

Promotions of food and drink in an online retail environment

EVIDENCE OVERVIEW
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Introduction: online retail food promotions as a public health issue

Obesity and diet-related diseases have been affecting health globally over the last decades (NG *et al.*, 2014; Murray *et al.*, 2020). In 2007 a landmark report on tackling obesity mapped a range of interrelated factors that affect individual energy balance, grouping them into seven thematic clusters (Butland *et al.*, 2007). Within the cluster of food consumption, food exposure and food abundance were reported to have strong effects. In 2015, Public Health England (2015) published a report on sugar reduction; one of its recommendations was to ‘reduce and rebalance the number and type of price promotions in all retail outlets including supermarkets and convenience stores and the out of home sector (including restaurants, cafes and takeaways)’ (Tedstone, Targett and Allen, 2015). Since then, the evidence on the extent and role of price promotions and non-monetary promotions on the quality of diet has been emerging (The UK Government, 2018; Coker *et al.*, 2019; Food Standards Scotland, 2020).

Scottish Government consulted on restricting price and non-monetary promotions of unhealthy food, both in-store and online, in 2018 (The Scottish Government, 2018); and at the beginning of 2020 was working on the Restricting Food Promotions Bill. Due to the coronavirus outbreak this work was paused; justified by the new unknown economic, business and equity impacts (Fitzpatrick, 2020). Promotions, however, continue having their effects on purchase and consumption of unhealthy food. Moreover, due to the outbreak of the pandemic, the way we shop has been changing. In 2017, the online share of the UK grocery market was 7.6% (McKevitt, 2017); however, recently one of the leading supermarkets reported more than doubling of their online trade (Simpson, 2020).

This context places urgency on both better understanding how food and drink are promoted in an online retail environment and on the introduction of the planned legislation. The aim of this rapid review of literature is to provide better understanding of food and drink promotions in an online retail environment and identify their types and use, to inform a public health advocacy campaign.

Methods

Research question ‘*What are the characteristics of food and drink promotions in an online retail environment and their effect on purchase?*’ and key search terms were defined using the PICOS approach (Centre for Reviews and Dissemination, 2009) (Table 1).

Table 1. Defining research question using PICOS approach

Domain	Search term
P - Population	Adults (over-18s)

I - Intervention	Promotion of food and drink in an online retail environment (price and non-monetary)
C - Comparison	Not necessary but if present, a comparison group could be an absence of promotion or a historical control group
O - Outcomes	Amount or volume or type (healthy/unhealthy) of food and drink purchased
S - Study design	Any study design

Databases searched included PsycInfo, Econlit, Cochrane Library, Business Source Complete, Web of Science, Emerald and SAGE because they cover health care, social and behavioural sciences, marketing and economics (University of Edinburgh, 2020). Systematic approach to searching and study selection are presented in Tables 2 and 3 respectively. Search results were imported into Mendeley software and duplicates removed. Titles and abstracts were assessed against the inclusion/exclusion criteria by one reviewer. Full texts of all eligible studies were reviewed against the criteria with reasons for exclusion reported. Data was extracted into a table in Appendix 1.

Table 2. Search strategy

Search step	Search term	Fields searched	Comments / justification
#1	customer* or shopper* or client* or buyer* or purchaser* or browser* or patron* or user*	.mp	Focuses on role in online purchasing
#2	promotion* or price promotion* or non-monetary promotion* or location or pop-up or personal* promotion*	.mp	Focuses on promotion techniques
#3	online shop* or online grocer* or online store* or online supermarket* or online chain* or online business*	.mp	Focuses on shopping environment
#4	purchas* or buy* or identif* or select* or choos* or acquir* or prefer* or purchas* intention	.mp	Focuses on purchasing and identification of food/drink choices
#5	Food* or drink* or produce or grocer*	.mp	Focuses on food and drink only
#6	#1 and #2 and #3 and #4 and #5		Combines steps 1-4*
#7	Limit 5 to (English language)	.mp	To obtain relevant findings
#8	Remove duplicates	.mp	

Table 3. Inclusion and exclusion criteria

Domain	Inclusion criteria	Exclusion criteria
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Problem/population	Users of online grocery stores	Users of physical grocery stores, individuals with intellectual disabilities
Intervention	Studies investigating effect of online promotions on purchase and/or identification of food and drink	Studies involving physical in-store promotions, advertising, loyalty programmes, labelling, non-retail environment (i.e. YouTube)
Outcomes	Purchase or intention of purchase or preference or identification (i.e. healthy/unhealthy) of food and drink; store sales	Lack of purchase or identification as an outcome
Study design	Any study design	Protocols, dissertations, theses, conference abstracts, editorials, opinions
Other variables	Published in English; peer-reviewed papers; no publication date restriction	Publications not in English

Results

Searches of the identified databases identified 350 potentially relevant citations. After duplicate removal (n=51), abstracts and titles were screened, and 21 full-text papers were selected. They were assessed for eligibility and 6 met the inclusion/exclusion criteria (Figure 1).

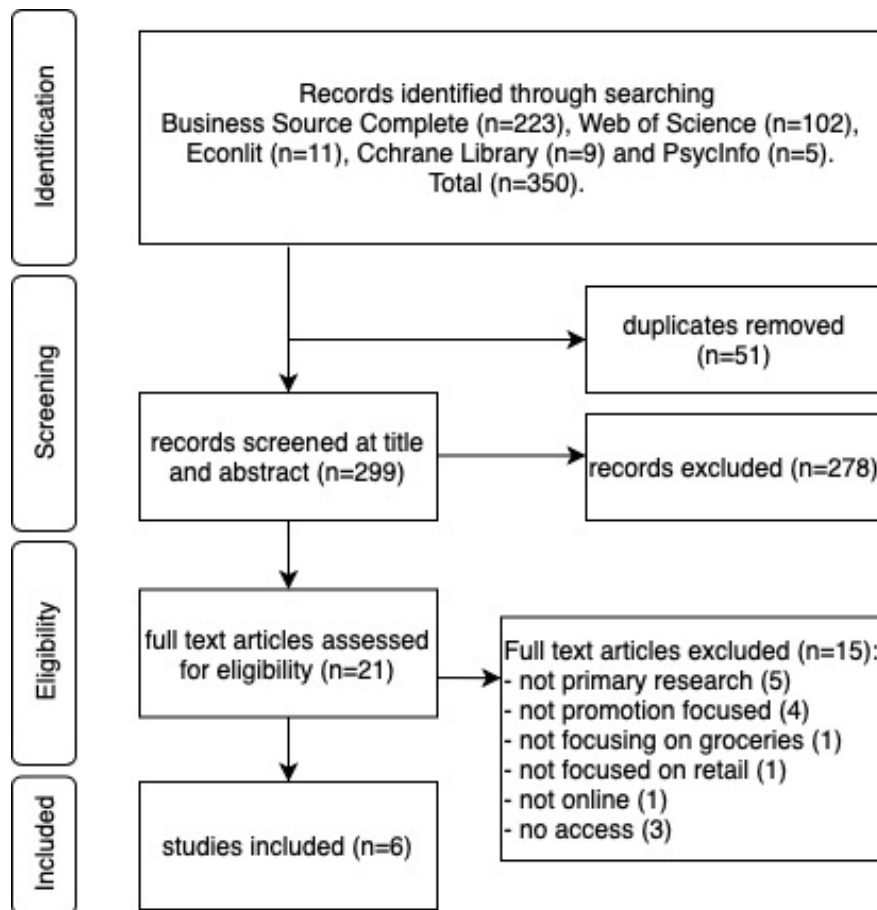


Figure 1. Flow chart of study selection PRISMA (Moher et al., 2014). Other two databases searched were Emerald and SAGE but these did not return any results.

The search identified 6 primary studies that used large longitudinal datasets from online grocery retailers. Three studies were from the USA (Degeratu, Rangaswamy and Wu, 2000; Shi and Zhang, 2014; Wan et al., 2017), one from Spain (Arce-Urriza, Cebollada and Tarira, 2017), one from Belgium/France but using UK data (Breugelmans and Campo, 2016), and one from China (Cui and Wang, 2010).

Types of online retail grocery promotions

Three papers explored the effect of online price promotions, specifically price discounts, on purchase (Degeratu, Rangaswamy and Wu, 2000; Breugelmans and Campo, 2016; Arce-Urriza, Cebollada and Tarira, 2017). Cui and Wang (2010), in addition to price discounts, considered web display, defined as ‘the presence of a product on the first page for the category’. Wan et al (2017) investigated how to individually target price discounts to improve their profitability. Finally, Shi and Zhang (2014), in an attempt to ‘mitigate the pressure of price and promotion’, looked at choice decision aids, such as shopping lists or previous order lists, learning from the evolving experience of shoppers.

Effects of price discount online

The effects of price discounts were tested on the examples of product categories, such as orange juice, milk and cereal, margarine or cola. Cui and Wang (2010) suggested that while consumers were not sensitive to the net prices of cola alternatives, they were still attracted to price promotions. Similarly, Breugelmans and Campo (2016) concluded that price promotions could stimulate purchase (milk and cereal example).

The earliest identified study, by Degeratu et al (2000), reported that the combined effect of price and promotion on choice was weaker online than offline for detergent and paper towel. Unfortunately, the study was unable to conclude this about the grocery product investigated – margarine. Later, Arce-Urriza et al (2017) confirmed that promotions had higher impact on brand choice offline than online. Based on those findings different promotion strategies for offline and online were recommended, specifically less price promotions online than offline (Breugelmans and Campo, 2016; Arce-Urriza, Cebollada and Tarira, 2017).

Promotions online can affect promotions offline and vice versa. A study exploring cross-channel effects of promotions reported that price promotions in one channel had a negative effect on category purchases in the other channel during the promotion period, and that promotion frequency in one channel could decrease future promotion sensitivity in the same and other channels (Breugelmans and Campo, 2016). These cross-channel effects were stronger for more loyal customers. The authors recommended personalising promotions to also account for frequency of shopping.

Personalised promotions

Two of the identified papers proposed models to personalise promotion strategies. The studies considered all available grocery categories within their datasets. A scalable framework by Wan et al (2017) allowed prediction of preferences and estimation of individual price elasticity for each shopping trip. This allowed creation of personalised lists of products to be discounted either online or offline.

A model proposed by Shi and Zhang (2014) was developed with consideration of how and why online shopper's behaviour would change over time. The model enabled prediction of individual customer's purchase behaviour at a given time allowing customisation of sales strategies. The study identified decision aids that can enhance store loyalty and reduce need for price discounts, namely shopping lists, previous orders lists and ability to sort available stock by nutrition. However, ability to sort by brand and by price may reduce loyalty and increase price sensitivity.

Arce-Urriza et al (2017) also argued for tailoring promotions to an individual or consumer-segment, using information from store loyalty cards. The idea was to use selling strategies that are likely to be more successful with particular individuals or groups, improving customer satisfaction and sales (Wan et al., 2017).

Non-monetary promotions

Webpage display was the only non-monetary promotion strategy considered by the identified evidence and only one paper explored it (Cui and Wang, 2010). It was defined as the ‘presence of a product on the first page for the category’ and was reported to have had little influence on product choice in the ‘cola’ category, which was the only category explored by this study. The authors explained it by the fact that cola was a frequently purchased category and consumers had already established preferences.

Discussion

Online grocery shopping is a relatively new and globally rising phenomenon, made possible by the establishment of the world wide web in the 90s. The majority of online shoppers also shop in physical stores; combining convenience of online shopping with the advantages of offline experience, such as self-service or more time to shop around (Campo and Breugelmans, 2015).

Click vs. brick

‘Click’ and brick’, or online and offline physical shopping environments, differ. Consumers shop for groceries online mostly for convenience, time saving, replenishing stocks and buying in bulk, paying less attention to promotions and purchasing same brands (Arce-Urriza, Cebollada and Tarira, 2017). Contrastingly, in physical stores, customers spend more time shopping around, tend to purchase brands on promotion, and brand-loyalty is lower. It was suggested that shoppers buy more on promotion offline also because of strong merchandising in physical stores (Barnett, 2011). Online shoppers, however, are still susceptible to promotions. An analysis of a large dataset of online grocery transactions from the UK Morrisons supermarket, which included individual-level information on place, device, timing and browsing behaviour, showed that around 60% of all product additions to a basket were ‘disrupted’, resulting from site searches or engagement with retailer promotions; the remaining

additions were 'stable' stemming from saved favourites and previous orders (Munson, Tiropanis and Lowe, 2017).

Types of online promotions

Location of an item on the website can be compared to the shelf display position in-store (Kalyanam and McIntyre, 2002), which has known effect on sales (Nakamura et al., 2014; Cameron, 2018). The identified evidence focused strongly on price promotions, specifically discounts, online. One study explored web display, which is only one option for location within a retailer's website.

This rapid review revealed a possible gap in evidence on the effects of non-monetary promotions online. While it could be a result of the limited time allowed for this work, it may also be because online grocery shopping is a relatively new phenomenon. Alternatively, personalisation strategies suggested by the identified evidence could be making it a difficult area to study because of the complexity of personalisation strategies.

Online shopping and health

None of the identified papers considered health effects of online grocery promotions. The evidence on offline health effects of these strategies was clear enough for the Scottish and UK governments to propose legislation restricting promotion of unhealthy food and drink. While similar effects can be assumed, online shopping environment differs from offline as described above. For example, does the tendency to re-stock online and use previous online order lists have potential to reinforce bad as well as good habits? It could be argued that such customised promotion may increase health inequities.

A research group from Cambridge reported that listing foods in order of nutritional content (in this case saturated fat) and offering healthier swaps when shopping online, improved nutritional quality of the shopping basket (Koutoukidis et al., 2019). This research was not identified by the search strategy, possibly because it did not mention 'promotion' but instead specific strategies such as positioning and swapping. However, it is relevant, and the search strategy should be widened to specific non-monetary promotions, such as positioning on the website and timing of promotions.

Strength of evidence

All included studies considered large datasets from leading online retailers from Europe, USA and China (Appendix 1). While a randomised experiment would be best to explore differences in choice/purchase between online/offline, such approach was deemed not practical (Degeratu, Rangaswamy and Wu, 2000). Quality appraisal was not performed because areas from which the evidence came (marketing, economy or data science) are beyond the author's professional expertise. These areas, however, have potential to contribute to understanding of and improvements in public health, which clearly demonstrates its cross-disciplinary nature.

Limitations

This rapid review has a number of limitations. First, the datasets used by the identified papers are relatively old in the context of how quickly technology develops; they are from 1996 to 2007 and one study did not disclose this information (Wan et al., 2017). As increasing numbers of customers shop for groceries online, and the coronavirus pandemic accelerated this shift, this review did not consider currently used strategies or current consumer behaviour. Second, as discussed above, the search strategy could have resulted in omission of some evidence. This is related to the limited time to deliver this work. Third, only one paper used a UK dataset (Breugelmans and Campo, 2016); and consumer behaviour may differ between countries. Finally, the author of this review is a health professional and not an expert in the fields, which the identified evidence comes from. Consequently, the author was unable to accurately evaluate strength of the evidence, especially with regards to methods used.

Conclusions

This rapid review allowed better understanding of the context and types of online promotions to inform a health advocacy campaign. Price promotions online were reported to stimulate sales. The evidence suggested that individually customised price promotions, which are based on shopper characteristics, could increase retailers' profits both in physical retail stores and online. Strategies to personalise online promotion are constantly evolving through analyses of large amounts of data from store loyalty programmes; and the identified evidence, although very relevant, may be not current. Little evidence on non-monetary promotions online may indicate limitations of this review or a gap in evidence.

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Appendix 1. Data extraction table

Author(s) and date	Study design	Aim	Sample size	Setting (location/ context)	Promotion type(s)	Outcomes	Results	Conclusions
Arce-Urriza et al, 2017	Observational longitudinal data; a mixed logit model was used to estimate the effects of promotions on brand choice	To evaluate the differential effect of price promotions on orange juice purchasing behaviour (brand choice) across the offline and online channels of a grocery retailer	N=3416 users of both online and offline shop; 15,134 observations (5362 online & 9772 offline)	Spain; data collected May-Nov 2007 store - a large European grocery chain selling across offline and online stores data – from customer loyalty card database, incl. info on cardholder purchasing patterns;	Price promotion; (TPR)	brand choice / purchase	1) promotions have a higher impact (on brand choice) offline than online 2) frequent customers are more influenced by promotions than infrequent customers (offline only)	multichannel retailers would benefit from implementing distinct offline versus online promotion strategies, and by promoting more intensively offline and less intensively (less frequent promotions and/or lower price discounts) online; consumer-level/ segment-level customization of promotions recommended
Breugelmans and Campo, 2016	Observational longitudinal data; uses simulations to assess the effect of 1) similar pp in both channels, 2) different pp depth in the online & offline channel, 3) different frequency of pp in online & offline channel	To examine the impact of price promotions on purchase of milk & cereals in a multi-channel grocery retail (consumers shopping both)	Milk: n=9,251 households (2,175 multi-channel & 7,076 single-channel offline shoppers) Cereal: n=7,836 households (2,034 multi-channel, 5,760 single-channel offline, and 42 single-channel online shoppers)	UK household panel from Kantar Worldpanel, obtained from AiMark (Tesco) for the period from July 2006 to December 2007 (78 weeks)	Price promotions (TPRs)	Purchase decisions	1) Pp have positive impact on purchase decisions but negative effect on category purchases in the other channel during the promotion period; 2) promotion frequency in one channel can decrease future promotion	“a differentiated pp strategy can pay off, especially if it includes more offline pp and the differentiation takes place along the frequency dimension.”

							sensitivity in the same and other channels; the cross-channel effects are more negative for more loyal customers	
Cui and Wang, 2010	Observational longitudinal data; choice modelling (estimates a discrete choice model using the panel data of a frequently purchased product from an online supermarket)	To examine the effects of loyalty and e-marketing mix variables on the choices of online consumers at the stock-keeping-unit (SKU) level of cola	N=2000 panellists who bought cola products at least twice in the 26-month period between Feb 2001 and Aug 2003	Internet retailer, Beijing, China	Price discounts (TPRs) and web display defined as the presence of a product on the first page for the category	effects of loyalty and e-marketing mix variables on choice	Although online consumers are not sensitive to the net prices of SKU alternatives; they are attracted to price promotions. Webpage display had little influence, perhaps because cola is a frequently purchased product category, and consumers have significant experiences with the brands and have already formed their preferences	Analysing consumer choices at the SKU level can help online supermarkets with promotion planning and inventory and distribution management to improve customer satisfaction and profitability
Degeratu et al, 2000	Longitudinal observational, using field data from separate samples of online and offline shoppers (accounting for self-selection differences between these samples)	To understand the differences in choice behaviour (choosing margarine) induced by the shopping medium (online or offline)	1) data from Peapod, 'about' 300 subscribers from May 1996 to July 1997 2) data from IRI, N=1039 panelists who shopped in the same grocery chain in the same geographic area collected between Sep 1995 and Nov 1997 from	US, Chicago suburban area, relatively affluent and the online sample <u>not comparable</u> to general population	Price cuts (TPRs) were the only promotions in the online Peapod sample	Purchases (choice), price sensitivity	For margarine <u>unable to test</u> whether price had smaller impact on choices in online supermarkets than in traditional supermarkets.	<i>(my note) The data is 23-25 years old and the interface of the online retailer does not resemble today's websites in any way! Treat the results with caution.</i>

			three stores					
Wan et al, 2017	The study reports development of a nested factorisation framework and then tests it	to study the problem of modelling consumer preferences and price sensitivities from large-scale grocery shopping data in order to support personalized and scalable recommendation and demand-forecasting systems; to propose a nested feature-based matrix factorization framework to model both preferences and price sensitivities at scale	1) Dunnhumby dataset includes transactions over two years from around 2000 households who are frequent shoppers at multiple stores of a retailer, 105 categories 2) MSR-Grocery dataset – 8 months of transactions from a single store in Seattle; 152000 product transactions from 53000 distinct shopping trips by 1,228 frequent consumers across 1,929 popular products in 55 categories.	USA	Personalised promotions online or offline: hybrid personalised coupon lists (personalized ranked lists can be provided by matching preferences, or customized promotion strategies can be provided based on estimated price elasticity)	Category purchase, product choice, purchase quantity; used to obtain preference prediction and price elasticity estimation	the proposed personalized, interpretable and scalable framework can provide high quality preference predictions and specific price elasticity can be estimated for each shopping trip; price affected product choice but had limited effects on category purchase or product quantity	Grocery shopping behaviour is explored in this study but the nested multi-stage framework and the relationship between preference and price sensitivities can be translated to other domains (e.g. clothes shopping, online advertising).
Shi and Zhang, 2014	The study reports construction of a nonhomogenous hidden Markov model (NHMM) of consumers' store visit and shopping trip spending decisions in the online store	To investigate how prior usage experience with various decision aids (nutritional needs, brand preference, economic needs and personalised shopping lists), available when online shopping, contributes to online purchase behaviour evolution	Data collected during a 62-week period in 1996-1977 when online retailer first launched. It included 247 households (on average 20 shopping events and spent \$123/event).	USA	Non-monetary: sorting by price, nutrition and brand name, shopping lists and previous order lists	Sales	Consumers evolve through distinct behavioural states over time, and the evolution is attributable to their prior usage experience with various decision aids; Consumers gravitate towards a habitual decision process	The model enables online retailers to infer each individual customer's purchase behaviour at a given time and to use that as a basis for designing various customisation strategies

		<p>Relevant sub-question: How to design targeted promotion activities in an online store based on the proposed model and how to quantify expected sales improvement from these actions?</p>					<p>on online grocery stores, and their average price and promotion sensitivities increase first and then decrease but the level of heterogeneity rises continuously</p> <p>shopping lists, previous orders lists and sorting by nutrition can enhance store loyalty and mitigate the pressure of price and promotion</p> <p>but sorting by brand and by price can reduce loyalty & increase price & promotion sensitivities</p>	
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