Interventions changing the assortment of available food and drink for leaner, greener diets: promising but overlooked

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We highlight an overlooked set of interventions - altering the assortment of available food or drink - which have the potential to contribute significantly to reducing unhealthy and unsustainable patterns of consumption and the resulting health inequalities.

1. The Problem

Diets that are suboptimal - high in saturated fat, free sugar and salt, and low in fibre - are one of the largest contributors to premature death and preventable diseases worldwide and health inequalities (1). Food production – especially of livestock – is also a major contributor to environmental harm [ref 12]. Reducing the supply and consumption of these foods (eg biscuits, confectionery and sugary drinks), - and also, meat and alcohol would improve health globally, reducing rates of obesity and the risk of diseases including cardiovascular disease and many cancers (2–8) and could reduce the inequalities in health that stem from their consumption (9–11). Reducing consumption of these products would also lessen the environmental harms associated with their production, processing, transport and retail (12–15).

Reducing consumption of these foods and drinks to the extent needed to improve health equitably and protect the environment will require multiple interventions delivered at scale with the potential to reach everyone. These include price-based interventions such as health taxes and carbon pricing (16,17), and restrictions on price promotions (18) and marketing (19). Interventions that alter the assortment of these products – hereafter termed *availability* - also have the potential to shift consumption at scale, as shown in several recent field studies, summarised below. But this growing evidence has received little systematic analysis by researchers. Reflecting this, it remains largely overlooked by policy-makers. Specifying more precisely what availability interventions comprise will provide greater conceptual clarity and illuminate the evidence base. This in turn could increase the use of this type of intervention by policy-makers and others to improve population health both equitably and sustainably.

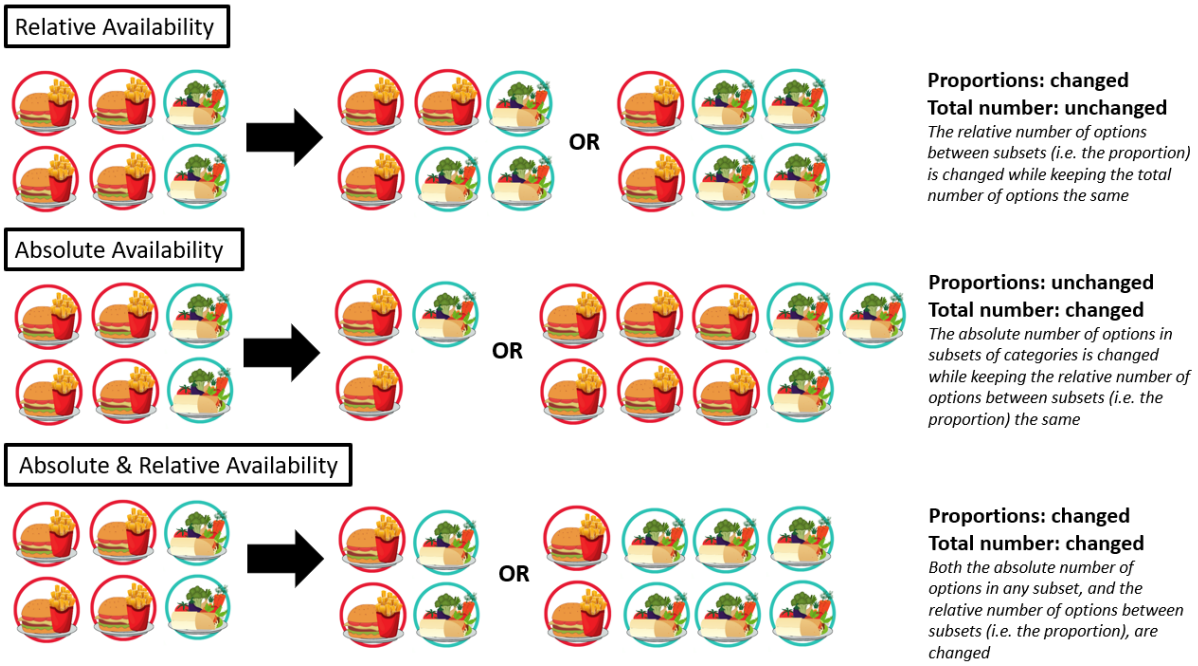
2. What are Availability Interventions?

Availability interventions are those that alter the assortment of options – their number or range - in absolute or relative terms. Such interventions might be applied across a broad spectrum of settings and levels, ranging from macro to micro, at the level of a country (*eg* limiting the availability of outlets selling higher strength alcohol: (20), a neighbourhood (*eg* reducing the density of unhealthier food outlets (21) or retail premises, such as a shop, café, restaurant or bar, in private and public sector settings (22)(38). Our focus is on the latter, comprising availability interventions at the point of product selection, given several recent studies show large effects thus meriting consideration for the first time – to our knowledge - as a distinct set.

Recent progress has been made in defining and conceptualising these interventions (23,24). There are two broad types, shown in Box 1: Relative Availability and Absolute Availability, which can be combined. Relative Availability has been most studied. This involves changing the number of options between subsets of products while keeping the total number of options the same. These are particularly suited to contexts where the amount of space or number of options is constrained, such as a set of supermarket shelves, a vending machine, or a limited restaurant menu. Examples include

replacing some confectionery with fruit or nuts, some sugary drinks with no or low sugar options, some alcoholic with non-alcoholic drinks, and some meat-based meals with vegetable-based ones.

Figure 1 Availability Interventions*



** burger and salad images are used to represent any option of either less healthy or healthier foods*

3. How effective are Availability Interventions – and for whom?

A Cochrane review of availability interventions found that reducing availability resulted in large reductions in the selection of targeted foods (25). However, only five eligible studies had been conducted in real world settings. Of these, three could be included in a meta-analysis, generating a highly uncertain estimate of the intervention's effect, encompassing both relatively small and large effects on reducing selection of targeted products (confidence interval ranged from -11% to -60%). Table 1 summarises findings retrieved from an updated search for this review, identifying four new studies. Of these nine studies, seven focused on reducing selection of *less healthy* foods and drinks, one on increasing selection of healthier foods, and one on reducing selection of *less sustainable* meat-based foods. Eight of the studies altered the *relative* availability of the target food(s), with only one altering the *absolute* availability, and none altering both. A consistent direction of effect is evident: reducing the proportion of a targeted subset of food or drinks reduces its selection, often markedly so. This is noteworthy given the heterogeneity in study settings and interventions. For example, increasing the proportion of vegetarian meal options in a cafeteria from one in four (25%) to two in four (50%) decreased the likelihood of meat meals being selected by almost eight percentage points (from 81% to 73%) (26). Similarly, increasing the proportion of lower energy food options in cafeterias from 42% to 50% decreased the daily calories purchased by almost five percentage points (22).

While these studies have focused on reducing selection of *less healthy* foods and non-alcoholic drinks, in principle, the findings should apply to other products including meat and alcoholic drinks. Preliminary results from an online study involving selection and purchasing from an online

supermarket (27) support the findings of an earlier study of hypothetical selection (28). Decreasing the proportion of alcoholic drinks from 75% to 50% or 25% increased the proportion of non-alcoholic drinks selected (non-alcoholic beers and wines and soft drinks) from 24% to 32% and 45% respectively (27). All these studies have been conducted in high income countries. While there are no a priori reasons why availability interventions would not be effective in middle and low income countries, differences in baseline availability or social norms regarding could influence the magnitude of effects thus meriting evaluation.

A key remaining uncertainty for these interventions concerns the magnitude of change in availability and the resulting effect size. This is likely to vary with context. Relatively small changes in the availability of lower energy foods in worksite cafeterias – from about 42% to 50% - decreased energy purchased by an average of about 4.8% a day (Reynolds 2021). Larger effects are found with larger changes. For example, increasing the proportion of vegetarian meal options from 1 in 4 to 2 in 4 (Garnett 2019), or from 1 in 3 to 2 in 3 (Pechey 2022), increased their selection by about 15 and 20 percentage points, respectively.

Given the contribution of suboptimal diets to health inequalities it is important to ensure that availability interventions do not widen these. None of the studies in Table 1 were designed to examine this. Related evidence suggests that these interventions are unlikely to exacerbate existing inequalities. In a review assessing the potential for diet-related interventions to generate inequalities, none of those classified as "place-based" – concerning changes to characteristics of the environment that include changing the availability of some foods – preferentially benefitted the least deprived groups(29). This is in contrast with interventions targeting individuals, for which a sizeable minority were more effective in the least deprived groups. This pattern of findings is replicated in a review of the impact of diet-based interventions on those with intellectual disabilities (30). In addition, a mega-analysis that pooled data from four online and two laboratory studies (21,360 observations from 7,375 participants) assessing the impact of availability interventions on selecting healthier foods in general populations suggested minimal differences in responses to these interventions by socioeconomic position (31).

Understanding how availability interventions work can help to optimise their impact (24,32). Two possible mechanisms that have been investigated include: increasing the probability that a preferred option is provided when the variety on offer increases; and, changing perceptions of what is a popular option, also known as a social norm. First, selection of any option from an assortment is largely influenced by an individual's pre-existing preference (33). So, adding apples and oranges to a display previously only containing bananas and unhealthy snack bars increases the chances that the available fruit options include any individual's most-preferred option, thereby increasing the chances that fruit (versus a snack bar) is selected (34). For maximum effect, the most popular snack bars would be swapped for popular and well-liked fruits. Second, social norms have a large influence on our behaviour including what we eat. Stock displayed often reflects existing preferences, with the greater the amount of stock displayed for the same product – such as chocolate bars or fruits – the greater their implied popularity, and in turn, selection (34). Changing the stock displayed can change perceptions, preferences and in turn what is selected. Other mechanisms include reducing the effort needed to resist preferences for highly palatable energy dense food (35,36). Whether the mechanisms vary by type of availability intervention (Figure 1) awaits study.

4. Realising the potential of Availability Interventions

The effectiveness of availability interventions as well as their acceptability and feasibility for businesses to implement are illustrated in two recent studies. Across six UK supermarkets, increasing the availability of healthier oven-cooked chips by adding packs of low-fat chips not previously available in the study stores alongside packs of regular chips, reduced sales of the latter by about 23% with a corresponding increase in sales of the healthier alternative (37). In a university cafeteria, increasing the proportion of meat-free meals from one in three to two in three increased sales of meat free meals by almost 20 percentage points, from 42% to 61% (38). Public acceptability of availability interventions is also high, with 79% of a representative English sample (n=4500) finding acceptable policies to replace some higher energy products with lower energy alternatives in cafes and restaurants (39).

Availability interventions are ripe for inclusion in local, national and global policies to improve health and protect the environment at scale given their consistent and often substantial effects on selection and purchasing, with no evidence of adverse effects, particularly on inequalities. As with all interventions implemented into policy, evaluations should be designed-in given some interventions are altered during implementation and to inform adaptations to the intervention to achieve the expected effect. Such evaluations are also important in contributing to the emerging evidence regarding the size of effect from different magnitudes of change in availability, used in different contexts and populations, for different foods and drinks.

To date, there are few examples of availability interventions in existing policies. For example, in Scotland all retail outlets in healthcare buildings are required to ensure that 50% of food and 70% of drinks on sale are not high in fat, sugar or salt (40). In Portugal, there is now a requirement that cafeterias in public sector settings make available at least one vegetarian dish (41). More recently, the UK government has proposed increasing the availability of alcohol-free and low alcohol products (42). Several factors likely contribute to the relative neglect of these interventions in current policies. First, they have yet to be systematically analysed in a form accessible to policy-makers. Second, they don't fit with the dominant public discourse around unhealthy behaviour which concerns personal responsibility (43,44) a discourse reinforced by some corporations to distract and delay the introduction of more effective policies that would reduce their profits (45–47). Third, these interventions may be resisted by businesses fearing sales losses. While losses have not generally been reported in evaluations (22,38,48) businesses heavily dependent on selling unhealthy and unsustainable foods may lose. Governments will likely take different approaches to helping business transition to providing healthier and more sustainable foods. Reflecting these and other factors, policies for tackling obesity have tended to focus on weaker interventions that target individuals – making high demands on individual agency and thereby sometimes increasing inequalities (29). This is in contrast to those that change the decision structure (including availability interventions) which make fewer demands on individual agency and thereby are less liable to increase inequalities (49,50). Summarising the evidence for availability interventions in a form useful to policy-makers – as we aim to have done here - should help highlight the opportunities for their inclusion in health and sustainability strategies.

Evidence for the effectiveness of availability interventions is now at a stage to merit consideration by policy-makers and others as an effective addition to interventions in public and private sector settings to shift currently unsustainable patterns of consumption towards laudable but as yet unmet population health and net zero goals.

Key messages

- Suboptimal diets – particularly the consumption of energy dense foods, meat and alcohol - are one of the largest contributors to premature death and preventable diseases worldwide, contributing also to health inequalities and environmental harm.

- Interventions that alter the assortment of available food or drink show consistent and often substantial effects on selection and consumption with no evidence of adverse effects including increasing health inequalities.

- This promising evidence will be strengthened by research specifying more precisely the nature of these interventions and estimating the size of effects achieved by different magnitudes of change in availability, in different contexts, for different populations and for different foods and drinks.

- Availability interventions, currently overlooked by policy-makers, merit urgent consideration in public and private sector settings where energy-dense foods, meat or alcohol are on sale or offered given their potential to contribute significantly to as yet unmet population health and net zero goals.

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Table 1 Availability studies using randomised or quasi-randomised controlled designs in real-world (field) settings

Study	Targeted product	Setting	Availability intervention type: Relative vs Absolute vs Both (comparison)	Effect size (%; 95% CI where available)	Additional comments
Brimblecombe et al (2020) (51)	Less healthy food *Discretionary food and beverages focusing on reduction in free sugars (e.g. confectionery, soft drinks)*	Food retail stores in First Nations communities in Australia (n=20 stores)	**Relative**: Replacement with healthier or non-food products (versus usual retail practice)	Sales of free sugar were reduced by -2·8% (95% CI –4·9 to –0·7)	Availability supplemented by other intervention components (sugar warning labelling/signage, no promotional activity allowed on targeted products)
Fiske et al (2004) (52)	Less healthy food *High-fat snack foods*	Vending machines in school teacher lounges (n=10 vending machines)	**Relative:** Replacement with low-fat products (versus no changes made)	Sales of high-fat snacks were reduced by -23.5% from baseline in intervention (versus -1.8% control)	Availability supplemented by other intervention components (labelling and signage)
Foster et al (2014) (53)	Less healthy food *Full-calorie beverages in checkout refrigerators*	Supermarkets in low-income areas (n=8 stores)	**Relative:** Replacement of full-calorie with reduced-calorie beverages (versus no changes made)	Sales of full-calorie beverages were reduced by -16.3% from baseline in intervention (versus -12.5% control)	Availability supplemented by altering placement of no-calorie options, and in context of wide range of other products (including other categories targeted by interventions e.g. milk, frozen meals)
Garnett et al (2019) (26)	Less sustainable food *Meat-based meals*	Cafeteria for university students (n=1 cafeteria)	**Relative:** Replacement of meat-based meals with vegetarian meals (versus no changes made)	Sales of meat-based meals were reduced by -7.8%	Additional observational studies conducted in two cafeterias which suggested effects of replacing meat-based meals on their sales of -14.5% and -14.9%
Kocken et al (2012) (54)	Less healthy food *High-calorie snack foods*	Vending machines in schools (n=28 schools)	**Relative:** Replacement with lower-calorie snack foods (versus no changes made)	Sales of high-calorie snacks were reduced by -9.3% per person in intervention (versus control)	

Pechey et al (2019a) (55)	Less healthy food *Higher calorie foods in multiple categories (including cooked meals and snacks)*	Worksite cafeterias in UK (n=6 cafeterias)	**Relative:** Replacement with lower-calorie foods (versus no changes made)	Calories purchased were reduced by -6.9% (95% CI -11.7% to -1.7%)	
Pechey et al (2019b) (56)	Less healthy food *Less healthy foods (determined by calorie content) and drinks (determined by sugar content)*	Food and drink vending machines in an English hospital (n=10 vending machines)	**Relative:** Replacement with lower-calorie foods and lower-sugar drinks (versus no changes made)	Non-significant reduction in calories purchased from snacks of -17.2% (95% CI -47.4 to 30.5); Calories purchased from drinks were reduced -52.6% (95% CI -69.3 to -26.9);	
Reynolds et al (2021) (22)	Less healthy food *Higher calorie foods in multiple categories (including main meals and desserts)*	Worksite cafeterias for supermarket chain in Great Britain (n=19 cafeterias)	**Relative:** Replacement with lower-calorie foods (versus no changes made)	Calories purchased were reduced by -4.8% (95% CI -7.0 to -2.7)	
Roe et al (2013) (57)	Healthier food *Absolute number of fruit and vegetable snack options*	Childcare facility (n=61 children)	**Absolute:** Providing more fruit or vegetable snack options (versus fewer fruit or vegetable options)	Fruit or vegetable consumption was increased by an average of 67% per person	