to emphasise the increased recommendation, but in preference to a 10 point scale (3o), to give consistency with other 'C' nutrients/ food components in relation to a 20% score band maximum. But the situation with all 'C' components is not analogous.

Protein is on average over-consumed (eg 11-18 year olds mean intake +42% vs EAR) (calculated from DH, 1991 and DHSC, 2012, see appendix below); whilst fibre is usually under-consumed, with only 7% of children meeting the recommendation (from NatCen & MRC, 2018, see appendix). In addition, fibre intake in children has unfortunately reduced – being significantly lower than 6 years ago (PHE, 2018a).

For reference, the 5 point scale originated to 'more appropriately' balance scores allocated for protein, fibre and fruit and vegetables against those for energy, saturated fat, sugar and sodium (FSA, 2005). However, this came from a concern that "some processed foods with particularly high levels of fat, sugar and salt were not categorised as 'high in fat, salt or sugar' because of their protein content" (ibid.,p9). This suggests concern about potential unintended effects of high protein morphed into a solution that was detrimental to encouraging additional fibre and fruit and vegetable intakes.

Whilst I am aware of concerns about basing the model on portion sizes, the combination arguably unfairly penalises products (like breakfast cereals and cereal bars) that are good sources of fibre, but eaten in relative small (vs 100g) portions (FSA, 2009). As an indicator of the relative importance of fibre, when a study used regression to determine weighting factors for nutrients for nutrient profiling, it was fibre that made the best one-nutrient variable model (Arsenault, Fulgoni, Hersey & Muth, 2012).

Given the above, compared to the proposed 8 point scale (3n), a 10 point scale (3o) would be advantageous – further supporting the increased fibre intake recommendations, and providing additional encouragement to reformulate products to be healthier.

Fruit, vegetable & nut scoring
Only 8% of children aged 11-18 meet the 5-A-Day recommendation for fruit and vegetable intake (NatCen & MRC, 2018). The review tested three Fruit, vegetable & nut (FVN) modifications, but they made very small / no difference, and hence it was felt there was no justification for amendment. The very small difference is to be expected given the 'bimodal distribution' with only a few foods and drinks not having either 0% or 100% FVN (PHE, 2018b). Nevertheless, a small benefit is still a benefit. A modification may only apply to a relatively small number of products, but if (such as 3a or 3c) it encourages increased FVN content, it is better.

Another barrier to healthier reformulation, especially given the bimodal distribution, is the >40% of product FVN start point. Unfortunately I was unable to check the original rationale for this (see

below re papers no longer available online). However a scale with a lower start point would encourage both the addition of at least some FVN to products without, and the relative increase of FVN in products with 1-40% (such as breakfast cereals, cereal bars, soups and ready meals). For example, I would suggest an adapted version of modification 3c, with a 0 to 7 scale, and equal intervals, but across the whole range (hence 0, 17, 33, 50, 67, 83, 100% would give 0-7 points respectively).

Seeds

Whilst the review focused on alignment with current dietary recommendations, the "approach also considered opportunities for changes to other nutrients/food components" (PHE, 2018c, p2). Seeds are currently excluded from the FVN category (DH, 2011). Yet they are often considered together with nuts, have similar nutritional qualities, and are good sources of vitamins and minerals (Allman-Farinelli, 2017).

The National Diet and Nutrition Survey (NDNS) indicates children can have very low intakes of minerals micronutrients, in particular iron, where 28% of 11-18 year olds (inc. 48% of girls), were below the Lower Reference Nutrient Intake (LRNI); and calcium, where 15% of 11-18 year olds were below the LRNI. Others included zinc, magnesium and selenium (19%, 37% and 33% 11-18 yr olds below LRNI respectively). (NatCen & MRC, 2016, and calculations from it, see appendix). Blood tests have found both iron-deficiency anaemia (low haemoglobin) and low iron stores (ferritin) in 9% of older girls (NatCen & MRC, 2018). Calcium intake at this age is particularly significant as fracture risk in old age is linked to calcium intake in childhood and early teens (given peak bone mass achieved early adulthood) (Williams & Powers, 2017).

For reference, a portion of sesame seeds supplies 11% of the iron and 13% of the calcium of the RNIs of a 15-18 year old girl. As well as 11% of the zinc and 19% of the magnesium. Whilst a portion of sunflower seeds supplies 11% of the iron; as well as 18% of the zinc, 33% of the magnesium and 20% of the selenium. (From DH, 1991 and Finglas et al, 2015, see appendix).

Linseed/flaxseed is one of the richest sources of the plant-based ω-3 fatty acid, alpha-linolenic acid (ALA), which appears to have a positive impact on cardiovascular disease (Rodriguez-Leyva, Bassett, McCullough & Pierce, 2010). Marine-sourced ω-3 fatty acid may be more potent, but oily fish consumption is well below the recommendation – mean intake in children being only approximately 15% of it (from NatCen & MRC, 2016, see appendix). It is also not suitable for vegetarians/vegans. Of note, Australia sets a Nutrient Reference Value for ALA specifically (eg 0.8 g/day for 14-18 year old girls) (Australian National Health and Medical Research Council, 2014).

Given the above, I would suggest adding seeds to the FVN category. In addition, if combined with the FVN scoring suggestion above, it would further encourage reformulation.

Protein Cap

Whilst I appreciate the basis of the protein cap, the way it is implemented leads to a sudden and sharp disparity between products who happen to score 10 versus 11 'A' points (bar those with >80% fruit, vegetables and nuts). I note it "was agreed not to remove or modify the protein cap given comments previously considered as part of the 2007 review of the effectiveness of the UK NPM 2004/5 and SACN's recommendations" (PHE, 2018b, p. 25). However, the 2007 review indicates this was not a clear-cut issue, and whilst SACN raised concerns, the Review Panel itself recommended protein cap removal.

SACN's key concern was "the public health implications of reclassifying some foods from 'less healthy' to 'healthier' particularly in respect of the sugary breakfast cereals" (FSA, 2009, p. 1). However, the Review Panel were not convinced of the scientific rationale for retaining the cap, and felt it may be hampering potential reformulation activities (ibid.). The conclusion was that "although there is some scientific justification for removing the protein cap, the wider public health arguments for maintaining the status quo are more persuasive" (ibid., p. 9). But this is based only on the options of maintaining or removing the cap.

When Food Standards Australia New Zealand adapted the UK NPM 2004/5, concerns were raised about the impact of the protein cap on some breakfast cereals, given they are "a low moisture food . . . [and] therefore scores more energy points per 100g" (PHE, 2018b, p. 67) – and hence they chose to offset "the extra energy points the food scores resulting from their low moisture content" (loc. cit.) by raising the protein cap threshold from 11 to 13 points.

However, I would argue that, whilst it adds a small amount of complexity, rather than to suddenly exclude protein completely, a better option is to reduce it, by halving it, for products who score 11 or more 'A' points. This would offer the benefits of the protein cap, but minimise the detrimental effects.

Original model development

This is outside the review's remit, but it is unfortunate that information about the development of the original model – including Rayner, Scarborough, Boxer & Stockley. (2005). Nutrient Profiles: Development of Final Model – appears to no longer be available online (prev. at http://www.food.gov.uk/multimedia/pdfs/nutprofr.pdf).

Appendix

Protein

Protein EAR (DH, 1991)
Boys – 11-14 = 42.1g/d; 15-18 = 55.2g/d -> Avg. = 48.7g/d
Girls – 11-14 = 41.2g/d; 15-18 = 45.0g/d -> Avg. = 43.1g/d

Protein intakes (2008-2011, means) (DHSC, 2012)
Boys 11-18 – Protein = 73.4g/d -> + 51% vs EAR
Girls 11-18 – Protein = 57.5g/d -> + 33% vs EAR
-> Avg. Boys & Girls = + 42%

Fibre

The percentage of children meeting the AOAC fibre recommendation was 10% of those aged 1.5 to 3 years and 4 to 10 years and 4% of those 11 to 18 years. (NatCen & MRC, 2018)
-> Weighted avg. = 7%

Mineral intakes

Proportion of participants with average daily intakes below the Lower Reference Nutrient Intake for NDNS RP UK Years 5 and 6 (combined) (NatCen & MRC, 2016)
% with intake below the LRNI –
Boys 11-18, Girls 11-18 –
Iron – 9, 48 -> Avg. = 28.5%
Calcium – 12, 19 -> Avg. = 15.5%
Magnesium – 27, 48 -> Avg. = 37.5%
Selenium – 23, 44 -> Avg. = 33.5%
Zinc – 17, 22 -> Avg. = 19.5%

Minerals from seeds
Female, 15-18 years, RNIs (per day) (DH, 1991) –
Iron 14.8mg; calcium 800mg; zinc 7mg; magnesium 300mg; selenium 60µg/d

Portions sizes (Tesco, n.d.a; Tesco, n.d.b; Tesco, n.d.c) –
15g – Sesame Seeds
25g – Sunflower Seeds; Linseeds/flaxseeds

Composition per 100g (Finglas et al, 2015); hence % of RNI in portion –
Sesame seeds –
Iron (mg) = 10.4 -> % of RNI in 15g = 11%
Calcium (mg) = 670 -> 13%
Zinc (mg) = 5.3 -> 11%
Magnesium (mg) = 370 -> 19%

Sunflower seeds –
Iron (mg) = 6.4 -> % of RNI in 25g = 11%
Zinc (mg) = 5.1 -> 18%
Magnesium (mg) = 390 -> 33%
Selenium (µg) = 49 -> 20%

Oily fish
Mean consumption of oily fish in all age groups remained well below the recommended one portion (140g) per week in all paired years. Mean consumption was equivalent to 13–29 grams per week in children. (NatCen & MRC, 2016)
Avg. 13-29 = 21
-> 15% of 140g

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21. Individual 2

This consultation respondent provided the following links:

https://www.nature.com/articles/s41430-018-0104-3

https://www.nature.com/articles/s41430-017-0017-6

http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002484

https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/nutrient-profiling-for-product-reformulation-public-health-impact-and-benefits-for-the-consumer/CDCD9DC269CA4292DA20E5B795F37A01#

https://www.efsa.europa.eu/sites/default/files/event/documentset/stakeholder061111-p8.pdf

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5754044/

https://www.ncbi.nlm.nih.gov/labs/journals/br-j-nutr/new/2018-02-20/

http://researchbriefings.files.parliament.uk/documents/POST-PN-0530/POST-PN-0530.pdf

http://www.euro.who.int/__data/assets/pdf_file/0005/355973/ENP_eng.pdf?ua=1

https://foodfoundation.org.uk/wp-content/uploads/2016/11/Appendix-2-International-Examples.docx

Zhou X, Perez-Cueto FJ, Santos QD, Monteleone E, Giboreau A, Appleton KM, Bjørner T, Bredie WL, Hartwell H. A Systematic Review of Behavioural Interventions Promoting Healthy Eating among Older People. Nutrients. 2018 Jan 26;10(2):128

https://academic.oup.com/restud/article/85/1/396/3108825

https://publications.parliament.uk/pa/cm201617/cmselect/cmhealth/928/92808.htm

The UK Ofcom Nutrient Profiling Model - Defining 'healthy' and 'unhealthy' foods and drinks for TV advertising to children Mike Rayner, Peter Scarborough, British Heart Foundation Health Promotion Research Group, Department of Public Health, University of Oxford Tim Lobstein, International Obesity Task Force, London October 2009

http://www.foodstandards.gov.scot/downloads/Board_meeting_-_2017_March_08_-__Diet_and_Nutrition_one_year_on_0.pdf

https://vhscotland.org.uk/wp-content/uploads/2018/01/Voluntary-Health-Scotland-response-to-A-healthier-Future.pdf

https://www.health.govt.nz/system/files/documents/pages/hr_20151047_-_attachment.pdf

https://www.ofcom.org.uk/__data/assets/pdf_file/0015/43008/Television-Advertising-of-Food-and-Drink-Products-to-Children.pdf

https://www.ofcom.org.uk/__data/assets/pdf_file/0024/31857/hfss-review-final.pdf

https://foodfoundation.org.uk/wp-content/uploads/2017/07/3-Briefing-UK-Junk-Food_vF.pdf

http://www.fdf.org.uk/keyissues_hw.aspx?issue=644

https://www.asa.org.uk/asset/98337008-FA03-481B-92392CB3487720A8/

https://www.sciencedirect.com/science/article/pii/S2352385916300214

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5598004/

Lehmann U, Charles VR, Vlassopoulos A, Masset G, Spieldenner J. Nutrient profiling for product reformulation: public health impact and benefits for the consumer. Proceedings of the Nutrition Society. 2017 Aug;76(3):255-64.

http://www.finut.org/wp-content/uploads/2017/02/Nutrient_Profiling_Scientific_Aims_versus_Actual_Impact_Public_Health_FINUT_final_180117.pdf

http://researchbriefings.files.parliament.uk/documents/CDP-2018-0012/CDP-2018-0012.pdf

22. Individual 3

I have read parts of the report; I must say a big report and got bored half way through. I will be surprised how many manage to finish, possibly look at concise reports to get better feedback.

Although the findings, information is factual and correct the only point I would put over is that no matter if the children eat well and within guidelines if they do not keep relatively fit they will still put on weight. It is good we look at these guidelines while still promoting a little of anything ie junk food/sugar drinks is not a crime as long as you work the excess off with extra play.

Good luck

23. Individual 4

In my opinion the 2018 draft Nutrient Profiling Model is a significantly improved representation of current UK dietary recommendations in comparison with the current version. As fewer foods and drinks will meet requirements, the impact on this for future obesity rates will hopefully be positive and significant. Regarding the language used, salt is more easily understood by the general population than sodium therefore understanding and following guidance will be promoted within the wider population.

24. Innocent Limited

Thank you for asking for our thoughts on how the proposed modifications to the UK NPM 2004/5 reflect the current UK dietary recommendations with regards to juice and smoothies.

In a nutshell

To us, success for the revised NPM would be a reduction in the calories and sugar that kids are getting, at the same time as increasing the amount of fruit & veg and fibre in their diets.

As you might expect, we are concerned that the proposed model classifies 100% fruit and veg juices and smoothies as HFSS. That's not just because juices and smoothies are what we spend our days making, it's because as a category they provide a quarter of the fruit and veg that kids in the UK get.[1] And we don't want to see those kids getting even less fruit and veg in their diets than they do today.

There are a few things we would like to mention:

1. A bit about our business
2. Our thoughts on improving the health of our drinkers
3. The evidence on the role juices & smoothies can play in a healthy, balanced diet: o Fruit juice & smoothies (FJS) make a positive contribution to the diets of children and adults in the UK
    - Consuming fruit juice is beneficial for dietary quality and long term health outcomes
    - Fruit juice does not contribute to excess energy intakes or obesity
4. Our suggestions for how the model can best improve the health of the UK.

1. A bit about our business

Launched nineteen years ago, innocent has recently become the UK and Europe's number one chilled juice and smoothie brand. Our mission has always been, and always will be, making natural, delicious food and drink that helps people live well and die old. We are committed to doing our bit to improve the diets of the UK's children by helping them get more fruit, veg & fibre, fewer calories & less sugar.

Our juices and smoothies are made entirely from fruit and veg (with the odd botanical and vitamin added). The only sugar present in our drinks is naturally occurring from the fruit and veg, we don't add any sugar.

We believe that everything we make should taste good and do good too. So we try to make it easier for people to do themselves some good, and to leave the planet a little bit better than we found it. This is reflected in everything we do, from the recycled plastic in our bottles, to sourcing fruit from places that go the extra mile in terms of looking after all the people that work on the farms and the environment. We donate 10% of profits to charity, mainly to the innocent foundation, which supports charities working all over the world to help the world's hungry.

We also proudly run the Big Grow, a campaign that this year alone has got 450,000 kids up and down the UK growing and learning about fruit and veg, a million kids overall to date.

2. Our thoughts on improving the health of our drinkers

We take our lead from you on this, as Alison Tedstone said when the most recent NDNS data was published, “A healthy balanced diet is the foundation to good health. Eating 5 A Day and reducing our intake of calories, sugar, and saturated fat is what many of us need to do to reduce the risk of long term health problems.” That makes sense to us and here’s how we’re trying to help:

Getting enough fruit & veg and fibre

We all know that getting more fruit and veg in our diets is a good thing. It’s doing that every day that seems to be tricky, with just 1 in 3 adults and less than 1 in 10 children getting their 5 a day[2].

- Our juices and smoothies are made entirely from fruit and veg (with the odd botanical and vitamin added) and all count towards your 5 a day.

We know that not getting enough fruit and veg is contributing to most of us not getting enough fibre either, with average adult consumption at 19g versus the recommended 30g a day. For children aged 11-18yrs that’s only 15.3g and only 4% meet the recommendations for fibre intake[3],

- As well as all the micronutrients drinkers get in our juices, in our smoothies they also get fibre with our core range containing between 2 and 4g per bottle.

Reducing calories, sugar and saturated fat

Since you shared the juice and juice drinks sugar reduction plan with us, we have been working hard to see how we can meet those challenges on calories and sugar.

Because the only sugar present in our drinks is naturally occurring, from the fruit and veg, we can’t take any sugar out so our focus is on portion size. So far:

- we are reducing the portion size of our kids juices and smoothies from 180ml to 150ml, ready for September 2019;
- we will be reducing the portion size of our biggest on-the-go juices and smoothies too, from 330/360ml to 300ml on current plans;
- all our take home drinks have clear portion size recommendations on pack.

That would bring 80% of our drinks within the calorie cap, leaving us with some recipe work to do to see how we can rebalance the fruit and veg combinations in the others to meet the targets.

3. Evidence on the role juices & smoothies can play in a healthy, balanced diet

getting enough fruit & veg and fibre

Fruit juice and smoothies make a positive contribution to the diets of children and adults in the UK

Because they are packed full of the good stuff from fruit and veg, 100% pure fruit juice and smoothies have been recommended as part of the 5-a-day scheme since it was introduced in 2003.

i. Only 31% per cent of adults and 26% of older adults meet the **5-a-day** recommendation[2].

ii. Consumption of fruit and vegetables by children aged 11 to 18 years is 2.6 portions per day for boys and 2.8 portions per day for girls[2]. Only 7 per cent of boys and 9 per cent of girls in this age group met the **5-a-day** recommendation[2].

iii. Fruit juice provides essential vitamins and minerals that children are deficient in including **folate and potassium**. 15% of girls aged 11-18 are below the LRNI for folate[4] and 38% of 11—18 girls are below the LRNI for potassium[5].

iv. According to NDNS data there is an increased risk of iron deficiency in girls aged 11 to 18 years, 32% fail to meet the LRNI for iron[6,7]. Vitamin C in fruit juice increases **non-haem iron absorption** from iron-containing foods, when the two are consumed together[8].

v. A glass of orange juice delivers around **a third of your RDA of vitamin C** and a wide range of other **antioxidants and phytonutrients**. Fruit juice provides children with between 41% - 53% of their daily vitamin C intake[9], and importantly between 24% and 12% of their daily folate intake[9].

vi. 100% fruit juices have a **high density of certain micronutrients** and their consumption is associated with greater likelihood of adherence to dietary guidelines for some vitamins and minerals[10].

vii. Fruit juices contain a range of vitamins, minerals and bioactive compounds, such as flavanones, that are important for good health:

- 100% orange juice is a source of **vitamin C, potassium, and folate.**

- 100% fruit juices may be declared a "source" of key micronutrients, and some nutritional compounds in fruit juice have **greater bioavailability** than in the fresh fruits from which they are derived.[11]

- The nutrients in fruit juice come directly from the squeezed fruit. When micronutrient levels of **vitamin A, folate, vitamin C, calcium, magnesium and potassium** were compared in juices versus the whole fruits from which they were derived, no significant differences were found.[12]

- Pro-vitamin carotenoids (for example, ß-carotene), present in fruit and vegetables, represent about 40% of the vitamin A consumed daily in western countries. A study of 8,861 subjects, including 2,310 who routinely drank juice, reported a 14% higher daily vitamin A intake among the routine orange juice drinkers compared to non-consumers (660µg retinol equivalent/day vs. 580µg retinol equivalent/day respectively)[13] .

VIII. Drinking fruit juice correlates with higher fruit intakes[10].

IX. In addition to the benefits of juice outlined above, smoothies also contain the benefits of whole, crushed fruits, particularly fibre. Only 4% of children aged 11-18 meet their recommendations for fibre[14]. An innocent mango smoothie contains 3.5g fibre and can deliver up to 14% of an 11-18 yr old's daily requirement for fibre.

"Unfortunately, there is a tendency for fibre to lack 'health' appeal, especially amongst teens and young people. Smoothies are an innovative way of delivering this important nutrient. We know

that fibre is 'retained' in smoothies even after processing – particularly the pectin and cellulose fibres. So, drinking fibre is another way to obtain it alongside eating it. innocent's range of smoothies all provide between 2-4g of fibre per 250ml"[15].

That all adds up to a lot of good stuff that people are getting when they drink juice and smoothies. Which is why we are concerned that the proposal to classify juice and smoothies as HFSS will reduce the valuable nutritional contribution they can make.

Reducing calories and sugar

The classification of FJS as HFSS in the proposed model is down to the definition of the sugars within them as free. The reasons given for that are "the potential to deliver large amounts of sugar" and that "the physiological response to sugar consumed as a drink may be different to sugar in food" [16].

To the first point, as we see from the NDNS, FJS contribute the same amount of energy, or less, as whole fruit so this potential to deliver large amounts of sugar is not happening in reality:

Fruit juice and smoothies contribute 10% of free sugars for 4 – 10 and 11 – 18 years olds but only 2% of energy for the same age groups – the same % energy as from whole fruit for teenagers and half the % energy as from whole fruit for primary school children[17, 18.]

To the second point, there is no consistent, causal evidence of a harmful physiological response to the sugar consumed in FJS. In fact the opposite is true:

There is broad scientific evidence that consuming fruit juice is beneficial for dietary quality and long term health outcomes

The 5-a-day campaign was introduced to reduce the public health risk of heart disease, stroke and some cancers - juices and smoothies contribute to that reduction in risk.

i. Observational studies in children and adolescents have found that a higher consumption of fruit juices generally corresponds to a **lower intake of simple sugars**[19, 20]. This may reflect other behaviours associated with fruit juice intake, such as lower consumption of confectionery or sugar-sweetened beverages.

ii. The evidence from observational studies suggests either no impact or a **modest beneficial effect of 100% fruit juices on CVD**, with the strongest associations seen with stroke[21].

iii. Clinical studies reveal several mechanisms relating to vascular health, inflammation, lipid oxidation and platelet aggregation that could **explain a benefit for 100% fruit juices in lowering CVD risk**. Polyphenol compounds and potassium in fruit juices are most likely responsible for these effects.

iv. Numerous randomised controlled trials indicate a clear beneficial effect of fruit and vegetable consumption on the reduction of blood pressure. A recent review[22] revealed that fruit juices, too, confer benefits similar to those seen for fruit and vegetables. Evidence indicates a modest yet consistent **reduction in blood pressure** with fruit juice consumption[23-27].

v. Products containing fructose, such as 100% fruit juices, have a low GI (i.e. orange juice = 50) and result in less impact on postprandial blood glucose levels than carbohydrates

such as glucose, maltodextrin and processed starch. Due to their natural sugar content per portion, 100% fruit juices have a moderate GL. According to current knowledge, fruit juices such as orange juice are **low-GI and -GL products and do not have adverse effects on glycaemic parameters nor increase the risk of type 2 diabetes**[29-33].

Defining the sugars within FJS as free appears therefore to be misleading when free sugars are referred to as a cause of obesity and related diseases. This calls into question the basis on which the proposed model would classify FJS as HFSS from a health outcomes perspective.

Action on Sugar's recently published Healthy Food and Drink Strategy remarks that HFSS foods and drinks are now a bigger cause of death and disability than cigarettes. The scientific evidence shows that this is simply not the case for fruit juice and smoothies consumed in line with dietary guidelines.

Not all sugars in our smoothies are free:

Having confirmed that the cell walls of the fruit in our smoothies remain intact after blending[34], we wanted to understand what that meant for the sugars, and the level of free vs. trapped sugars in our drinks. So we asked the scientists at Leatherhead to put our smoothies under the microscope again to understand what proportion of the sugars in them are free.

They found that the fruit purees we use contain anywhere between 4% free sugars (chilled banana puree) and 70% free sugars (strawberry puree)[35, Appdx.C].

This further calls into question the free sugars basis on which the proposed NPM would measure our smoothies.

There is no consistent evidence that consuming fruit juice contributes to excess energy intakes or obesity:

vi. There is no evidence of widespread overconsumption of juice with the **average intakes** of children who consume juice being 155ml[10] .

vii. Adults and children who drink fruit juice **eat more portions of fruit and vegetables** than non-juice consumers[14].

viii. Fruit juice consumers have a **lower body weight, body mass index and waist circumference** than people who do not drink juice[10].

ix. Concerns that the natural sugar content may adversely affect **diet quality or energy intake** are unfounded[10].

x. The SACN report on carbohydrates & health reported that there was **no association between unsweetened fruit juice, BMI and body fatness in children**[36]: "Three studies also assessed BMI in relation to unsweetened fruit juice consumption and found no significant association between baseline consumption and BMI at follow-up (Striegel-Moore et al., 2006; Libuda et al., 2008; Fiorito et al., 2009)". No significant association between unsweetened fruit juice consumption and body fatness and fat distribution was found by the three studies that determine this exposure (Johnson et al., 2007; Libuda et al., 2008; Fiorito et al., 2009)[36].

xi. Few studies have considered the **impact of 100% fruit juice on body weight**, and the literature is dominated by observational data which does not show cause and effect. These studies have varied from positive correlations between adult weight gain, albeit clinically insignificant amounts[37,38] to inverse associations between BMI, waist circumference and 100% fruit juice intake[39]. A study of a large European cohort reported no association between the combined intake of 100% fruit juice and fruit nectars and body mass index[20].

xii. Turning to the few randomised controlled trials that are available, these tend to show **no impact on weight management**, even at intakes up to 500ml daily.
   - The authors of a recent review on citrus fruit juices concluded that "Based on clinical intervention studies, the addition of orange juice or grapefruit juice to a habitual or study diet did not result in weight change, suggesting that individuals likely compensated with other dietary choices"[39] .
   - A similar finding was seen in a 2017 randomised controlled trial in which 500ml of orange juice was consumed daily for 12 weeks as part of calorie-controlled diet[40].

This evidence suggests that the NPM review does not need to restrict the consumption of 100% juice and smoothies to achieve its ultimate aim of reducing childhood obesity.

The impact of the revised NPM would go far beyond advertising to children

The stated aim of the review is "to ensure high sugar products would not be potentially advertised to children" – innocent juices and smoothies are already not advertised to children.

Since the consultation launched we have seen that anything classified as HFSS will be referred to as junk food. Proposals include banning all HFSS advertising on TfL sites, restricting promotions, applying teaspoons of sugar labelling and implementing a 9pm watershed on advertising.

These restrictions don't appear to be appropriate for 100% juice and smoothies which, according to the evidence, can play a positive role in a healthy, balanced diet.

4. Our suggestions for how the model can best improve the health of the UK

Getting enough fruit & veg and fibre

We have been looking into innovation that would include more whole crushed fruit in 100% fruit and veg drinks and so deliver the benefits of more fibre in a wider range of drinks. We are also keen to bring the veg-rich gazpacho we have developed for France to the UK.

The proposed model would render such innovation impotent as nothing natural could be included in our 100% fruit and veg recipes to make them non-HFSS. We suggest:

- **including a fibre scale for drinks**: innocent smoothies are one of the few drinks to be a source of fibre but under the proposed model, there is no level of whole crushed fruit that could be included in a 100% juice or smoothie to make it non-HFSS. The level of fibre needed is higher than the fibre level of whole fruit. Using a fibre scale for drinks would distinguish between lower and higher fibre drinks, encouraging innovation to make more drinks a useful part of efforts to raise fibre intakes. Appdx. A

- **moving to a 10 point scale for FVN**: moving to a 10 point scale for FVN would encourage higher inclusion rates of fruit and veg in other products and enable consumers

to distinguish between juice drinks and 100% juice and smoothies. Giving increased recognition to FVN content would balance the absence of recognition for any nutrients from fruit and veg other than fibre in the proposed model. The micronutrient contribution of fruit and veg has important implications for health outcomes and would be better recognised by a 10 point scale. Appdx. B

Reducing calories and sugar

We are committed to the considerable investment required to achieve the sugar reduction targets for our drinks eg

- a new filling line to move our kids smoothies from 180ml to 150ml in 2019 will cost just under £2m
- a new bottling line and bottle pre-forms to move our super smoothies and juices down from 360ml will cost more than double that
- recipe development and consumer trials to reduce sugar / ml in our juice blends all takes time away from creating new drinks.

Our suggested changes to the proposed NPM would ensure that this progress could continue whilst the model still achieves its aims:

- **exempting juice and smoothies**: an exemption from the model for 100% juices and smoothies would recognise that:
    - FJS is the only category high in free sugar which is 100% fruit and veg so all sugar is naturally occurring and cannot, by definition, be removed. Unlike all other categories except milk which is already exempted, there is no reformulation that HFSS classification can encourage.
    - There is no consistent evidence that drinking FJS has any of the health impacts that restricting free sugar consumption aims to avoid. As laid out above, the opposite is true.
        - Consuming 100% juice in line with current dietary guidance delivers micronutrient benefits comparable to those of whole fruit, and with smoothies, the fibre too.
        - There is no evidence of the overconsumption of fruit juice and smoothies.

And finally

To recap, we wanted to share with you:

1. A bit about our business
2. Our thoughts on improving the health of our drinkers
3. The evidence on the role juices & smoothies can play in a healthy, balanced diet:
    - Fruit juice & smoothies (FJS) make a positive contribution to the diets of children and adults in the UK
    - Consuming fruit juice is beneficial for dietary quality and long term health outcomes
    - Fruit juice does not contribute to excess energy intakes or obesity

4. Our suggestions for how the model can best improve the health of the UK.

As we said at the beginning, to us, success for the revised NPM would be incentivising a reduction in the calories and sugar that kids are getting, at the same time as increasing the amount of fruit & veg and fibre in their diets.

Drinking 150ml of 100% fruit juice or smoothie as part of a healthy, balanced diet is a tasty, convenient way to help achieve that success and should be supported by consistent dietary guidance.

Thank you for reading.

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Appendix A

Suggested fibre scale for drinks

Fibre (AOAC) (g)	Points
0	0
0.35	1
0.7	2
1.1	3
1.45	4
1.8	5
2.15	6
2.5	7
2.9	8

Appendix B

Suggested 10 point scale for FVN

FVN (%)	Points
0	0
40	4
50	5
60	6
70	7
80	8
90	9
100	10

Appendix C

Technical Summary

Title / Subject	Summary of project on analysis of free sugars in fruits, purees and smoothies
Document Reference	Version: 01
Project	Using Microscopy and Chromatography to Map the Release Profiles of “Free Sugars”
Client	Innocent Ltd

With the Scientific Advisory Committee on Nutrition[1, 2] recommending that the amount of “free sugars” in a diet should not exceed more than 5% of the total dietary intake, there is a need for food and beverage companies to understand and control the level of this sugar in their products. Sugars that are held within fruit cells are excluded from the definition of free sugars, underpinning the emphasis on eating fruit as part of a healthy diet. Products, including fruit bars, drinks and smoothies, which have a mix of intact fruit cells and disrupted fruit cells, will contain a level of free sugars that depends on the amount of cell breakage caused during the processing of the product.

At the request of Innocent Limited, Leatherhead Food Research carried out three streams of work.

Work stream [1]: The first work stream was to assess and evaluate the practicality of measuring free sugars in three fruits typically used in fruit based drinks, namely banana, strawberry and mango. The methodology involved separation of the solid part of the product from the liquid and analysis of the sugars in both solid and liquid phases using a standard HPLC method. Additionally the samples were examined using light microscopy to assess the cellular structures present.

The output of this first work stream is that it appears to be possible to estimate free sugar with this kind of separation technique; however, great care needs to be taken not to cause cell damage during the testing as this will increase the level of free sugar. This approach would need to be validated.

Work stream [2]: The second work stream was to undertake a top level literature review on the relationships between blending and homogenisation and cell breakage and release of sugars. The findings from the review indicated that fruits and vegetables could be broken down to varying degrees ranging from ruptured cells to differently sized pieces of tissue containing intact and ruptured cells. The type of cell breakdown is driven by a number of factors such as; the type of fruit, the variety, how they are processed and level of dietary fibre[3,4,5].

Work stream [3]: The third part of the work was to assess the impacts of different processing methods and to measure the free sugar produced. The samples examined included commercially-produced.

fruit purees and smoothies as well as laboratory-produced purees and also samples derived from fresh fruits after chewing.

This study showed that the level of free sugars compared to “trapped” sugars (held within the solid cell fraction) did vary depending on the type of fruit as well as the method of processing to form a puree. Freezing and chewing also produced differences in terms of free sugars. Some of the results are summarised in the table below.

Light microscopy showed that the three fruits had large differences in structure and the cells fractured in different ways, either through the cell walls or through the central lamellae, resulting in open cell contents or intact separate cells.

Whilst the number of samples analysed in this study was low, and further analysis is needed to increase the robustness of the data, the preliminary conclusions from this study demonstrate that the level of free sugars in a fruit puree is a consequence of cell rupture and the degree of rupture is dependent on the fruit type, variety, method of processing and storage conditions. There are

likely to be other factors, such as level of ripeness, that are also important but have not been assessed.

These results indicate that there is an opportunity for producers to control the level of free sugars in their products by understanding the relationships between cell rupture, manufacturing conditions and the ingredient properties.

Sample	% total sugars as "free" sugars	% total sugars as "trapped" sugars	Dietary fibre content (g/100g)	Sugar content (g/100ml)
Laboratory blended raw banana	17	83	1.4 (from literature)	12.46
Laboratory blended raw mango	68	32	No reliable information available	11.13
Laboratory blended raw strawberry	39	61	3.8 (from literature)	5.86 6.46 (different variety)
Commercial banana puree - frozen	21	79	1.5	18.67
Commercial banana puree - chilled	4	96	1.5	18.67
Commercial mango puree	55	45	0.34	17.8
Commercial strawberry puree	70	30	1.12	3.8
Chewed banana	37	63	nm[1]	nm[1]
Chewed mango	23	77	nm[1]	nm[1]
Chewed strawberry	33	67	nm[1]	nm[1]

nm[1] not measured

Summary of project on analysis of free sugars in fruits, purees and smoothies, , Version: 01

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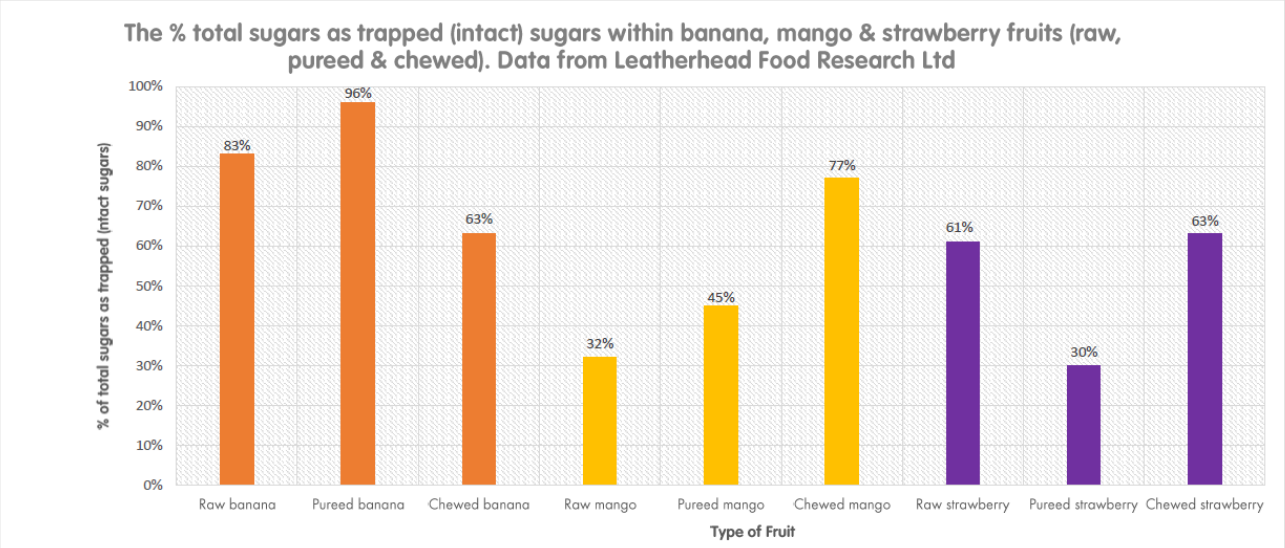

FOREWORD

A lack of fibre is one of the biggest and most overlooked dietary gaps in the UK. There has been much focus on free sugars and vitamin D recently but the importance of dietary fibre – the 'Cinderella' nutrient - continues to be significantly under recognised. Currently around 9 out of 10 of us don't get enough dietary fibre[1] with recently increased guidelines published by the Scientific Advisory Committee on Nutrition[2] making the gap between average fibre intakes and recommendations even wider.

Dietary fibre is important for a range of health reasons extending far beyond those related to poo. For example, it is now well known that fibre can help to regulate blood glucose response and lower cholesterol levels with newer evidence showing that it may also have positive influences on gut microbiota too.[3] Alongside this, increased dietary fibre has been linked to a lower risk of cardiovascular disease and coronary heart disease,[4] colorectal cancer[5] and diverticular disease.[6] Amongst children, those eating more fibre have been found to have a better antioxidant profile.[7]

It should also be appreciated that the term 'dietary fibre' is broad and within this, individual types of fibre can have distinct and indeed separate effects on the human body.[8] **Bearing this in mind innocent has worked with a number of UK universities to focus on this important area – that link fibre, food science and health.**

Recently published research from Leeds University shows that smoothies RETAIN the integrity of their fruit cell wall structures after production and that the dietary fibre naturally present has potential health benefits[9] Work carried out at Oxford Brookes University revealed that smoothies have a LOW glycaemic index (GI), with the fibre component of smoothies possibly contributing to this.[10] Research at Bristol University discovered that smoothies tend to be classed by consumers as being 'food like' which may be associated with feelings of satiation.[11]

It is well known that fruit and vegetables are an important source of dietary fibre. Latest government data[12] from Years 7 and 8 of the UK National Diet & Nutrition Survey (NDNS) (2014/15 to 2015/16) reveals that **less than a third of adults manage to get their 5-a-day[13]** and all life stages eat less on average, than the recommended 400g of fruit and vegetables, as advised by the World Health Organisation which forms the basis of the 5-a-day campaign in order to lower chronic disease risk and helping to ensure an adequate daily intake of fibre.[14,15,16]

Smoothies have been around in the UK since the 1990s, increasing in popularity. Smoothies are well-appreciated for their portability - changing lifestyles where people fuel on the move and seek healthier snacking options.[17] Alongside providing important antioxidant-rich fruits and vegetables, smoothies are also a valuable source of dietary fibre.

"Work carried out at Oxford Brookes University revealed that smoothies have a LOW glycaemic index (GI), with the fibre component of smoothies possibly contributing to this."

Given current UK dietary fibre gaps and the fact that people often see fibre as being indigestible, lacking in taste and unappealing, smoothies have the potential to be a promising and interesting means of fibre delivery, especially amongst children and young people who currently have some of the lowest fibre intakes in the UK.

SECTION 1
FOCAL POINT - FIBRE

FIBRE FORMS

Fibre can lack in 'health' appeal – often tied to bowel health but its role in our health is much broader than this. The term 'dietary fibre' is broad and within this individual types of fibre can have distinct and separate effects on the human body.[18] Most commonly, fibre is grouped as being 'soluble' or 'insoluble'.

Soluble fibre – This means just that – it is water soluble and well fermented (digested easily) and includes components such as pectin, gums and mucilages.[19] The types of fibre present in smoothies tend to be that of 'soluble fibre'.

Insoluble fibre – This does not dissolve as well in water (or indeed the gut), so is more likely to be expelled (yes, as poo). It typically includes fibre components such as cellulose, hemicellulose and lignin.[20]

Smoothies contain a combination of soluble pectins and insoluble celluloses.[21,22] Research has shown that the ratio of soluble dietary fibre (SDF) to insoluble dietary fibre (IDF) is typically 3:1 in smoothies.[23] **Smoothies contain a mixture of whole, crushed fruit and fruit juice and therefore contain more fibre than fruit juices** (1.7g per 100g vs. 0.1g per 100g respectively).[24]

FIBRE – THE HEALTH LINK

There is a an increasing body of evidence linking fibre to our health and well-being. Meta-analytical evidence (regarded as the gold standard) shows that people with higher fibre intakes tend to have a lower risk of: cardiovascular disease and coronary heart disease,[25] death from all types of cancers,[26] stroke[27, 28] and having a 'first' stroke, and amongst those suffering from constipation improve stool frequency.[29] Soluble fibre has also been found to reduce total and low-density lipoprotein cholesterol[30] and improve symptoms of Irritable Bowel Syndrome (IBS).[31]

"Smoothies contain a mixture of whole, crushed fruit and fruit juice and therefore contain more fibre than fruit juices (1.7g per 100g vs. 0.1g per 100g respectively)"

Our Microbiomes

There has been much interest in our microbiome aka 'gut flora' recently. Fibre helps 'good' bacteria to grow and flourish with diets higher in fibre being linked to a greater microbial diversity in the gut.[32] Unfortunately, when we have low intakes of fibre this can limit the diversity and number of favourable bacteria in the gut – placing our guts at risk of disease and infections.[33,34]

Evidence from human trials shows that fibre can play a key role in shaping the human gut microbiome.[35] Feeding beneficial gut microbiomes with dietary fibre – their preferred source of sustenance – could be one of the best approaches to maintaining gut health.[36] So, it seems that failing to consume enough fibre may be contributing to our "disappearing microbiomes" making us vulnerable to poor gut health.

HOW MUCH SHOULD WE HAVE?

Given growing evidence around fibre and health the Scientific Advisory Committee on Nutrition (SACN)[37] recommends that we should be eating MORE fibre – 25 to 30g daily. This guideline was developed based on evidence from studies where increased intakes of total dietary fibre were associated with a lower risk of cardio-metabolic disease and colo-rectal cancer.[38]

Within the SACN report it was concluded that the health benefits of fibre tend to come from studies where the exposure reflects dietary fibre intakes achieved through a variety of foods where it is present as a naturally integrated component. Given this, it was recommended that **fibre intakes should be achieved through a variety of food sources.**[39]

The good news is that smoothies can also count as a valuable fibre source. Currently, 9 out of 10 people in the UK are still not eating enough dietary fibre.

HOW MUCH ARE WE GETTING?

Our current fibre intakes are substantially LOWER than SACN guidelines. This trend of under consumption is across the board - apparent in all age groups and males and females alike. When looking at the fibre gap – that is the gap between intakes and recommendation intakes – our fibre consumption is consistently lower than the daily amounts advised.

The current UK National Diet and Nutrition Survey analyses fibre intakes for UK adults aged 19 to 64 years and 65 years and over. Latest results from Years 7 and 8 of this survey show that **less than 10 per cent of children and adults are meeting fibre recommendations** (Figure 1).[40] Fibre intakes are consistently low with mean intakes being just 15.3 grams per day in children aged 11 to 18 years and 19 grams per day amongst adults aged 19 to 64 years – well below targets of 25-30 grams per day. (Figure 2).[41]

To delve into this data further we re-analysed the archived NDNS data and specifically looked at fibre intakes amongst those in their twenties, thirties, forties and fifties[42] in order to further study this central age group.

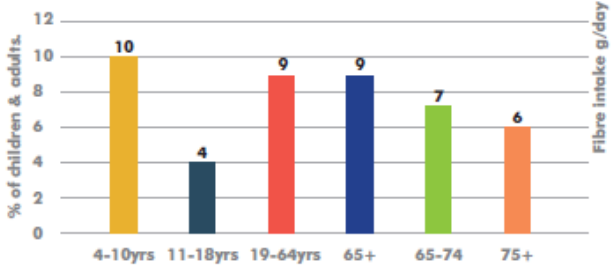

Figure 1: Percentage meeting fibre* recommendations.
Key: *AOAC fibre.

Dietary fibre guidelines[21] are set at:

- 15g/day for 2-5 year olds.
- 20g/day for 5-11 year olds.
- 25g/day for 11-16 year olds
- 30g/day for 16-18 year olds and adults.

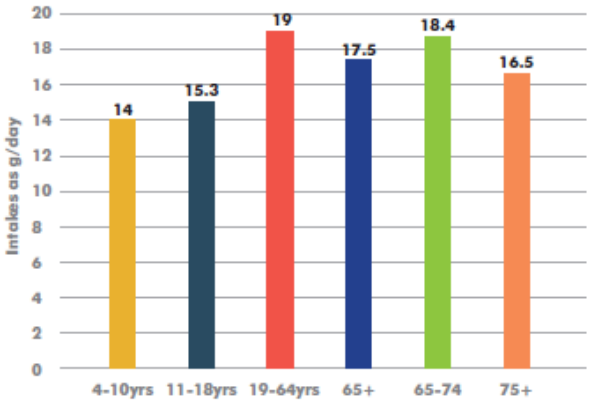

Figure 2: Fibre* intakes across the life span.
Key: *AOAC fibre.

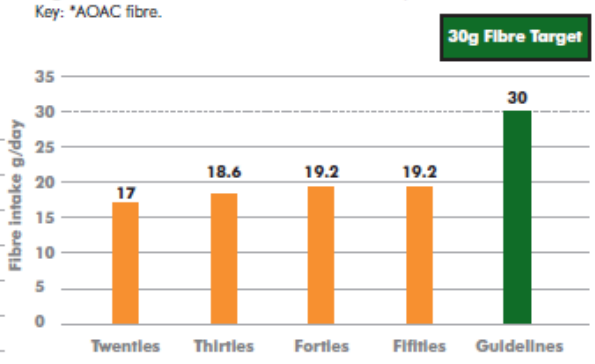

Figure 3: Fibre intakes (g/day) compared to guidelines.
Note: A conversion factor of 1.33 has been applied to non-starch polysaccharide values to estimate AOAC fibre content which is aligned with current guidelines.

KIDS, FIBRE

Children should be eating a healthy and balanced diet and by the time they are 5 years old they should be getting their 5-a-day from fruit and vegetables every day. Smoothies and fruit juices are suitable for children aged 12 months and over. For those aged between 1 and 4 they are also a useful source of vitamin C which can help with the absorption of iron. Official government advice is that a 150ml glass of pure, unsweetened fruit juice counts as one portion of fruit.[43]

Fibre is another nutrient that is important for children but tends to get overlooked. Latest data shows that children and young people in the UK have concerningly low fibre intakes. Secondary analysis from the UK National Diet and Nutrition Survey (Years 5 and 6) shows that **teens aged 16 to 18 years have an exceptionally large fibre gap, falling 12.3g short of fibre targets** (Figure 4). Those aged 11 to 16 years are next to follow, with fibre intakes 9.4g below guidelines.

Unfortunately, many children see fibre as being something that is rather unappealing and boring.[44] Taking this on-board, smoothies have the potential to be an innovative and promising vehicle for fibre delivery for children and young people alike.

"Children and young people in the UK have concerningly low fibre intakes."

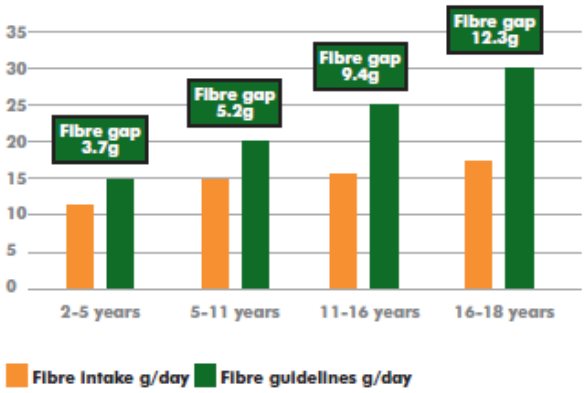

Figure 4 – Children's fibre intakes compared with guidelines.*

*SACN fibre guidelines for AOAC fibre.

ALL IN ALL

Fibre is under consumed across the board in the UK. The role of fibre extends far beyond that of bowel health and poo - helping to reinforce heart health, prevent cancer and support the microbiome.

Unfortunately, there is a tendency for fibre to lack 'health' appeal, especially amongst teens and young people. Smoothies are an innovative way of delivering this important nutrient. We know that fibre is 'retained' in smoothies even after processing – particularly the pectin and cellulose fibres.[45] So, drinking fibre is another way to obtain it alongside eating it. innocent's range of smoothies all provide between 2-4g of fibre per 250ml.

SECTION 2
FRUIT & VEG LOWDOWN

CURRENT RECOMMENDATIONS

Getting people to eat more fruit and vegetables is very much a global health priority. It is currently recommended that we eat 400g of fruit and vegetables daily. This advice was compiled by the World Health Organisation[46] which now forms the basis of the UK 5-a-day campaign.[47] The 400gram daily target was established in order to lower disease risk and help ensure an adequate daily intake of fibre.

In fact, research is beginning to show that we may need to eat MORE than 5-a-day to obtain the full health benefits of fruit and vegetables. For example, research at Imperial College London[48] concluded that we should be aiming for 10-A-DAY when it comes to daily fruit and vegetable portions.

The review published in the *International Journal of Epidemiology*[49] analysed data from 95 studies concluding that a daily intake of 800g (about 10 portions) was linked to a:

> 33% reduced risk of stroke.
> 31% reduced risk of all-cause mortality.
> 28% reduced risk of cardiovascular disease.
> 24% reduced risk of coronary heart disease.
> 14% reduced risk of total cancer.

In America,[50] latest guidance is also encouraging consumers to increase the total amount of fruit and vegetables to 9 to 13 servings in all forms available.

Note: Potatoes, sweet potatoes, cassava and other starchy roots are not classified as fruits or vegetables.

ARE WE GETTING '5'?

When it comes to fruit and vegetable intakes, these continue to be substantially lower than recommended. Data from years 7 and 8 of the UK NDNS[51] shows that **less than one-third of UK adults aged 19 to 64 years are meeting the 5-a-day target.** Furthermore, only 8% of children aged 11 to 18 years meet this target amount (Figure 5).

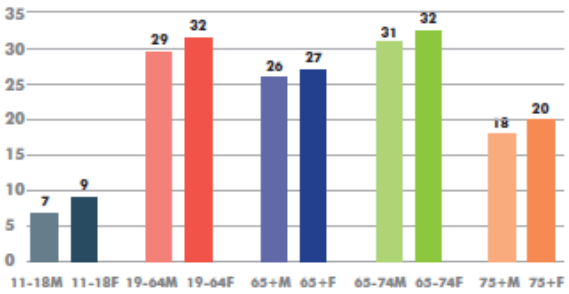

Figure 5: Percentage of Brits. meeting the 5-a-day target.

The current UK National Diet and Nutrition Survey collates data for adults aged 19 to 64 years and 65 years and over. A secondary analysis sought to 'delve deeper' into this rather broad age group, investigating fruit and vegetable intakes across 'mid-life'. Research showed that young people (aged 11 to 20 years) have some of the LOWEST fruit and vegetable intakes with only 8.5% achieving the 5-a-day. For those in their 20s only 1 in 5 (19.2%) met the 5-a-day. (Figure 6)

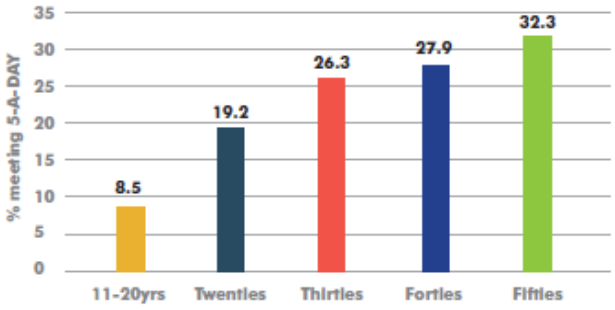

Figure 6: Percentage meeting 5-a-day target – 20s, 30s, 40s, 50s.

AMOUNT EATEN

Looking at the 'amount' of fruit and vegetables eaten, older children and teens aged 11 to 20 years need an extra 226.4g daily (about 2.8 portions) to achieve 400g per day. Even those in their fifties need an extra daily portion (89.3g) to achieve 400g per day.

As shown in Figure 7, for those aged 11 years and up consuming a smoothie daily could help to top up daily fruit and vegetable portions from 3.7 to 4.7, helping to align with 5-a-day recommendations.

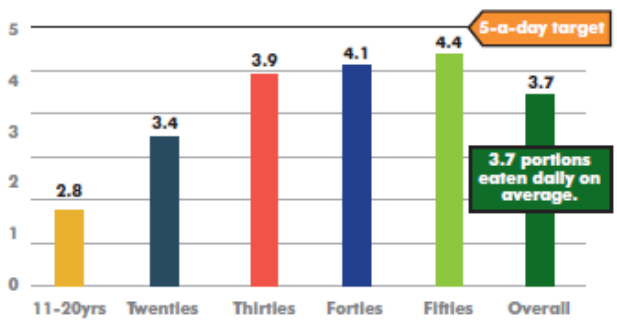

Figure 7: Daily No. of Fruit and Vegetable Portions eaten.

Some other research has looked at fruit and vegetable trends using data from years 1 to 4 of the UK National Diet and Nutrition Survey. The work published in the *British Journal of Nutrition* found that fruit intakes declined from age 7 in boys and girls, reaching its lowest level during the teenage years.[52] Unfortunately, there was very little evidence of recovery after this period, highlighting the importance of establishing good fruit and vegetable habits during early childhood.

Other work in school settings has shown that providing middle and high school students with a smoothie serving during school breakfast substantially helped to improve their daily whole fruit intake from 4.3 to 45.1 per cent.[53]

FRUIT & VEG BENEFITS

There are a host of health benefits linked to eating fruit and vegetables. They provide a good dose of fibre, vitamins, minerals, phytochemicals that function as antioxidants, phytoestrogens and anti-inflammatory compounds.[54]

Fruits and vegetables are major contributors to nutrients that are under consumed – including fibre, vitamins A, C, K, potassium and magnesium.[55] Other work using data from 12 studies has shown that consuming more fruit and vegetables can help to drive up the fibre, micronutrient and carbohydrate content of the diet and even reduce fat intakes.[56]

As a result, fibre can come from different food forms (not just bran flakes and dried fruits) – which now includes smoothies.

MICRONUTRIENTS

Despite the abundance of information we have about nutrition, we still aren't getting enough of the key vitamins and minerals needed for good health. Latest data from years 7 and 8 of the National Diet and Nutrition Survey shows that a number of vitamin shortfalls continue to exist in the UK.[57] The Lower Reference Nutrient Intake (LRNI) is a useful indicator of nutritional shortfalls, as intakes below this threshold indicate a potential risk of deficiency. It can be seen that:

- → 13% of adults and 21% of children (11 to 18 years) have vitamin A intakes below lower intake thresholds;
- → 10% of adults and 20% children (11 to 18 years) have riboflavin intakes below lower intake thresholds;
- → 8% of women of childbearing age (16 to 49 years) have dietary folate intakes below lower intake thresholds;
- → 54% girls (11 to 18 years) and 27% women (19 to 64 years) have iron intakes below lower intake thresholds;
- → 9% adults and 16% children (11 to 18 years) have calcium intakes below lower intake thresholds;
- → 13% adults and 38% children (11 to 18 years) have magnesium intakes below lower intake thresholds;
- → 17% adults and 28% children (11 to 18 years) have potassium intakes below lower intake thresholds;
- → 12% adults and 20% children (11 to 18 years) have iodine intakes below lower intake thresholds;
- → Around one-third (35%) adults and children alike have selenium intakes below lower intake thresholds;

So, despite modern life and our easy accessibility to a wide range of foods, it is clear that nutritional shortfalls still do exist. Drinking a daily smoothie providing some of these could help to 'balance out' some of these shortfalls.

ALL IN ALL

Fruit and vegetables are an essential component of a healthy diet. A large body of evidence shows that they protect us against heart disease and certain cancers. Yet unfortunately, two-thirds of the UK population fails to meet the 5-a-day recommendation.

This is concerning given that fruits and vegetables are a valuable source of fibre, vitamins, minerals, antioxidants and phytonutrients. We have seen in this section how smoothies and drinking 1-a-day could help to narrow the fibre gap. Whilst different smoothies provide different nutrients, they can also help deliver key nutrients such as vitamin A and folate where there are shortfalls (see our nutritionals).

SECTION 3
SMOOTHIE SCIENCE

A number of new studies have recently been carried out looking at smoothies from a food science and nutritional perspective. Here's a snapshot of some of this research.

FIBRE IS RETAINED IN SMOOTHIES
University of Leeds

New research at the University of Leeds and published in the *Journal of Nutrition and Food Science*[58] has studied the level to which cell wall structures stay intact during simulated digestion. The team studied the cell wall structures and noted that these remained intact in a commercial fruit smoothie (blend of banana, mango, orange and apple - innocent) and fruit purée (banana, mango - innocent), but not in fruit juices (apple or orange).

The fruit smoothies were also homogenised (mixed) in a similar way to which they would be digested in the gut, also known as 'gastro-intestinal digestion', and the total, integrated and soluble fibre content determined.

Even when the smoothie was subject to simulated digestion, cell wall structures remained and were still present even 16 hours after they had been incubated with digestive enzymes (Figure 8). These findings indicate that **the cell wall structures of smoothies are similar to those seen in crushed fruits. They are preserved during commercial smoothie making and further retained during digestion.**

So, smoothie processing **does not** appear to adversely affect the cell wall structures of fruits. This means that smoothie consumption could offer similar benefits to whole fruits. More work is needed to see how this could affect health but the retention of these cell walls in smoothies, as seen here, may have benefits that are independent to total fibre content.

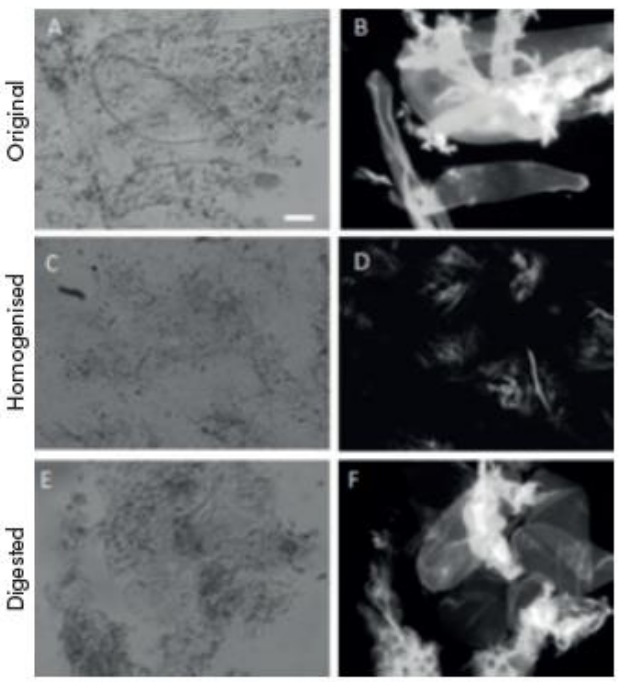

Figure 8: Light and UV microscopy images of commercial smoothie samples.

"It is well recognised that habitual intakes of dietary fibre are consistently low in the UK. Smoothies may be another means of delivery in terms of helping to improve these"

The second part of the research focused on measuring the total dietary fibre and integrated fibre content of the smoothies. Results showed that the proportion of soluble dietary fibre (SDF) and insoluble dietary fibre (IDF) made up 65 and 35% of the total dietary fibre, respectively (a ratio of SDF: IDF of 3:1).[59] These findings show that the amount of SDF is slightly higher than that of whole fruit which is typically found in a ratio of 1:2.[60]

Dr Emma Derbyshire, Public Health Nutritionist, notes: *"These are important findings. It is well recognised that habitual intakes of dietary fibre are consistently low in the UK. Smoothies may be another means of delivery in terms of helping to improve levels".*

She goes on to explain: *"Whilst it is well appreciated that fibre is needed for general health and wellbeing, these retained structures could have a wider role to play in gut health. We already know, for example, that dietary fibre is needed for the prevention of constipation and there is new evidence showing that fibre has an important role to play in shaping our gut microbiome".*

SMOOTHIES HAVE A LOW GI –
Oxford Brookes University

Research carried out at Oxford Brookes University[61] has determined the fibre content of two commercially available fruit smoothies (innocent) along with its impact on glycaemic response using accepted techniques.

The first part of the study evaluated the cellular and fibre content of two smoothies (Mango and Passionfruit, Strawberry & Banana) in detail. This was then compared against that of raw fruit (banana, mango, passionfruit and strawberry) that were either whole, blended, sieved or chewed versions of the fruits.

In a human crossover study the glycaemic response of the two smoothies was also compared against a reference food. The smoothies were tested once each with at least a one-day gap between measurements. The reference food was tested on three separate days. All tests took place before 10am after a 12-hour overnight fast.

It was found that smoothies' cell dimensions were greater than that from the fresh fruit. Electron microscopy (a very powerful microscope!) showed that **fruit smoothies retain their cellular material after smoothie processing.** Plant cellular material were also clearly present in the two smoothies after their production (Figure 9).

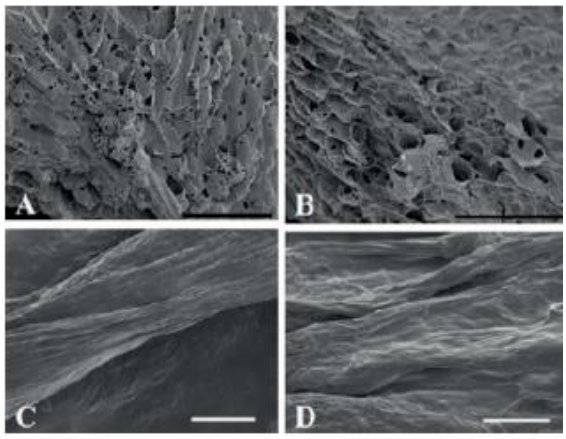

Figure 9: Vascular tissues/fruit fibres in smoothies.
A&B Strawberry & Banana Smoothie.
C & D Mango & Passionfruit Smoothie.

"Dietary fibre naturally present in fruits appears to be being retained during smoothie processing which has a glycaemic-lowering response."

The human trial showed that both smoothies - **Mango & Passion fruit and Strawberry & Banana had a low Glycaemic Index of less than 55** (indicating that is was low GI). Table 1 below details the GI of both smoothies - found to be low and the Glycemic Load (GL) value was medium-low.

Table 1: GI value, GL value (per 250ml bottle) and classification of the innocent smoothies.

	GI value (mean + SEM)	Classification	GL value (mean + SEM)	Classification
Strawberry & Banana smoothie	39 + 4	Low	11.4 ± 1.3	Medium
Mango & Passion Fruit smoothie	36 + 5	Low	9.7 ± 1.2	Low

Taken together, these findings show how the fibre appears to be retained in fruits after *smoothie processing*. In particular, **the Strawberry & Banana & Mango and Passion Fruit smoothies retained a considerable amount of fibre after processing, mainly in the form of cellulose and pectins.** This, in turn, appears to have a role in the lower GI of smoothies and the regulation of glycaemic response.

Dr Emma Derbyshire notes: *"It is often thought that smoothies have a high glycaemic index due to the presence of natural fruit sugars and the mobilisation of these during production. However, what we are actually seeing here is that the dietary fibre naturally present in fruits appears to be being retained during smoothie processing which has a glycaemic-lowering response'.*

SMOOTHIES ARE SATIATING –
Bristol University

Work carried out at Bristol University[62] has compared the satiety effects of innocent smoothies against other drinks and fruit. This work was carried out because there was speculation that smoothies may not be as filling as fresh fruit.

The study recruited 47 healthy adults aged 18 to 37 years who were allocated to different preloads, each with a similar calorie content (Table 2). Testing took place in the morning after an overnight fast and participants received one of the preloads as their 'breakfast.' These were given in 250 ml or equivalent servings.

After eating and drinking these preloads, energy intake from the 'ad libitum' (eat all you want) test meal was measured after 2 or 120 minutes. The team also measured feelings of hunger, fullness, and liking, desire to consume, enjoyment and satisfaction of both the preload and test meal.

Table 2. Nutrient content of the preloads

	kcal per serving[b]
Water (Control)	0
Blackcurrant squash	136
Milk	136
Smoothie	136
Fruit salad	136

Of the preloads, smoothies were rated high on liking, desire to consume, enjoyment and satisfaction, and were valued (amount-willing-to-pay measure) substantially higher than the other 'drinks' and similarly to the fruit salad. Smoothies were also regarded as being more *'food like'* than water or blackcurrant squash.

Just 2 minutes after having the preloads test-meal energy intake was reduced by fruit and smoothies alike compared with water. Also 2 hours after ingestion both smoothies and milk led to greater feelings of fullness compared with water and squash (Figure 10). Taken together these findings show that smoothies appear to be as filling as fresh fruit - even leading to reduced energy intake and increased feelings of fullness later on.

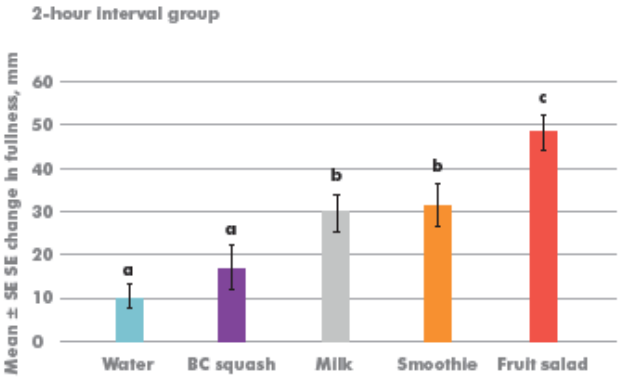

Figure 10: Increased fullness from Smoothies 2-hours after ingestion.

"The research carried out at Bristol University is great news. Until now we didn't really know whether smoothies were regarded as more of a drink or a food. These results show that young adults see these as being more 'food like' which means that other foods are less likely to be eaten implying satiating effects."

Dr Emma Derbyshire

ALL IN ALL
A growing body of evidence shows that the cell wall structures of fruits and vegetables are preserved and similar to those seen in crushed fruits. In turn, this appears to contribute to the low glycaemic index of smoothies and the steady increase in blood sugar levels that occurs after drinking an innocent smoothie. Latest research also shows that smoothies appear to have satiating effects which appear to be attributed to their fibre content.

Fruits and vegetables are an important source of a range of vitamins, minerals, antioxidants and other goodies such as phytonutrients. So, it's not surprising that many of these are also found naturally in smoothies.

Alongside this, studies show that smoothies are also LOW GI and contain all the fibre as found in whole fruits, making them an ideal choice from the chilled aisle. A 150 ml of a typical innocent smoothie provides 36% of your daily requirement of vitamin C. Other key nutrients that can be delivered via smoothies such as Seriously Strawberry and Magnificent Mango (Figure 11) include vitamin A, folate and zinc.

A routine vitamin analysis of smoothies shows the presence of a whole host of different vitamins and minerals. Amounts of these are given as a percentage of the dietary guideline (reference intake) per 100 ml. The array of difference nutrients present in smoothies and their contribution to the reference intake is shown below.

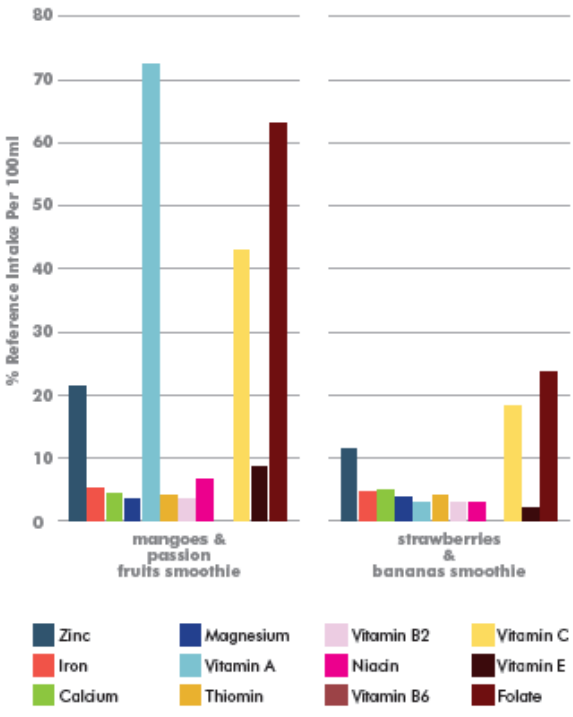

Figure 11: Vitamins & minerals in smoothies.

OTHER GOODIES

Smoothies are rich in a whole range of bioactive phytochemicals and have antioxidant profiles aligned with that of whole fruit. The US Institute of Medicine defines an antioxidant as *"a substance that significantly decreases the adverse effects of reactive species, such as reactive oxygen and nitrogen species on normal physiological function in humans".*[63]

Researchers at the Rowett Institute of Nutrition and Health[64] assessed the antioxidant capacity of smoothies and fruit juices using four different standardised methods (FRAP, TEAC, ORAC, HORAC) and found that all samples behaved as antioxidants.

Interestingly, it was found that smoothies tend to contain a greater array of phytonutrients (Figures 12 and 13) whilst juices tend to have fewer compounds but in higher concentrations. Researchers have found that there were at least 48 different phytonutrient compounds in four smoothies – probably a reflection of them containing at least 5 different fruits.[65]

Figure 12: Phytonutrient concentration in innocent drinks.

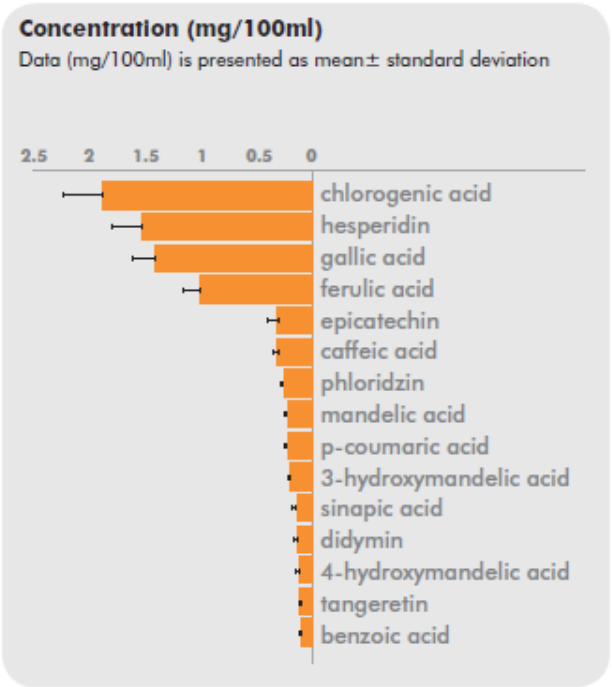

Figure 13: Major phytochemicals (>0.1mg per 100ml) present in a mangoes and passion fruits smoothie.

ALL IN ALL

Smoothies have the potential to be important providers of vitamins, minerals and phytonutrients. In particular, routine analysis shows that smoothies are a valuable source of vitamin C, vitamin A, folate and zinc alongside providing a spectrum of phytonutrients.

Fibre is NOT lost during smoothie processing

If is often incorrectly believed that fibre is lost during smoothie processing. However, this is NOT the case with latest research suggesting otherwise.

Research carried out at the University of Leeds[66] has shown that the cell wall structures of fruits used in smoothies remains intact AFTER smoothie processing. The experiments carried out also showed that the cell wall structures were similar to those found in crushed fruits. These findings indicate that these components may have their own separate health effects on the gut.

Other research at Oxford Brookes University[67] has also found that some smoothies (Strawberry and Banana and Mango and Passion Fruit) retain a considerable amount of fibre after processing, namely in the form of pectins and cellulose.

Types of fibre found in smoothies.[35,36]

- Soluble and insoluble fibre (3:1 ratio typically)
- Cell wall materials
- Pectin
- Cellulose (green plants especially)

Smoothies DO NOT have a high glycaemic index

Due to the 'blending' process as such it is often misconstrued that smoothies have a high glycaemic index/ load. However, latest research shows that this is actually NOT the case.

Glycaemic Index test carried out at Oxford Brookes University[36] has shown that the GI for smoothies tested was actually LOW and the GL was medium/borderline low.

It was concluded by the scientific team that the **fibre retained in smoothies even AFTER processing appeared to have a potential POSITIVE effect on glycaemic response.**

Glycaemic Index (GI) – The glycaemic index (GI) is a measure of the blood glucose-raising potential of the carbohydrate content of a food compared to a reference food (generally pure glucose).

Glycaemic Load (GL) – This is obtained by multiplying the quality of carbohydrate in a given food (GI) by the amount of carbohydrate in a serving of that food.

Smoothies DO NOT lead to dental caries

Research carried out at the Leeds Dental Health Institute[68] has confirmed that there is no significant difference between eating whole and juiced fruit when it comes to the effect on our teeth. In more detail, the research looked at 'demineralising' of the enamel and effects of intrinsic and extrinsic sugars when comparing whole or juiced apples, oranges, grapes, carrots and tomatoes.

Dental experts believe that any fruit or drinks that contain sugars or acids, including fruit, could damage your teeth if you don't look after them properly. So always brush your teeth twice a day with a fluoride toothpaste. Also keep foods and drinks that contain sugars or acids to mealtime, use a straw and avoid swishing liquids around your mouth.

Smoothies DO NOT contribute to weight gain

There is no secret to why we put on weight. If we eat or drink more calories than we need, then our bodies store them for later, no matter where the extra calories come from. The crucial thing is to get the balance right.

Several studies have shown that children and adults who drink fruit juice are in line with dietary recommendations and have better diets overall too, along with better health indicators such as insulin sensitivity.[69,70,71]

On average, a 250ml serving of a smoothie provides 7% of energy (based on a total daily intake of 2000 calories). The good news is that smoothies are packed with nutrients. So, with each calorie that you consume via a smoothie, you also get important nutrients such as vitamin A, vitamin C, folate and fibre.

Smoothies DO NOT provide a concentrated source of sugars

An innocent smoothie provides exactly the same quantity (weight-for-weight) and types of sugars that you would find in an equivalent amount of whole fruit. A 250ml fruit smoothie provides around 32% of the daily reference intake for total sugars, which is all made up of sugars naturally present in the fruit.

ALL IN ALL

Smoothies have had a rough time in the public press. When put into *real* context smoothies are a valuable source of a host of nutrients – including fibre. It is actually the fibre present in smoothies that contributes to their low GI. Smoothies also contribute to one of a 5-a-day for fruit and vegetables, so great news for our health and wellbeing.

Fibre is increasingly being seen as the "forgotten nutrient". It is clear from both the current UK National Diet and Nutrition Survey and secondary analysis of this survey that fibre is under consumed across all age groups by males and females. Children and young people also have diets that are currently lacking in fibre.

Unfortunately, fibre is a nutrient that can lack "health appeal", often linked to bowels and poo. However, there is good science to illustrate that we need fibre for other things too, such as our heart health, for cancer prevention and our gut microbiomes. We have seen that the fibre in innocent smoothies remains intact after processing and that this can contribute to their low GI.

Bearing this in mind it appears that smoothies could be an appealing and innovative way to deliver fibre alongside key vitamins and minerals to the UK population. Children and young people, in particular, who tend to see fibre as being 'unexciting' may prefer to drink fibre rather than eat it.

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https://fruitjuicematters.eu/en/consumption-and-behaviour/role-of-100-fruit-juice-in-the-diet

https://fruitjuicematters.eu/en/nutrition-and-bio-availability/nutritional-benefits-of-100-fruit-juice

https://fruitjuicematters.eu/en/technical-data-and-law/fructose-and-100-fruit-juice

https://fruitjuicematters.eu/en/consumption-and-behaviour/does-100-fruit-juice-impact-on-body-weight

https://fruitjuicematters.eu/en/consumption-and-behaviour/100-fruit-juices-and-sugar

https://fruitjuicematters.eu/en/new-science/metabolic-health-and-100-fruit-juice

https://fruitjuicematters.eu/en/new-science/100-fruit-juice-and-cardiovascular-disease

https://fruitjuicematters.eu/en/nutrition-and-bio-availability/nutrients-in-100-fruit-juice-are-bioavailable-but-processed-has-edge-over-fresh-for-bioactives

Review of Glucose Control, GI and Type 2 Diabetes with a Focus on Fruit Juice

1. Glycaemic Response

Glycaemic response refers to the effect that foods and drinks have on blood glucose after consumption. After eating a meal, carbohydrates (excluding fibre) are absorbed from the intestine into the bloodstream, causing a temporary increase in blood glucose concentration. This is called a glucose excursion. In response, the hormone insulin is released and blood glucose concentration returns to fasting levels, or falls slightly below.

There is clear scientific evidence that glycaemic response is linked with conditions such as type 2 diabetes, cardiovascular disease (CVD) and obesity. A systematic review and metaanalysis confirmed that foods with a low glycaemic impact (i.e. an attenuated effect on blood glucose) have a role in reducing the risk of such chronic conditions.[1]

There are several markers for assessing glycaemic control, all of which are used to diagnose diabetes.[2] Normal and abnormal values are shown in table [1].

- Fasting blood glucose levels
- Oral Glucose Tolerance Test (OGTT), which measures how quickly a 75 g dose of glucose is cleared from the blood in a fasting individual
- Concentrations of glycated proteins, eg HbA1c, which measure long-term glycaemic control

Table 1: Glycaemic control markers criteria[3]

Marker	Normal	Diabetes
Fasting glucose	70–99 mg/dl (3.9-5.5 mmol/l)	> 126 mg/dl (7.0 mm)
OGTT	< 140 mg/dl (7.8 mmol/l)	> 200 mg/dl (11.1 mmol/l)
HbA1c	< 6.5%	> 6.5 %

The glycaemic effect also depends on the sensitivity of tissues to insulin. **Insulin** is a hormone secreted by the pancreas which controls carbohydrate metabolism by stimulating insulin-sensitive tissues, such as muscle and fat, to absorb glucose, which lowers blood glucose. When blood glucose returns to normal, insulin release is slowed.

In cases of “insulin resistance”, muscle and fat tissue do not respond adequately to normal insulin levels, ensuring that blood glucose levels remain elevated. This stimulates further insulin release, leading to chronically high plasma insulin levels. The homeostatic model assessment (HOMA) is used to assess the risk of insulin resistance. This marker shows the dynamic between baseline (fasting) blood sugar and the responsive hormone insulin; the healthy range is 0.5–1.4.

2. Glycaemic Index (Gi)

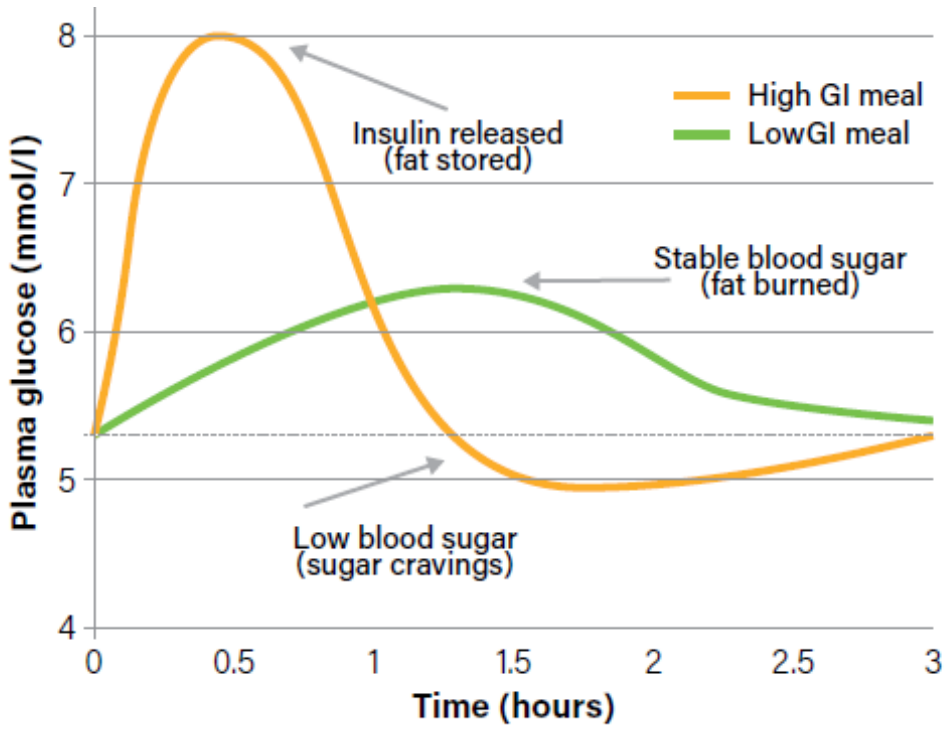
Carbohydrates provide the main energy source in our diet, but a downside is that they stimulate glucose and insulin. The glycaemic response varies for different carbohydrates. More slowly digestible carbohydrates or minimally processed carbohydrate foods produce a different glycaemic response and this finding let to the concept of GI (glycaemic index). GI is defined as

the area under the glucose response curve after consumption of 50 g carbohydrate from a test food divided by the area under the curve after consumption of 50 g carbohydrate from a control food (either white bread or glucose).[4]

Generally, there are three categories of foods based on their GI values: high GI foods (> 70), intermediate GI foods (55–70), and low GI foods (< 55).[5]

Consuming low GI foods, instead of high GI foods, has a positive effect on lowering postprandial glucose levels and controlling glucose excursions. Fully and readily digestible carbohydrates such as glucose, maltodextrin, white bread and cooked potato starch (high GI products) produce a rapid increase in blood glucose, followed by an equally rapid fall. If high GI foods are eaten too often, this has implications for the glycaemic impact of the overall diet. **It is known that chronically high levels of insulin are related to insulin resistance and the development of metabolic syndrome (raised lipids, blood pressure and glucose) as well as type 2 diabetes (figure 1).**

Figure 1: Blood sugar response in healthy adults[6]



Compared with rapidly digestible carbohydrates, low GI products or non-digestible carbohydrates (eg polydextrose and insulin) produce a slower and more prolonged postprandial glucose excursion, thus eliciting a negligible blood glycaemic response.

Consumption of fructose, found in fruits and their juices, does not raise blood glucose levels. This is why fructose-containing foods tend to have a low GI. In addition to the carbohydrates in food, fat and protein can affect glycaemic response, altering the rate at which glucose enters the bloodstream. These effects are mediated through slower rates of gastric emptying or intestinal transit, and reduced access to digestive enzymes. For this reason, the GI value does not give a clear picture about meals or diets, just individual foods.

3. Glycaemic Load (GL)

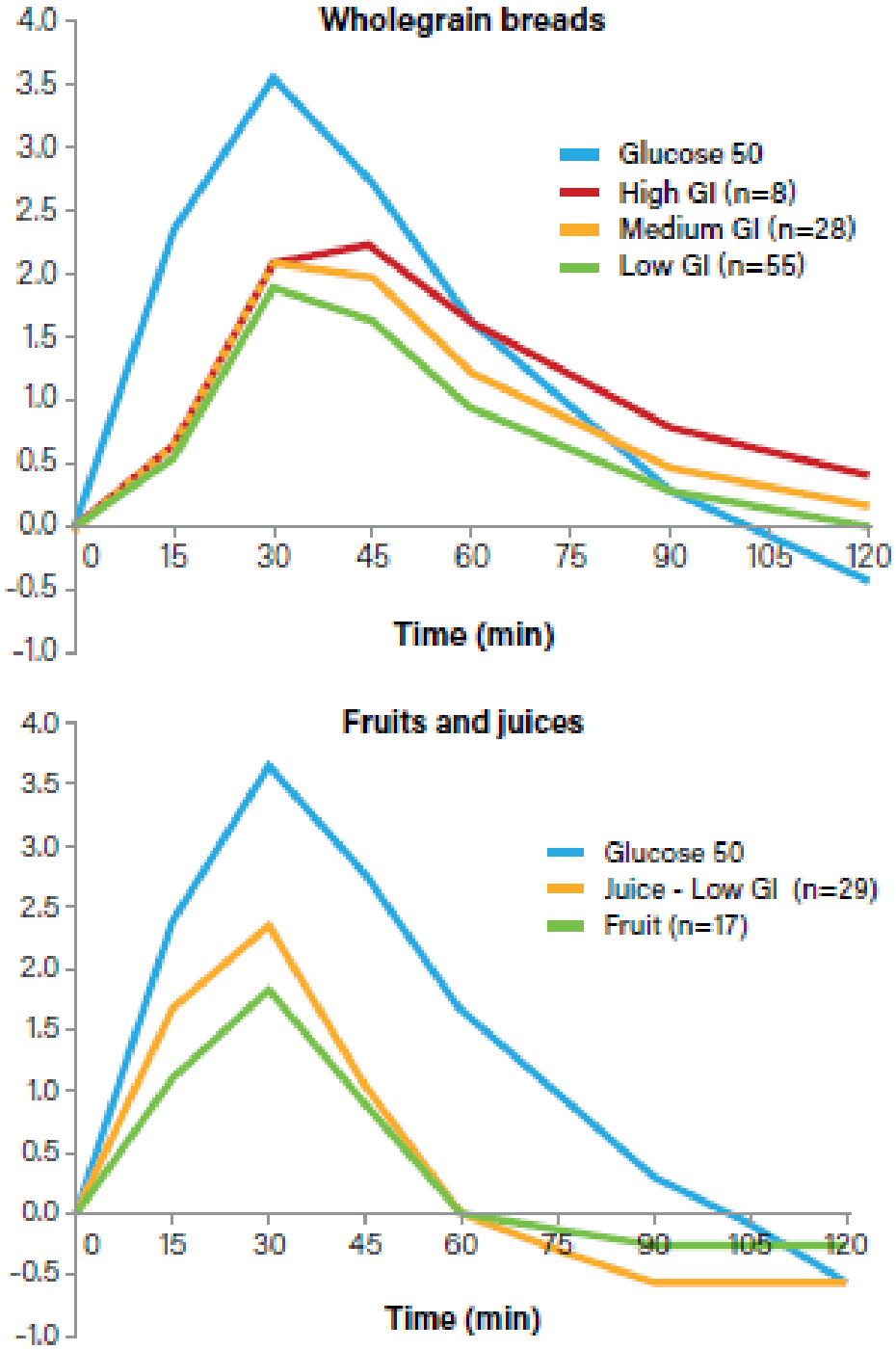
The glycaemic response to a food depends not only on GI but also on the total carbohydrate ingested. On this basis GL was created; defined as how much each portion of carbohydrate raises blood glucose levels. GL is classified as: low (< 10), intermediate (11–19) and high (> 20). Fruits and fruit juices have a low GI and intermediate GL (table 2).

Table 2: GI/GL of typical products[7]

Food item	GI/100 g	GL/portion
White bread	75+2	11/30 g
Whole wheat bread	74+2	7/30 g
Cornflakes	81+6	21/30 g
White rice, boiled	73+4	28/150 g
Apple, raw	36+2	6/120 g
Orange, raw	43+3	4/120 g
Orange juice, medium	50+2	11/250 ml
Orange juice, small	50+2	7/150 ml
Banana, raw	51+3	11/120 g
Potato, boiled	78+4	21/150 g
Sugar-sweetened drinks	63-68	16-23/250 ml

GI research shows that similar amounts of carbohydrate from different foods elicit different glycaemic responses. For example, contrary to beliefs, fruit juices have a low glycaemic peak in a similar way as seen for foods perceived as healthy, such as wholegrain bread (figure 2).

Figure 2: Postprandial glycaemia, and the shape of the curve depends on GI[5]



Diets based on lower GI products are beneficial for people with unstable glucose tolerance as well as patients with type 2 diabetes, according to studies of fasting glucose, HbA1c and insulin sensitivity markers. In healthy populations, lower GI diets and higher intakes of non-digestible carbohydrates resulted in statistically significant improvements in insulin sensitivity, but not fasting blood glucose levels as these depend on hormonal regulation.[8]

4. Fruit Juice, Glycaemic Control and Type 2 Diabetes

A systematic review and meta-analysis, based on 18 randomised and controlled studies, examined the effects of 100% fruit juice on glucose-insulin homeostasis. Compared with the control group, 100% fruit juices had no significant effect on fasting blood glucose (mean

difference: -0.13 mmol/l; 95% CI -0.28, 0.01; p = 0.07), fasting blood insulin (-0.24 mmol/l; 95% CI -3.54, 3.05; p = 0.89), HOMA-IR (-0.22; 95% CI -0.50, 0.06; p = 0.13) or HbA1c (-0.001%; 95% CI-0.38, 0.38; p =0.28). Therefore, 100% fruit juices had no effect on glucose-insulin homeostasis and are consequently not associated with increased risk of diabetes.[9]

In a second meta-analysis[10], fasting glucose and insulin levels were studied in 12 randomised controlled trials involving over 400 participants who were obese or had risk factors for diabetes or cardiovascular disease. In half of these studies, the intake of 100% fruit juice was 400g per day or more. The overall results showed that the consumption of fruit juices had no significant effect on the level of fasting glycaemia and insulin levels. Analysis of subgroups showed that the results were not affected by initial glucose concentration, study duration, type of fruit juice, glycaemic index of the fruit juice or the quality of the study suggesting a consistent effect on “at risk” populations.

In other research, 36 overweight healthy subjects were enrolled in a randomised, single-blinded, placebo-controlled clinical study[11] to investigate the effect of 100% orange juice consumption on blood lipid profile and indices of insulin sensitivity (HOMA-IR). During 12 weeks, participants received either 250 ml of orange juice daily or a control drink. The results revealed that orange juice did not adversely affect insulin sensitivity.

Studies on fruit juice consumption and risk of type 2 diabetes are also available in the literature. One meta-analysis[12] of four cohorts of adults found that consumption of fruit juices with added sugars was significantly associated with an increased risk of type 2 diabetes (RR = 1.28, p = 0.02) while consumption of 100% fruit juices (which never contains added sugar by law) was not associated (RR = 1.03, p = 0.62).

Another meta-analysis[13] of observational studies evaluated associations between type 2 diabetes and various beverages; sugar-sweetened soft drinks (17 studies), artificially sweetened soft drinks (10 studies) and unsweetened fruit juices (13 studies). It emerged that a high consumption of all these products, at intakes of more than 250 ml/day, was statistically associated with a greater risk of type 2 diabetes. However, in the case of fruit juice, the weak RR of 1.07 was only statistically significant after adjusting for several confounders including adiposity. The authors described the fruit juice finding as “unstable” and “sensitive to study design”.

The evidence suggests that 100% fruit juices have no effect on glucose-insulin homeostasis and are not a causal factor in the development of type 2 diabetes. This probably reflects the fact that 100% fruit juices do not have a high GI or GL, perhaps contrary to beliefs amongst health professionals and consumers. It is also likely that the consumption of fructose in moderation promotes improved glucose tolerance by triggering net liver and muscle uptake of glucose. In addition, fructose absorption is not dependent on insulin production.

Another reason may be the high levels of polyphenol compounds in 100% fruit juice. These have been proposed to have an important role in glucose-insulin regulation as they appear to inhibit glucose absorption, stimulate insulin secretion and glucose uptake by cells, and modulate cell signalling pathways as well as gene expression.[1]

5. Conclusion

Products containing fructose, such as 100% fruit juices, have a low GI (i.e. orange juice = 50) and result in less impact on postprandial blood glucose levels than carbohydrates such as glucose, maltodextrin and processed starch. Due to their natural sugar content per portion, 100% fruit juices have a moderate GL. Dietary guidelines vary in their recommendations for 100% fruit juice consumption, with most suggesting 130-240 ml/day for adults. However, intakes across Europe

are low, eg German adults have an average intake of 60 ml/day, while UK adults drink 46 ml/day. In conclusion, according to current knowledge, fruit juices such as orange juice are low-GI and -GL products and do not have adverse effects on glycaemic parameters nor increase the risk of type 2 diabetes.

Disclaimer: Every effort has been made to ensure that the information contained in this document is reliable and has been verified. The information is intended for non-commercial communication to healthcare professionals only. The information given in this dossier does not constitute dietary advice.

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Comparing sugar-sweetened beverages with 100% fruit juice: studies show that fruit juice behaves differently from sugary drinks in the body

Introduction

The presence of the natural sugars in 100% fruit juice (100%FJ) has raised questions about whether 100%FJ has a similar impact on health as sugar sweetened beverages (SSB). Typically, both contain around 9-11g sugars per 100g, but there is little evidence to support the notion that 100%FJ is similar to SSB in relation to health effects, such as obesity, glucose control and nutrient density (also called 'empty calories'). Furthermore, fructose intake has been associated with hyperuricemia and the risk of gout[1].

This article looks in more detail at the composition of 100%FJ compared with SSB and reviews a recent intervention study that investigated this issue in detail for the first time.

New study comparing cola and 100%FJ

A new randomised crossover study[2] recruited 26 healthy adults who were asked to consume either caffeine-free cola or 100% orange juice (100%OJ). The amount provided was around 20 per cent of the participants' daily calorie (energy) requirement, equivalent to around 1.3L per day. It is worth noting that this intake was chosen because 20% of daily energy supply may result from heavy carbonated drink consumption. Statistically, daily 100%FJ consumption is less than 100mL and recommended intakes tend to be 150-200mL daily.

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The drinks were matched for total sugar content, providing an average intake of 112g of sugars per day from the drinks.

After two weeks, and a 1-2 week washout period, participants switched to the other drink for a further two weeks. During the study, measurements were taken to evaluate the impact of the two drinks on glycemic control, uric acid metabolism (as a marker for gout risk), body weight and gut microbiota.

The study revealed the following results:

- No statistically significant changes in body weight, gut bacteria populations or insulin sensitivity (measured by oral glucose tolerance test) after consuming either of the drinks, indicating no negative impact on these health markers;
- Compared with 100%OJ, consuming cola significantly increased the area under the curve for glycemia, reduced 24-hour insulin secretion, and led to greater glucose variability, indicating differences in terms of day-to-day control of glycemia;
- Serum potassium levels were lower after cola versus 100%OJ. 100%OJ is a source of potassium which is proven to support normal blood pressure;
- Blood uric acid levels reduced by an average of 0.43mg/dL ($p<0.01$) after daily consumption of 100%OJ

due to increased uric acid excretion.

Thus, despite having the same overall sugar content as cola, drinking large amounts of 100%OJ did not increase the risk of gout nor have any detrimental impact on glycemic control.

The authors concluded that the "health consequences of commonly consumed sugar-containing beverages cannot be solely refined to their sugar content because they differ profoundly due to secondary constituents". These may include vitamin C, an antioxidant, and beneficial plant compounds such as flavanones and carotenoids.

Timing of 100%FJ consumption

Another randomised crossover trial[3] from the same laboratory considered the most favourable time to drink 100%FJ from a metabolic standpoint. Twenty-six healthy adults were given a daily supply of 100%OJ to drink for two weeks, either between meals or with meals, i.e. three times a day. After this, there was a 1-week washout period before switching to the alternative condition. During the study, other citrus juices were not permitted.

Once again, the amount of 100%OJ consumed was equivalent to 20% of calculated daily energy requirement which was an average intake of 1.3 litres per day, including 112 ±19g per day of natural sugars.

The results showed that drinking 100%OJ with a meal led to a *decrease* in average fat mass of -2.5kg ($p<0.05$) while between meal consumption led to a modest increase in average fat mass of 1kg ($p<0.05$). Interestingly, the energy provided by the 100%OJ equated to an extra 7700 kcal over the 2-week period which would have theoretically increased fat mass by 855 ±150g. Clearly, in the case of 'with meal' consumption, this theoretical increase in fat mass did not materialise – indeed, there was fat loss.

Insulin sensitivity, measured by HOMA-IR and Matsuda index, did not differ significantly after either intervention. Neither were differences seen in daylong glycaemia, insulin secretion, change in basal insulin sensitivity or triglyceride levels (all $p>0.05$). However, a liver function marker (gamma-glutamyl transferase) was significantly lower after the 'with meal' condition indicating more favourable liver function. This challenges the view that fructose in 100%FJ somehow harms liver function.

The authors concluded that a conventional 3-meal structure served with 100%OJ had a favourable impact on energy balance, whereas juice consumption in-between meals may contribute to a gain in body fat.

Comparing health effects of 100%FJ and control drinks

A small number of previous studies have been published which compare SSB or a control drink with 100%FJ in terms of type 2 diabetes (T2DM) and weight gain.

One meta-analysis[4] revealed associations between SSB (17 studies), artificially sweetened soft drinks (10 studies) or 100%FJ plus other juices with no added sugars (13 studies). Combined results revealed that high intakes (>250mL daily) of all these beverages significantly increased risk of T2DM.

Specifically for 100%FJ, the relative risk was small at (RR =1.07), and only achieved statistical significance after adjusting for several confounding factors, including adiposity. The authors commented that the results for 100%FJ (unlike for sugary drinks) should be

interpreted with caution due to their poor quality and risk of bias.

A second meta-analysis[5] of four cohorts of adults found that consumption of fruit juices with added sugars was significantly associated with an increased risk of type 2 diabetes (RR = 1.28) while consumption of 100%FJ was not associated (RR = 1.03, p = 0.62). European law dictates that 100%FJ can never contain added sugar.

In other research, 36 overweight healthy participants received either 250mL of 100%OJ daily or a control drink for 12 weeks. This was a randomised, single-blinded, placebo-controlled clinical study[6] . Compared with controls, 100%FJ had no significant impact on fasting blood glucose and insulin sensitivity markers suggesting that 100%FJ has a *neutral* effect overall on markers of glycemic control. Nor did 100%FJ have any adverse effects on blood lipid profile.

Another study[7] on blood lipids recruited adults with elevated or normal cholesterol levels to drink either 750mL daily of orange juice from concentrate for 60 days versus a 'no juice' control. Low density lipoprotein cholesterol (LDL-c) was significantly reduced by the end of the trial amongst those subjects with elevated cholesterol levels at baseline, whilst high density lipoprotein cholesterol (HDL-c) was raised. These findings suggest that orange juice may facilitate free cholesterol transfer to HDL-c which is a favourable effect in terms of normal heart health.

There is a belief that 100%FJ consumption contributes to weight gain, despite this view not receiving support from high quality intervention studies. In a recent trial[8], 78 obese patients were randomised to drink 500mL daily of either 100%OJ or a control drink over 12-weeks. Daily 100%OJ, at intakes more than twice the amounts usually recommended in Europe, did not inhibit weight loss (Figure 2) but did increase vitamin C and folate intakes by 62% and 39%, respectively. 100%OJ is a recognised source of these nutrients. Energy intakes were unaffected by the drinks, whereas significant improvements in insulin and lipid profiles were seen in the 100%OJ group relative to the control.

Nutritional content and glycemic load of 100%FJ compared with SSB

The nutrient composition of 250mL (a typical single serve) of 100% orange juice (100%OJ) is shown below alongside a 330mL typical single serve of cola (as an example of a SSB).

	100%OJ[a]	Cola[a]
Energy kcal	102	135
Total sugars g	21.3	36.0
Calcium mg	27.5	19.8
Iron mg	0.5	trace
Magnesium mg	23.8	3.3
Phosphorus mg	38.3	99.0
Potassium mg	1140	3.3
Zinc mg	0.2	trace
Vitamin C mg	91.0	0
Thiamin mg	0.2	0
Riboflavin mg	0.1	0
Niacin mg	0.7	0
Folate mcg	53.8	0
Vitamin B6 mg	0.2	0
Vitamin A mcg	10.3	0
Vitamin E mcg	0.2	0
Hesperidin & narirutin mg[9]	158	0
Pectin mg[10]	20-30	0
Glycemic index[11]	50	63
Glycemic load[b]	11	21

[a] Data from food tables unless stated; [b] calculated from glycemic index and portion size.

Clearly, when overall nutrients are taken into account, the nutritional composition of 100%OJ is markedly different to that of an SSB, such as cola. Whilst similarities exist

between the sugars and therefore energy (calories) content of 100%OJ and cola, the micronutrient content is vastly different. Furthermore, the level of certain nutrients is such that on-pack 'source' claims can be made for the potassium, vitamin C and folate content of 100%OJ, but this is not so for cola which has negligible amounts of these micronutrients. 100%OJ also contains bioactive citrus flavanones, such as hesperidin and narirutin which have been associated with positive health effects[12]. These are discussed below.

Metabolic comparisons with SSB

In addition to the nutritional differences shown above, 100%FJ also differs from SSB in terms of glycemic effects. Food and drinks with a high glycemic index (GI) or glycemic load (GL), e.g. white bread or glucose drinks, will rapidly boost post-prandial blood glucose levels.

Contrary to expectations, 100%FJ do not have a high GI. For example, international GI tables[13] reveal that 100% apple juice has a GI of 41 while 100%OJ has a GI of 50 – both are lower than accepted lower GI foods such as wholewheat bread and cooked oatmeal. Conversely, SSB usually have a high GI; cola has a GI of 63. These differences are borne out by studies on the effects on glycemia of 100%FJ.

In a meta-analysis[14] of 18 randomised controlled trials (RCTs) involving 960 adults, the impact of 100%FJ on markers of glycemic control was examined. Many of the participants were overweight or had metabolic risk factors, such as hypercholesterolaemia or type 2 diabetes (T2DM). Compared with the control group, 100%FJ had no significant impact on fasting blood glucose, fasting blood insulin, HOMA-IR (a measure of insulin resistance) or HbA1c (long-term blood glucose levels). According to the authors, 100%FJ had no effect on glucose-insulin homeostasis and is consequently not associated with increased risk of diabetes.

In a second meta-analysis[15], fasting glucose and insulin levels were studied in 12 randomised controlled trials involving over 400 participants who were obese or had risk factors for diabetes or cardiovascular disease. In half of these studies, the intake of 100%FJ was 400g per day or more. The overall results showed that the consumption of 100%FJ had no significant effects on the level of fasting glycemia and insulin levels.

The high levels of polyphenol compounds present in 100%FJ have also been proposed to have an important role in glucose-insulin regulation. These polyphenols appear to inhibit glucose absorption, stimulate insulin secretion and glucose uptake by cells, and modulate cell signalling pathways as well as gene expression[16].

Bioactive compounds in 100%FJ

In addition to the vitamins and minerals 100%FJ contains a range of bioactive substances, including carotenoids (mainly lutein and cryptoxanthin), polyphenols (hesperidin and narirutin which are within the flavanone group) and pectin (fibre). Most SSB are devoid of these compounds naturally present, although some may have plant compounds as additives.

Whilst it is well-recognised that eating a diet rich in fruit and vegetables is associated with lower mortality and risk of chronic diseases[17], several studies have investigated whether consuming some portions as juiced fruit can deliver similar benefits.

For example, in an 8-week trial[18], volunteers drank 100% red OJ (high in lycopene) daily over 8 weeks. The results showed that, compared with the control group, 100%OJ intake led to a

combination of effects, including lower blood pressure and insulin resistance, which may help to lower the risk of metabolic syndrome.

In an RCT[19] of 24 overweight men drank 500mL of 100%OJ, a control drink with hesperidin, or a placebo drink over 4 weeks. The results showed that both 100%OJ and hesperidin significantly reduced diastolic blood pressure and improved endothelium-dependent microvascular reactivity (an indicator of how well the lining of blood vessels constrict or relax). This suggests that the vascular benefits of oranges and 100%OJ are possibly due to hesperidin.

Other work[20] has found that 100%OJ consumption can lead to the short-term elevation of eight different flavanones and 15 phenolic compounds. Flavanones are soluble compounds which are found in the juice cloud, rather than in cell walls which explains their increased bioavailability in juice compared with whole fruits[9].

Studies have confirmed, not only are these carotenoids and polyphenols present in 100%FJ, they are also bioavailable[9,21]. Bioavailability is the degree to which food nutrients are available for absorption and utilisation in the body.

Conclusions

100%FJ cannot be directly compared with SSB due to their more complex matrix, directly impacted by the nutritional composition of the juiced natural fruit, without added sugars. Specifically:

- 100%FJ, especially 100%OJ, is a valuable source of nutrients such as potassium, folate, vitamin C
- 100%FJ contains bioactive compounds, including carotenoids and polyphenols, such as flavanones, which are bioavailable;
- Despite the similar sugars content, 100%FJ has a lower than expected GI compared with SSB.
- Per capita consumptions of OJ and SSB largely differ (7.5 L vs. 75 L). Consequently, in contrast to SSB OJ is not consumed as a thirst-quenching beverage.

Studies, and meta analyses, suggest that, compared with SSB, 100%FJ, especially 100%OJ, is associated with the following effects:

- Compared with SSB, 100%FJ has no demonstrable impact on body composition, even when consumed in higher amounts by overweight adults with or without an energy reduced diet.
- Compared with SSB, serum potassium levels were higher after drinking 100%OJ. Potassium is proven to support normal blood pressure.
- Compared with SSB, blood uric acid levels reduced after daily consumption of 100%OJ. Raised uric acid is a risk factor for gout.
- 100%FJ has no unfavourable impact on blood glucose or insulin levels, and no statistically significant association with risk of T2DM and has some favourable effects on total and LDL-c and other markers of metabolic syndrome;
- Studies suggest that 100%FJ polyphenols may have a role in supporting normal health and lowering the risk of chronic conditions such as cardiovascular disease, and T2DM.

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25. ITV plc

Introduction

ITV plc is the UK's leading commercial broadcaster and TV producer and amongst the largest commercial broadcasters and TV producers in Europe.

Although we are increasingly a global company, we are rooted in the UK and just under half of our group employees in the UK are based outside London in a network of 43 offices across the UK's nations and regions. ITV is the main news competitor to the BBC and Sky spending around £120m each year on national, international and nations and regions news.

Clearly, ITV is not a food or drink manufacturer nor are we experts in nutrition. However, we have a close interest in the PHE Nutrient Profiling ("NP") system because one of its primary uses is in determining what products can be advertised in programmes aimed at children or in other adult focussed programmes which are of "particular appeal" to children assessed using the 120 indexing system.

This latter category of programmes is particularly relevant in the current context, since such programmes are usually primarily aimed at and overwhelmingly watched by adults but have a disproportionate number of child viewers compared to the number of children in the general population. However, even more important is the fact that PHE itself (and some other organisations) are pressing for further restrictions on the advertising of HFSS products on TV including a pre-9pm ban on the advertising of HFSS food and drink on TV.

As we have set out in extensive submissions to government elsewhere, we do not believe that there is any evidence based case for such further restrictions on TV advertising, in summary because:

- Children's media and leisure habits are changing rapidly and they are watching less and less TV and therefore are exposed to materially less and less HFSS advertising on TV each year. Furthermore, all the research by Ofcom shows that children are spending significantly more time in the largely unregulated online world than they are watching linear TV. The UK already has amongst the strictest rules in the world for advertising HFSS food and drink products on TV.

- On ITV's channels alone for example, there has been a circa 50% decline in the number of HFSS adverts seen by children in the past 5 years. The decline in the number of HFSS adverts seen by children on the ITV main channel in what some have called "family viewing time" (6-9pm) has been even steeper – a 62% reduction overall with a 68% reduction on Saturday evenings since 2010. Significant continued decline in the number of HFSS adverts seen by children on TV over the past decade appears to have had no effect on childhood obesity.

- The vast majority of the audience for TV pre-9pm is adult and those children that are watching linear TV are overwhelmingly watching with adults, usually parents.

- The money that would come out of HFSS advertising on TV were a pre-9pm ban to be introduced will simply go into all sorts of other forms of marketing, including in other media, online, in store and ultimately into price reductions. Since PHE's view is that 40%

of sugary products are bought on promotion, this would seem a perverse outcome from a policy intervention designed to reduce childhood obesity.

- It would also be particularly perverse to intensify the regulation of a media platform children are leaving (TV) driving the HFSS advertising revenue, inter alia, to global online platforms that children are increasingly using but which are not subject to equivalent regulation.

- The loss of HFSS revenue will make a material impact on the ability of the commercial public service broadcasters in particular to continue to invest in PSB content, particularly news.

In the context of the calls by PHE for such an extension of the restrictions on advertising HFSS food and drink on UK television, changes to the PHE definition of what an HFSS food and drink product are even more important. Ultimately the debate here is mostly about what can be advertised to adults in future (since they make up the overwhelming majority of the TV audience outside of children's programmes) and this is increasingly the case as the number of children watching linear TV declines.

Proposed Extension of PHE's NP system

Against this backdrop, the proposed changes by PHE to the NP system put into sharp relief the suitability of that system as the basis for deciding what food and drink can be advertised where in the UK. We have increasingly serious concerns that the NP system is no longer fit for purpose. The proposed changes to the NP model would, on PHE's own consultation document, see at least another circa 300 products restricted from advertising on television as a purported child protection measure. This would appear to catch many yoghurts, fruit juices as well as breakfast cereals but not other products such as pot noodles or chips.

Our concerns in this context are reinforced by an independent critique of the NP system by Professor Tom Sanders, Emeritus Professor of Nutrition and Dietetics at King's College, University of London which we enclose at Annex 1. Professor Sander's overall conclusion is that:

> *"The enormous swathe of food to be deemed unhealthy, the misclassification of healthy foods into an unhealthy category and its failure to recognise what many nutritionists would regard as less healthy foods for children such as chips and pot noodles, question the validity of the NPM for assessing dietary quality."*

The more detailed concerns expressed by Professor Sanders include the following:

- *"In the meat category 56% of foods failed, as did 13% in the fish category, including some sources of oily fish such as tinned sardines and smoked mackerel (which are good sources of omega-3 fatty acids). However, meat and fish are usually consumed with rice/potatoes and vegetables".* By contrast, *"what is particularly surprising from the evaluation in the report is that chips (including fine cut chips which contain more fat) and pot noodles (high in salt) pass the NP test".*

- The revised NP model failed some foods that play an important role in the diet of children such as flavoured yoghurts and breakfast cereals. In particular: "milk products account for

most of the calcium, riboflavin and iodine intake that play a particularly important role in the nutrition of children". By contrast, *"a recent systematic review of food based dietary guidelines in the Netherlands found overwhelming evidence for including dairy products in their guidelines"*

- A high proportion of breakfast cereals fail the revised NP test, including those that are a useful source of dietary fibre. As Professor Sanders notes: *"Breakfast cereals are dry foods usually consumed in amounts ranging from 30-50g with milk. Fortified breakfast cereals are an important source of many micronutrients (vitamins and minerals) especially folic acid, iron and vitamin D for children, particularly in low income groups. Breakfast cereals high in fibre with no added sugar or salt passed. However, these are not fortified with micronutrients such as folic acid and are not popular with children".*

- A fundamental problem with the NP model according to Professor Sanders is that it *"profiles individual components outside the context of how those components are consumed together as part of a meal. It is similar to passing judgments on the ingredients of a recipe for a meal instead of judging the overall value of the meal as cooked."*

- In addition, the NP system fails many foods that are consumed in small amounts because they are judged on the amounts of saturated fat, salt sugar and energy that would be provided by 100g. This is particularly the case with most yellow fat spreads. But this problem also arises with yeast extracts such as Marmite (because of the salt content). Not only are people unlikely to consume these products in large amounts, as Professor Sanders notes such yeast extracts: *"make important contributions to the intake of folic acid and vitamin B12, especially in vegans, a group which is growing in size in the UK population and has a significantly high prevalence of vitamin B12 deficiency."*

The broader context: Lack of coherence in policy around product formulation and diet

Beyond these specific concerns about the NP system and the proposed changes, there appears to have been a lack of consideration of the broader context for the proposed review of the NP system and its implications. There is a troubling lack of coherence in overall approach by PHE – the proposed changes to the NP system are either at odds with or are dissonant with other policy initiatives around product formulation, diet and obesity. For example:

- A 150ml serving of fruit juice (or a smoothie) counts as one of the recommended 5 portions of fruit and vegetables a day. This has been recently confirmed in the new Government Eatwell Guide for a *"healthy balanced diet."* How is this consistent with a classification of such no added sugar drinks as HFSS and hence a restriction on advertising them?

- There is no evidence in the consultation to suggest that the products that will be restricted in future are either attractive to, marketed at or bought by children. In those circumstances, it is very hard to see the logic of restricting them, given that the primary purpose of the NP test is to underwrite the regulation of advertising. As Professor Sanders notes, the NP system as a whole "*"has the unfortunate side-effect of prohibiting the advertisement of foods (eg oils and spreads) that have little appeal to children as well as*

some foods that can form part of a healthy diet (eg cheese).” Many others could be added to this list from olive oil to some pasta sauces etc.

- There is no analysis at all of the likely effect on broadcasting of the proposed additional restrictions. Any sensible policy initiative ought to consider such a direct consequence of a policy change

- Given that simultaneously, in another context, PHE is advocating yet more restrictions on the TV advertising of HFSS food and drink it is not clear why it also makes sense to simultaneously create an unstable definitional framework for the TV advertising regime. This simply makes it impossible to work out the consequences of the policies that PHE advocates.

- Reinforcing the lack of a joined-up approach by PHE we are struck by the apparent contradiction between other policies being pursued by PHE simultaneously. At present PHE are overseeing an ambitious plan to take 20% of sugar out of the key categories of food that put sugar into children’s diets by 2020 (in parallel to the Soft Drink Levy mentioned above). Recently the first year results showed that there had been reductions in five of eight categories. In particular, and highly relevant to the current consultation, there has been a 5% reduction for yoghurts and breakfast cereals. This is an achievement that should be applauded. The problem is that, in parallel, PHE is proposing, via the proposed new NP rules, to restrict the ability of manufacturers of these lower sugar, reformulated products, to market those products on TV (unless they can get below the much lower proposed sugar threshold). Clearly such marketing is critical to drive sales of healthier variants and justify the investment in reformulation. It is hard to understand the logic for these two policy approaches pursued by the same organisation at the same time.

- The revised NP model suggests a threshold of 3.1g/100g for free sugars to define drinks high in free sugars. This threshold is much lower than the level of 5g/100g set by the Food Industry Soft Drinks Levy which currently exempts fruit juices and milk drinks that exceed the 5g/100g. Accordingly, the new NP model would restrict the advertising of drinks automatically exempted from the fiscal measure designed to encourage reformulation, but <u>also</u> potentially restrict the advertising of drinks that have reformulated in order to avoid the Soft Drink Levy because they don’t get below a new and even lower NP threshold.

Given the importance of the NP model in underpinning the rules on the advertising of HFSS food and drink in the UK it is important that it is up to date and commands public confidence. We have considerable concern that the proposed new NP system will restrict many more products but in ways that are becoming harder and harder to reconcile with a practical and common sense view of diet and health (or indeed with that of leading nutritionists). We are concerned that a system which classifies pot noodles or chips as unrestricted for advertising to children, but prohibits the advertising of most yoghurts, cheese and fruit juice needs considerably more thought and may not be fit for purpose any longer.

ANNEX

25. ITV plc: Critique of the Nutrient Profiling Model

By Professor T.A.B. Sanders DSc, Fellow of the Association for Nutrition. Emeritus Professor of Nutrition and Dietetics, King's College London.

Executive Summary

A nutrient profiling model (NPM) is used to regulate the suitability of foods advertised to children. Public Health England is seeking views on the proposed modifications that might be made to the UK NPM 2004/5, and the methodology for developing the modifications, in particular with reference to the remit and aims of the review to ensure the NPM reflects the current UK dietary recommendations. The critique that follows concludes

- The revised NPM is over-complicated.
- It can be argued that the NPM is no longer needed to regulate the suitability of drinks advertised to children as this can be done more simply by reference to portion size and sugar content.
- A fundamental problem with the NPM is that it profiles individual components on the basis of nutrients/100g outside the context of how those components are consumed together as part of a meal.
- An important limitation of NPM is that it does not judge foods in normal serving sizes against reference amounts. Many food ingredients fail because they are consumed in much smaller amounts than 100 g quantities on which they are judged.
- The revised NPM failed 59% of the foods tested including some foods that play an important role in the diet of children such as flavoured yoghurts and breakfast cereals.
- Chips and fries, which are associated with weight gain in children, pass the NPM.
- Food high in fat, sugar and salt could more easily be identified by using front of pack labelling which was introduced in 2016.
- The enormous swathe of food to be deemed unhealthy, the misclassification of healthy foods into an unhealthy category and its failure to recognise what many nutritionists would regard as less healthy foods for children, such as chips and pot noodles, question the validity of the NPM for assessing dietary quality.

Background

The Select Committee on Health and Social Affairs' latest report **Childhood Obesity – time for action** finds that one-third of children are overweight or obese, that obesity rates are highest for children from the most deprived areas and this situation is getting worse. The report endorses

calls for a 9 pm watershed ban on junk food advertising. The National Dietary and Nutrition Survey and the Family Food Statistics show continuing trends for a reduction in foods purchased for consumption at home and an increase in food and drink purchases outside the home. In many cases the portion sizes are greater than those of meals prepared at home. There is also increased availability of high energy foods from shops with extended opening hours as well as on-line shopping. Social trends mean that families are not eating meals together particularly in lower income groups, where a parent may be working and not back in time to eat together as a family. There has also been a greater dependence, particularly in urban areas, on ready prepared meals especially with the increase in the employment of those caring for children. There is particular concern that the increased consumption of high energy foods with low nutritional value contributes towards obesity. The types of foods regarded as particularly unhealthy by most nutritionists are sugar sweetened beverages, confectionery, snack foods (crisps, corn snacks, biscuits), ultra-processed food of low nutritional value such as pot noodles, cakes, ice-cream and food purchased from fast food outlets, particularly chips and other deep-fried foods.

The Nutrient Profiling Model

Nutrient profiling model (NPM) has been in use for more than a decade to control the advertising of food to children. Public Health England (PHE) have conducted an extensive review of NPM and proposed revisions to the existing model that take into account recent revisions of guidance on sugar and dietary fibre (SACN 2105). The NPM awards “A” points for increments of energy, saturated fat, sugar and salt per 100 g food or drink. “C” points are awarded according to the content of a) protein, b) the proportion by weight of the fruit, vegetables and nuts and c) dietary fibre. The sum of the C points is subtracted from the sum of the “A” points to give the NPM score: a drink or food fail if the score is ≥1 or ≥4 points respectively. However, foods that score 11 points or more are not allowed to include a mitigating score for protein unless they contain 80% fruit, vegetables and nuts (a score of 5).

Drinks

It can be argued that the NPM is no longer necessary for drinks following the acceptance of advice by SACN (2015) to revise the definition of free sugars to include vegetable and fruit juice and purees but to exclude lactose from milk. The nutrition labelling of drinks, which became mandatory from 2016, provides all the information required to regulate advertising of sugar containing beverages. It is clear from the evaluation in the review of the NPM that the other parameters used in the NPM are redundant in the drinks category. The use of the cumbersome NPM for drinks is, therefore, unnecessary as decisions about whether drinks are suitable to be advertised to children could be made much more simply by reference to portion size and total sugar content.

The revised NPM suggests a threshold of 3.1g/100 g for free sugars to define drinks high in free sugars. If applied it would mean that water, infusions (tea, coffee), plain milk, and artificially sweetened beverages would be the only drinks to remain below the threshold. This threshold value is much lower than the level of 5 g/100 ml set by the Food Industry Soft Drink Levy. The levy currently exempts fruit juices and milk drinks that exceed the 5 g/100 ml. Results of the first year of the sugar reduction programme show that many companies have reduced the sugar content of their drinks. The Eatwell Guide suggests that fruit juice (150 ml) can count as one serving of fruit and vegetables. It is noted that PHE launched a review of its sugar reduction strategy on 22 May 2018. Given that PHE is currently consulting to adopt the 3.1 g/100 g

threshold, drink manufacturers who have complied with a government request to reduce sugar content would expect to be able to advertise this fact. The adoption of this challenging limit (3.1 g/100 g) could have an adverse effect on future industry cooperation. Furthermore, many parents are reluctant to give their children drinks sweetened with artificial sweeteners, despite the reassurances concerning their safety given by government agencies, and many are aware that fruit juice is a good source of vitamin C.

Foods

The NPM has been in use on broadcast media since 2007 and there is now considerable experience with its use. It has not been as useful as hoped and has the unfortunate side-effect of prohibiting the advertisement of foods (eg oils and spreads) that have little appeal to children as well as some foods that can form part of a healthy diet (eg cheese). The NPM does not just target junk food. Indeed, many of the meals and recipes on popular TV programmes such as Master Chef and the Great British Bake Off would fail the NPM test.

A fundamental problem with the NPM is that it profiles individual components outside the context of how those components are consumed together as part of a meal. It is similar to passing judgments on the ingredients of a recipe for a meal instead of judging the overall value of the meal as cooked. It also does not take into account how individual meals complement each other to provide a balanced diet. For example, a breakfast high in sugar but low in fat will be offset by a main meal low in sugar but higher in fat.

The NPM review commissioned a comprehensive evaluation of the model on 2249 food items. The expectation would be that no more than 25% of foods would fail. However, the revised model failed 59%, even more than the 53% of the previous model. The increase in fail rate is a consequence of the revised definition of sugar, which includes fruit and vegetable juices as well as purees, and the halving of the acceptable intake of sugar.

The proposed revision of the NPM results in most fruit yoghurts and fromage frais failing because of their sugar content. Some of these are fortified with vitamin D and are popular with young children. The profiling model continues to fail cheese, as well as many foods containing cheese. Milk products account for most of the calcium, riboflavin and iodine intake and play a particularly important role in the nutrition of children. It is noted that other countries, eg France, who have adopted variations of the nutrient profiling model have allowed cheese as healthy food. Ireland also shares these concerns about suggesting cheese is unhealthy. A recent systematic review of food based dietary guidelines in the Netherlands found overwhelming evidence for including dairy products in their guidelines (Kromhout *et al*. 2016).

A high proportion of breakfast cereals fail the revised NPM, including those that are a useful source of dietary fibre. Breakfast cereals are dry foods usually consumed in amounts ranging from 30-50 g with milk. Fortified breakfast cereals are an important source of many micronutrients (vitamins and minerals) especially folic acid, iron and vitamin D for children, particularly in low income groups (Holmes *et al*. 2010). Breakfast cereals high in fibre with no added sugar or salt passed. However, these are not fortified with micronutrients such as folic acid and are not popular with children.

In the meat category 56% of foods failed, as did 13% in the fish category, including some sources of oily fish such as tinned sardines and smoked mackerel (which are good sources of omega-3 fatty acids). However, meat and fish are usually consumed with rice/potatoes and vegetables. By contrast, most ready prepared meals passed, probably because the components were not judged

in isolation. As expected, most biscuits and cakes failed and most snack foods such as crisps. What is particularly surprising from the evaluation in the report is that chips (including fine cut chips from fast food outlets which contain more fat) and pot noodles (high in salt) pass the NPM test.

The enormous swathe of food to be deemed unhealthy, the misclassification of healthy foods into an unhealthy category and its failure to recognise what many nutritionists would regard as less healthy foods for children, such as chips and pot noodles, question the validity of the NPM for assessing dietary quality. An important limitation of NPM is that it does not judge foods in normal serving sizes against reference amounts. This could have easily been done because the information is now readily available with front of pack labelling (DHSC 2016) which has been widely adopted by major retailers.

Further technical comments on the NPM are dealt with in detail in the Appendix.

Appendix

Detailed technical comments on the Nutrient Profiling Model.

1. Scoring system

Up to 5 “A” points for saturated fat and up to 6 for free sugar and salt can be awarded without exceeding the NPM reference values of 5 g, 6.25 g and 1.5g /100g respectively. These foods would not be regarded as high by EU FIC front of pack labelling.

1.1.1 The nutrients of interest are not uniformly distributed across food groups. The model assumes that linear increments in energy, saturated fat, free sugars and salt form a continuous positive relationship with adverse outcomes. This is not the case, adverse outcomes are only likely when the overall dietary recommendation is exceeded, not with values below it.

2. “A” points

2.1 Food energy score

2.1.1. The revised NPM adopts a reference intake of 2000 kcal (8400 kJ) which is the same used on front of pack labelling. Given that the weight of food consumed rarely exceeds 1000 g, this caloric intake would be achieved by an energy density of 2 kcal/g (equivalent to 840 kJ/100g). Energy density (kJ/100g) is used in the model as a negative score. However, this fails to take into account that energy requirements first have to be met before other nutrient requirements. The energy density of food is a key determinant of total energy intake. It is scientifically wrong to attach a negative score to an energy density less than 840 kJ/100g for food. Negative energy scoring should only be applied for high levels of energy density.

2.1.2 Scoring energy for drinks is redundant because virtually all drinks contain fewer than 313 kJ/100 ml and score no points. However, if drinks are consumed in much larger quantities than 100 ml they can make a significant contribution to energy intake. Typically, single serves are 200 ml in a small carton, 330 ml in a can and 500 ml in a bottle. PHE has published guidelines suggesting that flavoured milk drinks and fruit juice do not exceed 300 kcal/serving and 150 kcal/serving.

2.2. Saturated fat

2.2.1. SACN has completed a review on saturated fatty acids, which is out for consultation. This recommends that no more than 10% energy be derived from saturated fatty acids (about 22g for an intake of 8400 kJ/day). It is noted the EU FIC reference intake of 20 g/d is the value used on front of pack labelling.

2.2.2. The profiling model fails to differentiate between the healthier fats (monounsaturated and polyunsaturated fatty acids) and less healthy fats (trans and saturated fats) in cooking fats and oils because all fats contain 3696 kJ/100 g and more than 5 g saturated fatty acids/100 g.

2.2.3. Fries and chips have historically been an important source of saturated and trans fatty acids in the diet. However, this no longer is the case and nearly all fries and chips pass the NPM test.

- Fries from fast food outlets contain 14.2% g fat/100 g which is derived from vegetable oil blends (new varieties of high sunflower oil and rapeseed oil which are high in monounsaturated fatty acids) with a lower saturated fat content 2.5 g/100 g.

- Chip shop chips contain less fat (8.4 g/100 g) but more saturated fat (4.3 g/100 g) because they use cheaper blends containing palm oil.

- Home prepared chips contain less fat (6.7 g/100 g) but ready prepared fine cut chips fried at home absorb much more fat (21.3%). Rapeseed oil is the most widely used vegetable oil used for home deep-fat frying and the saturated fat content of chips prepared at home ranges from about 0.4 to 1.4 g/100 g.

- Potato fries and chips contain no free sugars and are virtually free from salt unless added. Fries have salt added by the fast food outlets but salt is usually sprinkled on home prepared and fish chip shop chips which would increase salt intake up to 0.78g/100 (3 “A” points).

- The range of “A” points for fries chips cooked in vegetable oil ranges from 6-9 points. This is offset by “C” point scores of 2 for protein and 4-5 for dietary fibre. Consequent, most chips and fries pass the NPM unless they are cooked in beef dripping or coconut oil.

- Portion sizes of fries from fast food outlets are generally smaller. The average size of chips from takeaways is variable and can be very generous but the Fish and Chip industry has standardized a portion as 284 g. Home-fried frozen chips are much cheaper and the most fattening because of their higher fat content. Oven chips are healthier because of their lower fat content (4.2 g/100 g).

(Data is taken from *McCance and Widdowson’s the Composition of Foods*, Seventh Summary Edition and the Sixth Electronic Edition).

2.3. Sugar

2.3.1. Data from the National Diet and Nutrition Survey has recently been published on the intake of free sugars in children. The intakes were greatest as a proportion of food energy in teenagers (girls 14.4% energy, 64.2 g/day; boys 13.9% energy, 71.2 g/day) where the major contributors are soft drinks, confectionery and cereal products. There currently is no available data on the relative proportions supplied by breakfast cereals, cakes, biscuits and puddings.

2.3.2. There is a need for further modelling to assess how intakes of free sugars can be reduced in breakfast cereals, cakes, biscuits and pudding without reducing the overall quality of the diet. Removing carbohydrate, particularly from cereals, from the diet has the effect of decreasing fibre intake and increasing the proportion of energy derived from fat. Replacing sugars with other sources of refined carbohydrates will neither change energy intake nor improve nutritional quality.

2.4. Salt

2.4.1. The replacement of sodium with salt is not controversial and the reference value of 6 g is in line with current nutrient labelling. However, a few foods (mainly sauces and extracts) which are consumed in small amounts and only make a small contribution to salt intake are adversely affected by the profiling model – notably yeast extracts and tomato ketchup.

2.4.2. Servings of pot noodles are usually labelled as high in salt but many appear to pass the NPM test.

3.“C” points

3.1.Protein

3.1.1. The reference value for protein (42g) represents the average requirement for children aged 11-14. However, it only accounts for 8.5% of the energy intake with an intake of 8400 kJ. The dietary reference values for fat and carbohydrate are 35 and 50% respectively which leaves the residual 15% of the energy intake as protein, which is close to the measured proportion of protein in children in the UK. The reference value in use on nutrition labels is 50g.

3.1.2. Regulations only permit a claim for protein if the food supplies at least 12% of the energy intake from protein. The model currently allows a protein claim for foods that supply less than 12% from protein.

3.1.3. It is noted that a previous peer review was critical of the protein cap applied to foods of animal origin. The reason why protein was included in the original score was to act as a surrogate for micronutrients associated with protein. Nutrients associated with animal proteins include vitamin B12, riboflavin, calcium and bioavailable sources of iron and zinc. Generally, fruit and vegetables are poor sources of protein with the exception of legumes and nuts. Fruit and vegetables are also devoid of vitamin B12 and poor sources of calcium. The logic of disallowing a protein score for foods with an A score of 11 or more unless it scores 5 points for fruit, vegetables or nuts, appears a circular argument as most fruit and vegetables are poor sources of protein. The protein cap does not appear to be scientifically valid.

3.2. Fruit, vegetables and nuts

3.2.1. Fruit and vegetables generally contain more water than other foods and generally less energy - sugar is their major macronutrient. They are poor sources of protein with the exception of pulses. Most fruit and vegetables are low in fat with the exceptions of some

pulses and avocado pears. Technical guidance on the NPM from the Department of Health in 2011 suggested that potatoes and starchy foods such as yams should not be included in this category. Further clarity is required on whether other root crops, particularly sweet potatoes, are excluded from the definition of fruit and vegetables. As the definition of free sugar has been changed to include fruit and vegetable juice and purees, it would seem that the positive scoring for this category is redundant.

3.2.2. The rationale for the inclusion of nuts in the profiling model was the emerging evidence that tree-nut consumption may be associated with decreased risk of cardiovascular disease in adults. Peanuts, which are legumes, are also often classified as nuts rather than pulses. However, nuts contain more food energy per gram than any other unprocessed food. There are good reasons to question why they should be included with fruit and vegetables, which are generally low in food energy. Moreover, the consumption of whole nuts by young children is not recommended because they can cause choking. Furthermore, a significant proportion of children have allergy to nuts and recent allergy labelling regulations require warnings to be placed on foods containing nuts. While small amounts of nuts (15g/d is the figure used in the Dutch dietary guidelines (Kromhout et al. 2016) can contribute to a healthy diet, nuts can make a large contribution to calorie intake. For example, a small 50g bag of peanuts would supply almost 300 kcal (15% of energy intake).

3.3. Dietary fibre

3.3.1. The use of the AOAC definition of dietary fibre and the reference value of 30g is in line with current food labelling.

3.3.2. In the case of nuts and pulses there is effectively double counting of the C score.

4. Foods consumed in small amounts and ingredients used in food preparation.

4.1. Many foods that are consumed in small amounts fail because they are judged on the amounts of saturated fat, salt, sugar and energy that would be provided by 100g.

4.2. Most yellow fat spreads fail the NPM but only supply 8g/serve. There are a variety of spreads providing 20-80% fat, with 38% being the most common proportion in reduced fat spreads. The use of lower fat spreads has the benefit of reducing energy intake when applied to bread; they also have a lower saturated fatty acid content than traditional fats such as butter.

4.3. Yeast extracts, such as Marmite, also fail because of the salt content. Yet these make important contributions to the intake of folic acid and vitamin B12, especially in vegans, a group which is growing in size in the UK population and has a significantly high prevalence of vitamin B12 deficiency (Gilsing et al. 2010). A typical serving size of yeast extract (4 g) would only contribute about 0.4 g to salt intake.

4.4. Sauces and condiments generally fail NPM. Notable examples are tomato ketchup (usual serving size 15 g), tomato puree and other sauces.

4.5. Some sauces can be major contributors of salt intake to the diet – notably soy sauce, which can contain as much as 20% salt. Reduced salt varieties of soy sauce (1-2% salt) are available but because the labelling is based on the amounts per 100g they also fail the NPM.

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26. Jamie Oliver Limited

Jamie Oliver Limited campaigns for better child health in the UK, with the goal of reducing levels of child obesity.

Thank you for giving us the opportunity to submit evidence.

1. Childhood Obesity

More than one in three (34.2%) children aged 10 to 11 have a weight status classified as overweight or obese[1]. Obesity prevalence for children living in the most deprived areas is more than double that of those living in the least deprived areas[2] and this gap continues to widen. Children with obesity are over five times more likely to be affected by obesity as adults[3] which increases their risk of developing type-2 diabetes, cancer, cardiovascular disease and strokes.

Food is the biggest industry on the planet and it urgently needs a reset. The society-wide normalisation of foods and drinks high in fat, salt and sugar (HFSS) must change. Whilst the food industry is making money, the annual spend on the treatment of obesity and diabetes is greater than the amount spent on the police, the fire service and the judicial system combined.[4] The government must do more to protect child health.

2. The impact of HFSS marketing on the health of kids

Protecting children from the exposure to HFSS marketing across all media is one of our key priorities. Advertising works, why else would companies spend billions of pounds on it? Domino's Pizza has revealed that pizza sales increase 30% whenever one of its TV ads appears on Channel 4.[5] Evidence shows that advertising influences how much children eat,[6] and can lead to them 'pestering' parents to buy unhealthy products.[7,8] Public Health England, for example, concluded in their review that "marketing is effective in influencing the purchase and consumption of high sugar foods".[9]

As Dr Emma Boyland, from the University of Liverpool, outlined to the Health and Social Care Select Committee: "the line that [HFSS advertising exposure] has a modest direct effect on food preferences is from at least 15 years ago, and the academic evidence has been greatly

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[1] NHS Digital (2017). National Child Measurement Programme - England, 2016-17.

[2] NHS Digital (2017). National Child Measurement Programme - England, 2016-17.

[3] Simmonds M et al. (2016) Predicting adult obesity from childhood obesity: a systematic review and metaanalysis. *Obesity Reviews*.

[4] Public Health England (2017). Health Matters: obesity and the food environment

[5] https://www.campaignlive.co.uk/article/dominos-sales-increase-every-tv-ad/15819

[6] Boyland E, Nolan S, Kelly B (2016). Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food
and nonalcoholic beverage advertising on intake in children and adults *Am J Clin Nutr*

[7] Hastings, G. (2006) The extent, nature and effects of food promotion to children: a review of the evidence. WHO 16.

[8] McDermott L et al. (2006). International food advertising, pester power and its effects. International Journal of Advertising.

[9] Public Health England (2015). Sugar reduction: the evidence for action

strengthened since. We can see that even a single acute experimental exposure to advertising—just a one-off exposure to food advertising—will increase children's food intake by around 30 to 50 calories. We know that in the region of 48 to 71 calories extra per day is all that is required over time to generate weight gain in children. It has also been shown recently that that increase in intake is not compensated for at a later eating occasion—kids will not adjust their intake at a subsequent meal to account for the snacking they did in response to food advertising. Food advertising will impact upon an energy imbalance and drive weight gain.[10]"

Our position

We support the use of the Nutrient Profile Model (NPM) as an established and evidence-based tool to identify HFSS food and drinks that should have marketing restrictions applied. The NPM plays a crucial role in shaping our food environment because in addition to determining which food and drinks can be exposed to children through marketing, it is key in driving food and drink companies to reformulate their products to include less saturated fat, salt and free sugars. It can also be used as a tool for other important actions such as retailer behaviour on promotions.

The scope of the process to update the NPM

We support the approach taken and methodology used by PHE to update the NPM. We note that a decision was taken, early in the process, and without consultation, to update the existing NPM rather than develop a new model from starting principles. There is little information about the rationale for this decision on the consultation documents. As such we feel there may have been a missed opportunity to fully consider the lessons or improvements from other model structures that could enhance the UK's NPM in order to provide protection to children from HFSS advertising. We encourage PHE to commit to a full review of the NPM against lessons from international models ahead of any future reviews.

The NPM test data set

We note that the NPM test data set was comprised of food and drink at a household level and does not include food and drinks products consumed out of home (OOH). One fifth of children eat food from OOH food outlets at least once a week. These meals tend to be associated with higher energy intake; higher levels of fat, sugar, and salt, and lower levels of micronutrients.[11] Evidence suggests that fast food is the most heavily advertised food and drink category, during the TV programmes most popular with children.[12] We strongly encourage PHE to undertake further testing, using OOH food and drink products to ensure the revised NPM provides adequate protection from fast food adverts.

Specific modifications

Free sugars

We strongly support modifications made to bring the NPM into line with evidence based dietary recommendations on free sugars made by SACN in their *Carbohydrates and Health* Report[13] in

[10] http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/health-and-social-care-committee/childhood-obesity/written/81090.html

[11] Public Health England (2017). Strategies for Encouraging Healthier 'Out of Home' Food Provision A toolkit for local councils working with small food businesses

[12] Obesity Health Alliance (2017). A watershed moment: why it's prime time to protect children from junk food adverts.

[13] SACN. Carbohydrates and Health.

2015. The latest National Diet and Nutrition Data[14] shows that children of all ages are exceeding the recommendation of free sugars providing no more than 5% of daily total energy intake, with girls aged 11-18 consuming just under three times the recommended daily limit of free sugars and it is crucial that measures are taken to reduce the marketing of foods and drinks containing free sugars.

We strongly support the performance measure that the draft 2018 NPM should allow fewer foods that are high in free sugars to pass the modified NPM and are relieved to see that during testing of the revised NPM this was achieved. In particular, we are pleased that the revised model allows fewer cereal and yoghurt products that are high in free sugars to pass. Sweetened cereals and cereal products represent the largest source of free sugars intake in children aged 1.5-10 years[15] and research carried out by the Obesity Health Alliance shows that these products are typically advertised to children, around children's programming. Cereals and yoghurts can contribute important nutrients to the diets of children but it is crucial that only the lower sugar products are marketed and that these products are not contributing to excess sugar intake.

Currently, the free sugars content of a product is not required to be listed on product packaging. We note that this will mean advertising regulators are reliant on manufacturers' own calculation of free sugars content to assess whether a product passes the revised NPM. It will make it more challenging for independent scrutiny by academics and NGOs with an interest in the enforcement of existing marketing restrictions and collecting evidence on the volume of HFSS marketing outside of existing restrictions. Therefore, we strongly encourage PHE to develop and make public standard tools that can be used by industry and all interested stakeholders to calculate free sugars content of food and drink products using information that is available on pack.

In addition, we strongly encourage government to make free sugars a mandatory part of food and drink labelling, as part of the commitment made in their Child Obesity Plan[16] to enable the consumer to make informed choices.

Fat

We support the recommendation to retain the current reference value for saturated fat. We note that this aligns with the 2018 draft SACN recommendation on saturated fat intake.

We encourage PHE to consider that a small number of very specific products which are high in unsaturated fats and are nutritious, such as olive oil, can be advertised.

Fibre

We understand the rationale of updating the NPM to take into account the revised UK dietary fibre recommendations. However, it seems counterintuitive to reduce the amount of fibre needed to score a point, in order to increase intake. It is reassuring that the modifications were considered to ensure they did not encourage high intake of free sugars while promoting intake

[14] Public Health England (2018). NDNS: results from years 7 and 8 (combined)

[15] Public Health England (2018). NDNS: results from years 7 and 8 (combined)

[16] Gov.uk (2016). Childhood Obesity: A Plan for Action

of fibre. We note that the changes to the free sugars component of the model were considered to offset the likelihood of products high in fibre and free sugars passing the model. However, as the saturated fat component of the model has not changed, the new fibre scoring means that some products are getting a better score overall despite being high in saturated fat and therefore have a higher chance of passing. We encourage PHE to review the recommended fibre modification to ensure that it does not encourage high intake of saturated fat while promoting intake of fibre. We are particularly concerned that some pre-packaged OOH products such as burgers could be high in both fibre and saturated fat. As outlined above, we strongly recommend that PHE carries out more comprehensive testing of the model using OOH products.

While we note that children and adults are not meeting daily fibre recommendations, it is our view that they should not be encouraged, via advertising, to increase fibre intake via consumption of high fat, salt or sugar products.

Portion size

The current model is based on per 100g and does not take into account overall portion size. The NPM should be used as a tool to protect kids from being exposed to meals whereby the individual components pass the NPM but is high in fat, sugar, salt and calories when eaten as a meal, as designed and as marketed. We encourage PHE to consider a system which takes this into account ie the Department of Health's front-of-pack colour coded labelling sets criteria if the portion size is higher than 100g.[17]

[17] Guide to creating a front of pack (FoP) nutrition label for pre-packed products sold through retail outlets