

International Journal of Population Data Science

Journal Website: www.ijpds.org



Swansea University
Prifysgol Abertawe

Supermarket Loyalty Card Data for Delivering and Evaluating Dietary Interventions: A Narrative Review

Romana Burgess^{1,2,*}, Alisha Suhag^{1,2}, and Anya Skatova^{1,2}

Submission History

Submitted:	08/10/2025
Accepted:	03/02/2026
Published:	08/04/2026

¹Digital Footprints Lab, Population Health Sciences, Bristol Medical School, University of Bristol, UK

²The MRC Integrative Epidemiology Unit at the University of Bristol, Population Health Sciences, Bristol Medical School, University of Bristol, UK

Abstract

Objective

Loyalty card data can provide valuable insights into food purchasing behaviours, offering a scalable tool to evaluate food choice in a real-world retail setting. This narrative review examines how such data have been used to deliver and assess dietary interventions.

Methods

We conducted a narrative synthesis of studies using loyalty card data to deliver or evaluate dietary interventions. Eligible studies were identified as a subset of a previously published scoping review of loyalty card data in health research, which involved systematic searches of MEDLINE, EMBASE, PsycINFO, and Scopus using keywords related to shopping, loyalty cards, and health. Searches were conducted in August 2024, with a final search in February 2025. Additional studies were identified through manual searches of reference lists for the purpose of this review.

Results

We found 15 studies evaluating dietary interventions using loyalty card data. Studies implemented a variety of intervention approaches, including price promotions, point-of-purchase nudges, educational messaging, and targeted feedback. The effectiveness of these were mixed, with some showing promising changes in purchasing patterns, and others limited by issues such as displacement effects and missing data. In addition, samples were biased towards female participants and older adults. Yet, loyalty card data enable longitudinal analysis, capture whole-basket purchases, and reduce reliance on self-report, positioning them as a valuable tool for use within dietary interventions.

Conclusion

Loyalty card data represent a promising tool for evaluating dietary interventions in real-world settings, offering granular insights into purchasing behaviour. However, several limitations were identified, including incomplete coverage across retailers and limited context about purchases. Linking loyalty card data with complementary datasets and using them to support personalised feedback may help address limitations, continuing to enhance their value for policy-relevant interventions.

Key words

Loyalty Cards; Diet; Interventions; Population Health; Supermarket

*Corresponding Author:

Email Address: romana.burgess@bristol.ac.uk (Romana Burgess)



Introduction

Supermarkets represent a critical setting for influencing dietary behaviours, given their central role in food purchasing globally. Interventions based in a retail setting can therefore be used to promote healthier diets, using strategies like educational campaigns, behavioural nudges [1, 2], or financial incentives [3] to guide consumers towards more nutritious choices. However, the same commercial setting has frequently been used to promote purchasing of unhealthy, nutrient-poor foods [4, 5], although legislation has been introduced to limit this practice (e.g., restricting promotion of high fat, sugar and salt products in UK retailers [6]). Several systematic reviews have shown that supermarket-based interventions can positively influence both dietary outcomes and food purchasing behaviour [7–10], underscoring the potential of retail environments as catalysts for dietary change. In particular, reviews have called for longer study durations to track sustainability over time, and more robust outcome measures that include how interventions affect overall food and drink purchasing as well as whole-basket impacts [9, 10]. Individual-level loyalty card data offer a promising way to meet these research priorities.

Loyalty card data—collected through transactions at the point-of-purchase—provide objective tracking of purchasing behaviour over time, and have been used widely in health research [11]. These data provide detailed, real-world insights into individual purchasing patterns—information that is crucial given the well-established links between diet, chronic disease prevention [12], malnutrition [13], and quality of life [14]. In contrast to traditional approaches such as receipt collection (which impose substantial participant burden [15]) or aggregated store sales data (which cannot be linked to individual demographic or behavioural characteristics [16, 17]), loyalty card data provide a low-burden and high-resolution alternative. These transactions allow researchers to track purchasing of specific food items and categories over time [18, 19], assess dietary change within individuals [20] and populations [21, 22], and examine patterns by demographic characteristics [23, 24]. As such, loyalty cards present a valuable opportunity for evaluating the impact of dietary interventions.

This review analyses intervention studies using loyalty card data, aiming to determine the value of these data for delivering and assessing dietary interventions in a retail setting. To address this, we explore two key questions:

- What are the methodological challenges associated with using loyalty card data in dietary intervention studies, and what strategies can address them effectively?
- What opportunities exist to improve the use of loyalty card data in dietary intervention studies?

Methods

This review adopts a narrative synthesis approach informed by a systematic search of the literature.

The studies included used loyalty card data to evaluate interventions at major supermarkets to investigate diet. Studies were eligible for inclusion if they: 1) involved an intervention implemented in a supermarket or retail setting; 2)

used loyalty card data as part of the evaluation process; and 3) aimed to promote positive dietary change. All studies were published in English. Both outcome evaluations and process evaluations were eligible, as long as loyalty card data was used to evaluate the intervention (although no process evaluations were found). Studies were excluded if they did not report on implemented interventions (e.g., purely observational analyses of loyalty card data), only described planned protocols (i.e., no intervention evaluation), or were published solely as conference abstracts.

The review focused on studies published from 1995 onwards, coinciding with when the first loyalty card scheme was established (the Tesco Clubcard). Studies included in the review were identified from our pre-existing scoping review exploring the role of loyalty card data in health research (published in 2025) [11]. As such, the search strategy has been reported in full elsewhere [11]. In brief, we searched four electronic databases—MEDLINE, EMBASE, PsycINFO, and Scopus—using search terms (including MeSH) related to shopping (e.g., shop*, supermarket*), loyalty cards (e.g., loyalty card*, loyalty scheme*), and health (e.g., health, diet*, nutrition*). An updated search was conducted on February 20th 2025. We identified 555 articles in total, which reduced to 352 after duplicates were removed. Title and abstract screening retained 74 studies, and full-text review identified 44 articles that used loyalty card data to evaluate any health outcome.

For the purpose of this review, we screened these 44 studies against our inclusion criteria to identify those specifically evaluating interventions targeting dietary behaviours. Studies that did not meet these criteria—such as cross-sectional studies, or those with health outcomes unrelated to diet—were excluded. Of these, eleven met the inclusion criteria. Manual searches of reference lists yielded three additional studies, and one further study was suggested during peer-review and subsequently included, resulting in a total of 15 studies.

Figure 1 shows a flow diagram of study selection for this review.

Studies were independently screened by two reviewers (Author R.B. & A.Su), and data extraction was undertaken by the same reviewers. For each study, we extracted data on the population sample, methods (including intervention design), and findings. Data were synthesised thematically (by Author R.B.) to identify common challenges and opportunities in using loyalty card data to evaluate dietary interventions in a supermarket setting. This involved identifying recurring patterns in how loyalty card data were used to design, implement, and evaluate interventions. Emerging themes were verified and finalised by the wider research team.

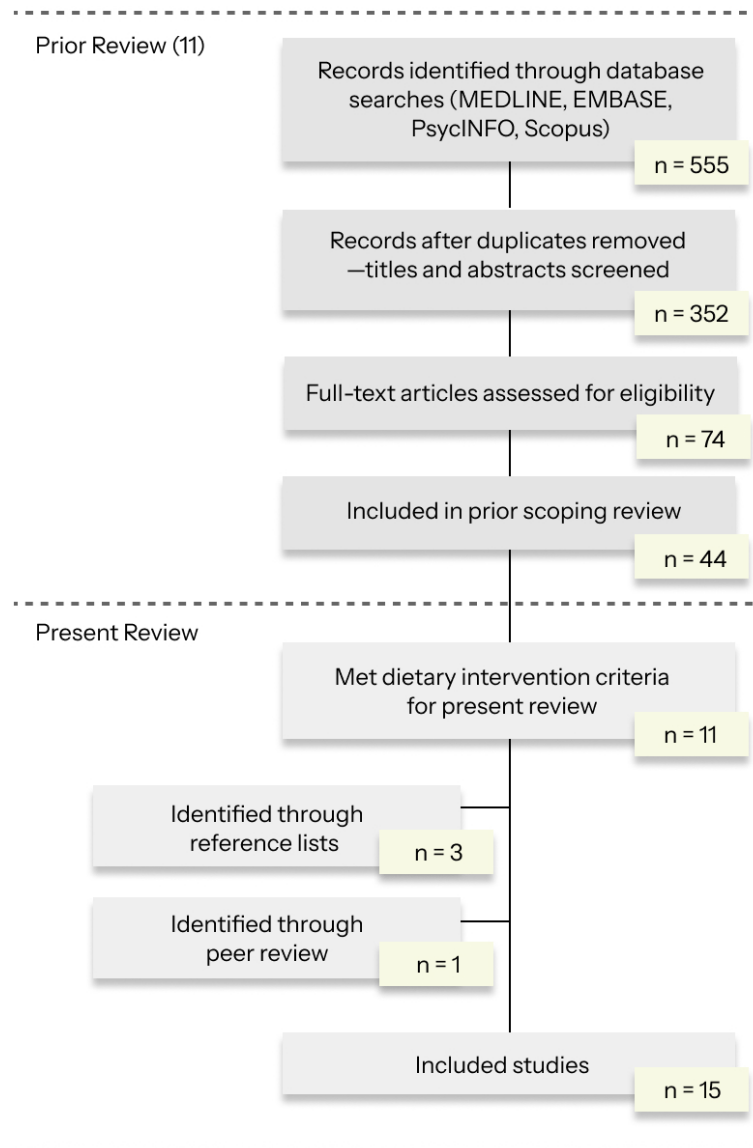
The review is structured to discuss the role of loyalty cards schemes in recruiting participants, delivering interventions, and evaluating them.

Results

The review identified 15 studies using loyalty card data to evaluate dietary interventions; Table 1 provides an overview of study characteristics.

Seven studies used data from the USA [26, 29, 31, 33, 35–37], with three from the UK [30, 32, 34], two from the

Figure 1: Study Selection Flow Diagram



Netherlands [25, 27], and one each from France [39], Australia [38], and Switzerland [28]. Study sample sizes ranged from 67 [26] to 6625 participants [39], with intervention and control groups predominantly randomised at a 1:1 ratio. Participant drop out often influenced final group sizes; for example, one study included 42 intervention and 53 control participants [28], while another included 150 control and 149 intervention participants [33]. Across studies, intervention group sizes generally ranged between 40–150 participants, with control groups of comparable size. Only one study did not include a control group, engaging 251 participants in total [37].

Baseline data were collected to establish purchasing patterns before the intervention, with durations ranging from 1 month [26] to 40 weeks [33], though studies commonly used a baseline period of around 2–3 months [30, 35, 36]. Intervention periods ranged between 8 weeks [26] and 6 months [30], with others reported as between 3 and 5 months [31–33, 35, 36]. Follow up periods ranged from 4 weeks [26] to 6 months [29, 38]. One study used an intervention which took place over a single day, with baseline and follow up periods of 6 months [37].

Participants were predominantly female in all studies. Samples largely comprised middle-aged to older adults, with mean ages ranging from mid-30s [30, 33, 35, 36] to early 60s [32]. Most samples were majority White [26, 29–37], although some studies included notable proportions of participants from other ethnic groups [26, 29, 37]. Educational attainment varied widely, with some samples characterised by predominantly low educational levels [30, 38] and others with higher education [25–27, 29, 32, 34]. Several studies included socioeconomically disadvantaged groups, such as participants living in areas of higher deprivation or enrolled in financial assistance programmes [30, 33, 35, 36]. Some studies included additional sociodemographic characteristics, including employment (e.g., [29]), marriage status (e.g., [29, 30]), whether participants had children (e.g., [38]), income (e.g., [26]), and household size (e.g., [36]).

Interventions varied in scope and structure, with the common goal of aiming to improve dietary quality within either households or individuals. Strategies included: discounting [26, 35], product placement [30], a nutritional podcast [37], support and feedback/education [32], dietician-led education

Table 1: Overview of Study Characteristics

Study	Country	Sample Size	Participant Characteristics	Duration of Data Collection	Intervention Details	Outcome
Mackenbach et al. (2024) [25]	Netherlands	321 (intervention = 139)	73% female - Mean age 57.6 years (SD = 10.8) 42% high education, 35% medium education	12 months (14 week intervention)	- Nudging (proximity, access, and visual attractiveness) and pricing (25% off) strategies targeting healthy foods - Six control and six intervention stores	Proportion of ultra-processed food purchases
Poskute et al. (2024) [26]	USA	67 (intervention = 38)	75% female - Mean age 39.4 years (SD = 13.8) 66% White, 13% African American; 7% Asian 45% educated to Bachelors, 21% to Masters; 16% to PhD	16 weeks (4 week baseline, 8 week intervention, 4 week follow up)	50% discounting on fruit and vegetables and noncaloric beverages - Randomisation by store and gender	Weekly average of fruit and vegetable purchases; dietary recall; body weight and fat %
Stuber et al. (2024) [27]	Netherlands	361 (intervention = 162)	73% female - Mean age 57.6 years (SD = 10.8) 42% high education, 35% medium education	12 months (6-12 month intervention)	- Nudging (proximity, access, and visual attractiveness) and pricing (25% off) and mobile physical activity (step counter and mobile coaching app) - Six control and six intervention stores	Average change in diet quality; daily step count; healthier purchasing; cardiometabolic risk markers
Monninghoff et al. (2022) [28]	Switzerland	95 (intervention = 42)	55% female - Median age 44 years (IQR 19)	12 weeks (2 month baseline, 5 month intervention)	An m-Health app providing personalised basket analysis and shopping tips	Nutritional quality of purchases; step count
Steen et al. (2022) [29]	USA	247 (intervention = 100/101)	69% female - Median age 58 years 75% White, 21% Black or African American 64% had a Bachelor's degree	3 month intervention (6 month follow up)	- Dietitian-led in-store nutrition education, guided by purchase data - Two intervention arms and an enhanced control (one intervention arm included added online support)	Adherence to a hypertension-reducing diet
Vogel et al. (2021) [30]	UK	150 (intervention = 62)	100% female - Median age 36.2 years (range 31-41) 91% White 59% low education 79% low Index of Multiple Deprivation	12 months (6 month intervention)	- Product placement (fruit and vegetables near store entrance, removal of confectionary from checkouts) - Three control stores, three intervention	Store level sales of fruit and vegetables (and confectionary); proportion of individual fruit and vegetables (and confectionary) purchases
Vadiveloo et al. (2021) [31]	USA	209 (intervention = 104)	90% female - Mean age of 55.4 years (SD = 14.0) 94% non-Hispanic White	9 months (3 month intervention)	Semiautomated, personalised weekly educational coupons	Grocery purchase quality; percentage spending on targeted food groups

Continued

Table 1: Continued

Study	Country	Sample Size	Participant Characteristics	Duration of Data Collection	Intervention Details	Outcome
Piarnas et al. (2020) [32]	UK	113 (intervention = 48/arm)	68% female - Mean age 62.4 years (SD = 10.8) 95% White 41% educated to higher education; 43% to secondary education, 14% no qualification	10 months (3 month intervention)	Three-arm personalised support and feedback from a healthcare professional: (1) brief support, (2) support and feedback), and (3) control	Between group difference in saturated fat (SFA) intake; % of SFA purchases; low-density lipoprotein cholesterol; feasibility
Moran et al. (2019) [33]	USA	300 (intervention = 150)	81% female 41% age 30-39; 37% age 40-49; 13% age 18-29; 6% age 50-59 90% White 25% SNAP* participants	40 weeks (16 week intervention)	- Ingredients of low-cost healthy meals were bundled and promoted in-store (displays, point-of-purchase messaging) - Weekly electronic reminders of the bundles based on behavioural psychology principles	Difference in storewide sales and individual purchases on bundled items
Harrington et al. (2019) [34]	UK	496 (intervention = 246)	66-68% female 20-25% between 46-55 years; 15-22% between 56-65 years; 17-18% 36-45 years 75-78% White 26-30% educated to degree level	11 months (6 month baseline, 6 week intervention, 12 week washout)	Web-based personalised feedback and goal setting, and traffic light label modelling	Healthiness of ready meal and pizza purchases
Polacsek et al. (2018) [35]	USA	401 (intervention = 204)	77-80% female 38-45% between ages 30-39; 31-38% between 40-49 88-90% White 17-27% SNAP participants	7 months (3 month baseline, 4 month intervention)	Same-day coupon for 50% off fruit and vegetables	Weekly spending on fruit and vegetables
Franckle et al. (2018) [36]	USA	148 (intervention = 77)	97-100% female 38-42% between 30-39 years 70-72% White 49-66% SNAP participants	7 months (2 month baseline, 5 month intervention)	Traffic light labelling educational newsletters (red = unhealthy, green = healthy) and financial incentives (5% discount) to reduce sugar-sweetened beverage consumption	Monthly in-store purchases; self-reported consumption
Bangia et al. (2017) [37]	USA	173 (no control)	76% female - Mean age 50.4 years (SD = 13.8) 58% White; 35% Black 95% held at least a high school degree; 28% bachelors; 13% graduate	12 months (1 day intervention, 6 months pre/post)	In-store educational podcasts (x10) promoting omega-3-rich foods	Monthly number of omega-3-rich food purchases
Ball et al. (2016) [38]	Australia	211 (intervention = 103)	100% female - Mean age 42.3 years (SD = 10.3) 33% did not finish high school	15 months (3 month baseline, 6 month intervention, 6 month follow up)	Behaviour change (goal setting: newsletters, recipes, food preparation guides, etc) to promote fruit and vegetable consumption	Quantity of fruit and vegetable purchases

Continued

Table 1: Continued

Study	Country	Sample Size	Participant Characteristics	Duration of Data Collection	Intervention Details	Outcome
Gamburzew et al. (2016) [39]	France	6625 (two intervention stores, two control stores)	N/A	18 months (6 months intervention)	- Shelf labelling and marketing (signage, placement, taste testing) of inexpensive nutritional foods - Two control stores, two intervention	Proportion of inexpensive nutritional foods in total food spending

*SNAP = Supplemental Nutrition Assistance Program.

[29], nudging and pricing strategies [25, 27], nutritional feedback via an m-Health app [28], meal bundling and promotions combined with messaging [33], targeted coupons and educational content [31], personalised feedback and goal setting [34], behaviour change strategies [38], shelf labelling and marketing [39], and financial incentives combined with nutritional labelling [36]. Outcome measures varied across studies; these included changes in individual purchasing behaviour, such as weekly/monthly spending [31, 35], quantity of purchases [26, 36–38], the nutritional quality of purchases and/or diet [27–29, 31, 32, 34], and the proportion of healthy food purchases [25, 39]. Other studies included store level sales [30] or health-related outcomes [28, 32].

Eight studies found the intervention to be effective [26, 29–31, 35–37, 39], three showed minor or partial effects [28, 32, 38], and four reported that the intervention had no effect [25, 27, 33, 34]. The successful interventions varied in scope; three increased fruit and vegetable purchasing via financial incentives [26, 35] or product placement [30], three used educational strategies (a podcast increased omega-3-rich purchasing [37], dietician-led in-store advice [29], and nutritional labelling on sugary beverages [36]), one used personalised weekly coupons to improve overall diet quality [31], and one used labelling and marketing to increase purchases of inexpensive, nutritional foods [39]. The interventions which showed some success—small but statistically insignificant improvements in nutritional quality [28] or saturated fat intake [32], or increased vegetable consumption but no change in fruit [38]—relied on personalised feedback or goal setting strategies, both of which were made possible by loyalty card data. In contrast, the ineffective interventions used meal bundling to promote healthy meals [33], nudging and pricing strategies to improve diet quality [27] or to reduce ultra-processed food purchases [25], or web-based feedback to improve healthiness of ready meal and pizza purchases [34].

These studies were used to inform the narrative discussion that follows.

Using loyalty card schemes as a catalyst for recruitment

Loyalty card schemes offer an efficient channel for recruiting participants into supermarket-based interventions. Several studies have leveraged retailer-held contact details, typically email or postal addresses, to invite cardholders to share

their loyalty card data for trials [30, 34]. This approach allows rapid outreach to a large and relevant customer base, including priority populations like low-income families (using demographic data held by retailers) or frequent buyers of unhealthy foods (using purchase histories) [34]. For example, one study targeting ready meal and pizza consumption used a supermarket's email system to contact 50,000 loyalty cardholders, quickly enrolling 496 participants [34]. However, this depends heavily on retailer willingness to lead recruitment, and may limit representativeness (i.e., as cardholders may differ systematically to non-cardholders).

Incidentally, even among cardholders, sampling can be challenging. Coverage of loyalty card use varies by gender, socioeconomic status, and local retail competition, while monopolies of specific stores may inflate representation of certain groups in some areas [40]. Participants also differ in how long they have held a card, how frequently they shop, and whether they shop at multiple stores. Together, these factors influence both the completeness of purchase histories and the representativeness of the recruited sample, and should be considered early in study design to ensure the feasibility of analyses and plan for (sub-)sampling strategies (e.g., [41]).

While contacting participants through trusted retail brands may enhance engagement, contacting participants via retailer-held emails for research raises ethical questions about consent and transparency, since individuals may not expect their commercial data to be used for research without explicit opt-in. One study compared several recruitment methods—letters, emails and text messages sent to cardholders from the retailer, in-store approaches, and advertisements on receipts and Facebook—and found that letters generated the highest participant interest [30]. This method meant that individuals could initiate first contact with researchers and choose whether to participate.

Using loyalty cards as a platform for intervention delivery

Loyalty cards can actively deliver interventions, such as by automatically delivering point-of-purchase coupons [35] or discounts [26]. This approach can also enhance participant engagement by offering immediate, tangible benefits, and may be especially effective for reaching low-income groups who are more likely to respond to interventions that provide instant savings rather than delayed incentives [35]. For instance, one study used loyalty cards to apply a 50% discount on fruit and

vegetables to the intervention group, in addition to using the card to track subsequent purchasing [26]. The intervention led to higher weight loss in the intervention group (an average loss of -1.33kg) compared to the control. Another used loyalty cards to automatically issue coupons, providing a 2-4-1 discount on fruit and vegetables [35]. The coupons were delivered at the point of sale, redeemed easily by scanning the card. These examples highlight how loyalty cards can serve as delivery mechanisms.

Developing personalised interventions in near real-time

Several studies have explored using loyalty cards to tailor near real-time feedback, incentives, or nudges based on individual purchase data [28, 29, 31, 32]. This dynamic targeting allows interventions to adapt to each participant's habits, preferences, and nutritional needs. For example, one study used a mobile health app to provide feedback on the nutritional quality of purchases, incorporating personalised features like an avatar, dashboard, basket analysis, and product recommendations [28]. While this led to small improvements in nutritional quality, there were no significant changes in the consumption of protein, fruits, vegetables, or fibre. Another study used personalised weekly coupons, based on customer preferences, purchase history, and baseline diet quality, to successfully improve grocery purchase dietary quality in the intervention group [31].

These examples illustrate how loyalty card systems can facilitate scalable, automated personalisation—delivering relevant, behaviourally aligned interventions in near real-time [33]. However, more research is needed to understand what forms of personalisation are most effective, and how characteristics such as age, diet quality, or shopping patterns may influence outcomes.

Using loyalty cards as a tool for impact evaluation

Loyalty card data provide rich, individual-level purchase records over time, making these data a powerful tool for evaluating changes in diet following an intervention. For example, researchers can track changes in the frequency and type of purchases over time [38], detect shifts in household buying patterns [36], and evaluate responses to targeted promotions [26] or public health campaigns [30]. However, there are limitations that must be addressed to assess intervention effects accurately.

Dealing with incomplete data

A key limitation of loyalty cards is their confinement to a single retailer, meaning purchases made elsewhere (e.g., other stores, markets, or grocery outlets) are unrecorded [28, 35, 37]. This complicates evaluation as displacement effects—where consumers shift their purchases to other retailers or product categories following an intervention—cannot be tracked [38]. For example, a study implementing a traffic light labelling system on sugar-sweetened drinks found a reduction in purchases within the intervention store but could not fully rule out compensatory purchases elsewhere [36]. Even within a single store, loyalty card data can be

incomplete. Not all transactions are linked to loyalty cards, either because customers forget to scan their card or choose not to, introducing gaps in the data that may skew outcome estimates. These inconsistencies are particularly problematic when participation in the intervention is tied to card use, as missing data may differ systematically between participants and non-participants, or before and after the intervention.

Issues related to incomplete data were acknowledged in over half of the studies, including the exclusion of participants who never used their loyalty card within the timeframe [31, 33, 35–37], unobserved purchases made at other retailers [28, 34–37, 39], or other reasons [34, 38]. These limitations underscore the need for greater data interoperability and coverage. Addressing this requires integrated loyalty systems across retailers or third party platforms (e.g., mobile diet tracking apps) to triangulate purchases and monitor true intervention impact. Loyalty card data could also be used to predict displacement risk using pre-intervention shopping behaviours, such as low store loyalty or high baseline spending on targeted unhealthy products.

Mitigating confounding

Isolating the true impact of interventions requires careful management of confounding variables—unmeasured factors like lifestyle or external influences that can bias results [28]. However, loyalty card data can help to mitigate confounding through within-subject comparisons [39], leveraging individuals' purchase histories before and after intervention exposure. This can help control for time-invariant personal factors, such as baseline diet, income proxies (e.g., basket value), and shopping frequency. These data also support advanced analytical methods (e.g., interrupted time series analyses), which can reduce bias in the absence of a control group by modelling purchasing trends over multiple time points before and after the intervention to distinguish intervention effects from underlying temporal trends. For example, one study used a point-of-purchase podcast—designed to be listened to while shopping—to encourage the purchase of omega-3-rich foods [37]. Although the study lacked a control group, the use of loyalty card data allowed researchers to compare each participant's purchasing behaviour before and after the intervention. This revealed that 59% of shoppers increased their omega-3 purchases—an insight made possible by the longitudinal nature of the loyalty card data.

Confounding at the store level—such as differences in location, customer base, or surrounding environment—also poses a challenge. One strategy to address this is to use geographically distinct control stores and using “matching” techniques to ensure comparability between intervention and control stores. One study matched six stores based on sales, customer profiles, and neighbourhood deprivation [30], attempting to increase the similarity of intervention and control stores and mitigate the influence of external factors. Another study matched four stores based on size, number of employees, visits per day, and type of supply [39], and ensured that stores were geographically distinct to avoid cross-shopping. While this improves external validity, individual-level matching using purchasing history could offer far more precise control—helping ensure that observed effects are attributable

to the intervention rather than to pre-existing differences between store populations.

Using data linkages to expand impact

Many interventions have linked loyalty card data with other data sources to provide a more comprehensive picture of dietary (and other health) impacts. While loyalty card records offer a continuous, objective view of food purchasing, they do not directly capture actual consumption, nutritional status, or contextual factors that influence dietary choices. Linking these data to other records can therefore significantly increase the precision of evaluation. For example, integrating dietary recalls can help delineate individual versus household consumption [30, 36], while linking to contextual surveys can account for external factors which influence purchasing decisions (e.g., dietary preferences) [37].

Beyond behavioural insights, combining loyalty card data with objective health measures—such as cardiometabolic markers [27], medication intake [29], and cholesterol [32]—can offer a clearer picture of impact. One study conducted a three-arm parallel trial aimed at reducing saturated fat intake [32]. Participants were randomly assigned to three groups: control, brief support (a 10-minute consultation with a healthcare professional) or brief support plus feedback (a personalised report on household saturated fat intake). Loyalty card data were used to generate real-time feedback on purchases high in saturated fats, and the study integrated data on body mass index (BMI), blood pressure and lipids (from a blood sample) as clinical outcomes. While the intervention did not yield significant changes in saturated fat intake or clinical outcomes across groups (aside from minor reductions in weight), it demonstrated how loyalty card data can be used to uncover tangible changes in individual health.

While integrating these markers could be invaluable for assessing health outcomes, this could pose scalability challenges if health professionals are required to administer many tests [32] or provide regular feedback to recorded dietary data [29]. A practical solution would be to leverage existing datasets, such as electronic health records or longitudinal population studies, to minimise resource constraints while maintaining robust evaluation metrics. Loyalty card data offer several advantages in this integration: 1) high temporal resolution (enabling pre/post intervention comparisons), 2) low participant burden, and 3) individual specificity. To realise this potential, collaboration between retailers, public health institutions, and researchers will be crucial to establish the infrastructure needed for secure, ethical, and effective data integration.

Facilitating an effective academic-retailer collaboration

Effective partnerships with retailers are essential for designing sustainable interventions that benefit consumers, researchers, and retailers themselves [42]. Given that interventions can directly implicate retailer profits and reputation, it is unsurprising that stores often play a key role in their design. In several cases, this involvement has constrained the scope or implementation of intervention strategies. For instance, one study used a combination of nudging (e.g., placing products

at eye level) and pricing strategies (e.g., 25% reductions on healthy foods) to improve diet quality, but found no effect [27]. Another study [25] analysing the same intervention with a focus on ultra-processed food purchases also found no effect. The authors suggested that co-production with the supermarket constrained the intervention's scope, as it primarily promoted healthy foods rather than discouraging unhealthy products—which would reduce sales—ultimately limiting the intervention to just 20% of potential store items. Even fewer items were approved by the retailer for price reductions, potentially further reducing the intervention impact.

Yet, loyalty card data offer an opportunity to quantify and communicate intervention value from both health and business perspectives. For example, the data might show increased basket size or repeat visits associated with healthy food promotions, or reduced financial losses from perishable produce (e.g., fruit and vegetables). These insights can strengthen the case for more mutually beneficial interventions.

Access to loyalty card data is typically contingent on collaboration with retailers, as these data are proprietary and managed internally by supermarket chains. While essential, this often presents logistical challenges. One study reported 12 month delays to finalise data sharing agreements and contracts, and received only two data updates from the retailer, limiting timely, personalised feedback to participant [34]. Beyond logistics, researchers may face restrictions on the type or granularity of data provided (e.g., no demographic data), difficulty linking to other datasets, or incomplete metadata. These limitations can affect intervention impact: delays may shorten exposure periods, infrequent updates can reduce the feedback effectiveness, and limited data sharing may constrain analyses. This can also affect the research process more broadly (e.g., jeopardising funding timelines and slowing publications). To mitigate these issues, prior work recommends establishing a shared understanding of the technical, legal, and operational boundaries early to ensure data accessibility supports intervention delivery and evaluation goals [34].

It should be noted that collaboration with retailers could theoretically present a conflict of interest, since interventions may intersect with retailer profit (e.g., if an intervention discourages any type of purchasing). However, pre-registered protocols, formal data agreements, and transparency with customers can help ensure that research objectives remain separate from commercial interests, by securing a study plan in advance, safeguarding researcher independence, and making the purpose and use of data clear to participants. Future policy frameworks could further formalise these safeguards.

Discussion

Supermarket-based interventions have been widely studied [7–10], with price promotions and in-store merchandising consistently identified as effective strategies for improving nutritional choice [10]. Far less attention, however, has been given to the use of loyalty card data to assess the impact of these interventions. This review aimed to assess the challenges and opportunities in using loyalty card data for delivering and evaluating dietary interventions. We identified 15 studies that

employed a variety of intervention approaches (from pricing to educational content to personalised feedback) over a range of timescales (from 8 weeks to 18 months). Crucially, all studies used loyalty card data to track purchasing patterns, allowing for objective, longitudinal assessments of dietary change post intervention.

Loyalty card schemes offer unique opportunities across the full cycle of dietary interventions, from recruitment to evaluation. For recruitment, retailer-held contact details enable rapid outreach to large, targeted populations—including low-income groups [35, 36] or frequent purchasers of unhealthy foods—although sample representativeness remains an important consideration. Across the studies included in this review, participants were predominantly female and White, with wide variation in age and educational attainment. In addition, loyalty card holders may differ systematically from non-cardholders (e.g., ethnicity, digital access), meaning that findings based on these samples may under- or over-estimate effectiveness, or fail to capture impacts among those who do not hold loyalty cards. Regarding intervention deployment, loyalty schemes allow automated delivery of point-of-purchase discounts, coupons, or personalised nudges, enhancing engagement while tailoring interventions to individual habits in near real-time.

Yet, the primary use of loyalty cards across studies was for intervention evaluation. Purchase records linked to individual cardholders allows clear comparison of dietary patterns before, during, and after an intervention, supporting assessment of dietary change and potential health impacts. While these records can (and often do) reflect household-level consumption, interpreting purchases as proxies for the cardholder's dietary exposure allows within-person changes to be assessed, and associations with individual health outcomes to be estimated, even without detailed household composition data. In some contexts, however, household-level data may be of interest to researchers [24, 43]. If necessary, survey data can be integrated to capture household composition and contextualise purchasing.

While loyalty card data provide insights that are difficult or impossible to obtain through traditional methods (like surveys or aggregate sales data), these records have limitations. They lack context regarding actual consumption, card sharing, and waste, and factors such as seasonal purchasing patterns, incomplete data, and displacement effects can affect reliability. Additionally, most studies rely on a single retailer or loyalty card, so purchases made with other cards or at other stores are not captured; this may lead to underestimating purchasing behaviour and dietary intake, biasing observed intervention effects. Lessons from prior work highlight operational considerations for implementing supermarket-based interventions in practice [44]. These include building trust with retailers, using robust study designs with adequate sample sizes, formalising data sharing agreements, assessing effects at both the individual and household-level, incorporating mixed-methods process evaluations, and ensuring scientific independence through formal contract agreements. Legal barriers remain a challenge, as loyalty card data are considered personal data but are owned by supermarkets, necessitating careful (and often time-consuming) negotiation to ensure ethical and secure use [34]. To address these concerns, prior research

emphasises the importance of transparent consent processes, clear communication with participants about third party involvement, and ensuring participants understand the value, validity and risks of data use [45]. Approaches such as explicit opt-in consent, research-led rather than retailer-led contact, and public involvement in study design may help to build trust and support sustained participation.

Despite these challenges, loyalty card data remain a promising tool for developing and assessing interventions at scale. They provide ecologically valid measures of purchasing behaviour, enabling assessment of individual-, household-, and population-level changes in diet over time and across diverse demographic groups. By providing high-resolution, longitudinal data, loyalty cards allow researchers and policymakers to identify which interventions are most effective, how behaviours vary across subpopulations, and where additional support or targeting may be needed.

Implications for policymakers

Insights from interventions using loyalty card data offer an opportunity to inform public health policies aimed at improving dietary outcomes. Key strategies include product placement legislation, food labelling laws, and subsidy programmes, all of which have the potential to drive healthier food purchasing and contribute to long-term population health benefits. For example, one study used product placement strategies to successfully boost fruit and vegetable purchases while reducing confectionary sales, by making healthy items more prominent in stores (e.g., near entrances) and replacing unhealthy items at checkouts and aisle ends with non-food products [30]. Their findings supported the proposed Food Promotion and Placement Regulation in the UK at the time, which aimed to restrict the placement and promotion of high fat, sugar, and salt foods [46]. This demonstrates how loyalty card-based evaluations can strengthen the case for national policies that encourage healthier food choices.

Crucially, these examples point to the value of loyalty card systems as tools to assess policy outcomes across time, regions, and consumer subgroups. These data can help policymakers design targeted interventions by identifying which populations benefit most from specific policies. For example, if certain income groups respond more to fruit subsidies or labelling interventions, this can guide equity-focused adjustments to national policy frameworks. However, national policy regulations are vital to ensure fair competition among retailers while also promoting healthy dietary choices (e.g., implementing uniform product placement strategies) [25, 27].

Limitations

Demographic and methodological biases in many of the included studies shaped the scope and strength of this review's conclusions. Many studies reported over-representation in their samples, including of women [25, 26, 32, 37] and older people [37], educated individuals [17], people of White ethnicity [37], those with high diet quality [25, 31], and those with high BMI [26]. This restricts the ability to draw firm conclusions about the effectiveness of loyalty card-based interventions across diverse demographic groups. Several studies were

also underpowered due to low sample sizes [25, 30, 32], high attrition rates [26, 28], or exclusion of low-engagement participants (e.g., <1 shop per month) [37]. which may obscure true intervention effects.

Beyond these study-level limitations, this review is constrained by the limited number of studies, and by heterogeneity in interventions, outcomes, and study designs, which reduces comparability. Reliance on published literature may also introduce publication bias. These limitations suggest that findings should be interpreted cautiously, and further high-quality, diverse research is needed to establish the generalisability and robustness of loyalty card-based interventions.

Acknowledgements

A.S. is supported by a UKRI Future Leaders Fellowship (MR/T043520/1) and an ESRC Smart Data Accelerator Award (ES/Y010973/1). R.B. and A.Su. are also supported by both awards.

Conflict of interests

None to declare.

Ethics statement

Ethical approval was not required as this review is based on secondary analysis of published literature.

Data access and AI statement

This study is based on analysis of previously published literature, all of which is cited in the reference list. No primary data were collected. The authors used ChatGPT (GPT-5, OpenAI) for language and grammar checks; the output was edited, reviewed and verified by all authors.

References

1. Dolan P, Hallsworth M, Halpern D, King D, Vlaev I. MINDSPACE: influencing behaviour for public policy [Internet]. 2010 [cited 2025 4]; Available from: <http://www.instituteforgovernment.org.uk/publications/>
2. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, et al. The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. *Ann. Behav. Med.* 2013 Aug.;46:81–95. <https://doi.org/10.1007/s12160-013-9486-6>
3. Giles EL, Robalino S, McColl E, Sniehotta FF, Adams J. The Effectiveness of Financial Incentives for Health Behaviour Change: Systematic Review and Meta-Analysis. *PLoS ONE* 2014 Mar.;9:e90347. <https://doi.org/10.1371/journal.pone.0090347>
4. Hawkes, C. Marketing food to children: the global regulatory environment [Internet]. World Health Organization; 2009 [cited 2026 14]. Available from: <https://www.who.int/publications/i/item/9789241598299>
5. Ravensbergen EA, Waterlander WE, Kroeze W, Steenhuis IH. Healthy or Unhealthy on Sale? A cross-sectional study on the proportion of healthy and unhealthy foods promoted through flyer advertising by supermarkets in the Netherlands. *BMC Public Health* 2015 May;15:470. <https://doi.org/10.1186/s12889-015-1748-8>
6. Restricting promotions of products high in fat, sugar or salt by location and by volume price: implementation guidance [Internet]. Dep. Health Soc. Care 2023 [cited 2026 14]; Available from: <https://www.gov.uk/government/publications/restricting-promotions-of-products-high-in-fat-sugar-or-salt-by-location-and-by-volume-price/restricting-promotions-of-products-high-in-fat-sugar-or-salt-by-location-and-by-volume-price-implementation-guidance>.
7. Hartmann-Boyce J, Bianchi F, Piernas C, Riches SP, Frie K, Nourse R, et al. Grocery store interventions to change food purchasing behaviors: a systematic review of randomized controlled trials. *Am. J. Clin. Nutr.* 2018 June;107:1004–16. <https://doi.org/10.1093/ajcn/nqy045>
8. Liberato SC, Bailie R, Brimblecombe J. Nutrition interventions at point-of-sale to encourage healthier food purchasing: a systematic review. *BMC Public Health* 2014 Sept.;14:919. <https://doi.org/10.1186/1471-2458-14-919>
9. Cameron AJ, Charlton E, Ngan WW, Sacks G. A Systematic Review of the Effectiveness of Supermarket-Based Interventions Involving Product, Promotion, or Place on the Healthiness of Consumer Purchases. *Curr. Nutr. Rep.* 2016 Sept.;5:129–38. <https://doi.org/10.1007/s13668-016-0172-8>
10. Golding SE, Bondaronek P, Bunten AK, Porter L, Maynard V, Rennie D, et al. Interventions to change purchasing behaviour in supermarkets: a systematic review and intervention content analysis. *Health Psychol. Rev.* 2022 Apr.;16:305–45. <https://doi.org/10.1080/17437199.2021.1911670>
11. Burgess R, Suhag A, Skatova A. Exploring the use of supermarket loyalty card data in health research: A scoping review. *Public Health* 2025 Oct.;247:105848. <https://doi.org/10.1016/j.puhe.2025.105848>
12. Xiao Y-L, Gong Y, Qi Y-J, Shao Z-M, Jiang Y-Z. Effects of dietary intervention on human diseases: molecular mechanisms and therapeutic potential. *Signal Transduct. Target. Ther.* 2024 Mar.;9:59. <https://doi.org/10.1038/s41392-024-01771-x>
13. Keats EC, Das JK, Salam RA, Lassi ZS, Imdad A, Black RE, et al. Effective interventions to address maternal and child malnutrition: an update of the evidence. *Lancet Child Adolesc. Health* 2021 May;5:367–84. [https://doi.org/10.1016/S2352-4642\(20\)30274-1](https://doi.org/10.1016/S2352-4642(20)30274-1)

14. Carson TL, Hidalgo B, Ard JD, Affuso O. Dietary Interventions and Quality of Life: A Systematic Review of the Literature. *J. Nutr. Educ. Behav.* 2014 Mar.;46:90–101. <https://doi.org/10.1016/j.jneb.2013.09.005>
15. French SA, Wall M, Mitchell NR, Shimotsu ST, Welsh E. Annotated receipts capture household food purchases from a broad range of sources. *Int. J. Behav. Nutr. Phys. Act.* 2009 July;6:37. <https://doi.org/10.1186/1479-5868-6-37>
16. Rehm J, Kilian C, Rovira P, Shield KD, Manthey J. The elusiveness of representativeness in general population surveys for alcohol. *Drug Alcohol Rev.* 2021;40:161–5. <https://doi.org/10.1111/dar.13148>
17. Stockwell T, Zhao J, Greenfield T, Li J, Livingston M, Meng Y. Estimating under- and over-reporting of drinking in national surveys of alcohol consumption: identification of consistent biases across four English-speaking countries. *Addiction* 2016;111:1203–13. <https://doi.org/10.1111/add.13373>
18. de la Iglesia R, García-González A, Achón M, Varela-Moreiras G, Alonso Aperte E. Fish, Seafood, and Fish Products Purchasing Habits in the Spanish Population during COVID-19 Lockdown. *Int. J. Environ. Res. Public Health* [Internet] 2022;19. Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85138383872&doi=10.3390%2fijerph191811624&partnerID=40&md5=50ab22ef8cf04491a6312b72cbe17b85>. <https://doi.org/10.3390/ijerph191811624>
19. Van Wave TW, Decker M. Secondary analysis of a marketing research database reveals patterns in dairy product purchases over time. *J. Am. Diet. Assoc.* 2003;103:445–53. <https://doi.org/10.1053/jada.2003.50069>
20. Erkkola M., Kinnunen S.M., Vepsäläinen H.R., Meinila J.M., Uusitalo L., Konttinen H., et al. A slow road from meat dominance to more sustainable diets: An analysis of purchase preferences. *medRxiv* [Internet] 2021; Available from: <https://www.medrxiv.org/>. <https://doi.org/10.1101/2021.11.25.21266850>
21. Fearn A, Borzino N, De La Iglesia B, Moffatt P, Robbins M. Using supermarket loyalty card data to measure the differential impact of the UK soft drink sugar tax on buyer behaviour. *J. Agric. Econ.* 2022;73:321–37. <https://doi.org/10.1111/1477-9552.12462>
22. Uusitalo L, Nevalainen J, Rahkonen O, Erkkola M, Saarijärvi H, Fogelholm M, et al. Changes in alcohol purchases from grocery stores after authorising the sale of stronger beverages: The case of the Finnish alcohol legislation reform in 2018. *Nord. Alkohol-Nark. NAT* 2022 Dec.;39:589–604. <https://doi.org/10.1177/14550725221082364>
23. Fogelholm M, Vepsäläinen H, Meinilä J, McRae C, Saarijärvi H, Erkkola M, et al. The dynamics in food selection stemming from price awareness and perceived income adequacy: a cross-sectional study using 1-year loyalty card data. *Am. J. Clin. Nutr.* 2024;119:1346–53. <https://doi.org/10.1016/j.ajcnut.2024.03.003>
24. Thomas M, Moore JB, Onuselu DA, Dalton A, Rains T, Lowry E, et al. Supermarket top-up of Healthy Start vouchers increases fruit and vegetable purchases in low-income households. *Nutr. Bull.* 2023;48:353–64. <https://doi.org/10.1111/nbu.12627>
25. Mackenbach JD, Pinho MGM, Stuber JM, van der Roest J., Lakerveld J, Beulens JWJ. The effects of nudging and pricing strategies on the availability and purchases of ultra-processed foods: A secondary analysis of the Supreme Nudge trial. *Appetite* 2024;201:107599. <https://doi.org/10.1016/j.appet.2024.107599>
26. Poskute AS, Ang IYH, Rahman N, Geliebter A. Effects of discounting fruits, vegetables, and noncaloric beverages in New York City supermarkets on purchasing, intake, and weight. *Obesity* 2024;32:1290–301. <https://doi.org/10.1002/oby.24058>
27. Stuber JM, Mackenbach JD, de Bruijn GJ, Gillebaart M, Hoenink JC, Middel CNH, et al. Real-world nudging, pricing, and mobile physical activity coaching was insufficient to improve lifestyle behaviours and cardiometabolic health: the Supreme Nudge parallel cluster-randomised controlled supermarket trial. *BMC Med.* 2024;22:52. <https://doi.org/10.1186/s12916-024-03268-4>
28. Monninghoff A, Fuchs K, Wu J, Albert J, Mayer S. The Effect of a Future-Self Avatar Mobile Health Intervention (FutureMe) on Physical Activity and Food Purchases: Randomized Controlled Trial. *J. Med. Internet Res.* 2022;24:e32487. <https://doi.org/10.2196/32487>
29. Steen DL, Helsley RN, Bhatt DL, King EC, Summer SS, Fenchel M, et al. Efficacy of supermarket and web-based interventions for improving dietary quality: a randomized, controlled trial. *Nat. Med.* 2022;28:2530–6. <https://doi.org/10.1038/s41591-022-02077-7>
30. Vogel C, Crozier S., Penn-Newman D, Ball K., Moon G, Lord J, et al. Altering product placement to create a healthier layout in supermarkets: Outcomes on store sales, customer purchasing, and diet in a prospective matched controlled cluster study. *PLoS Med.* 2021;18:e1003729. <https://doi.org/10.1371/journal.pmed.1003729>
31. Vadiveloo M, Guan X, Parker HW, Perraud E, Buchanan A, Atlas S, et al. Effect of Personalized Incentives on Dietary Quality of Groceries Purchased: A Randomized Crossover Trial. *JAMA Netw. Open* 2021 Feb.;4:e2030921. <https://doi.org/10.1001/jamanetworkopen.2020.30921>
32. Piernas C, Aveyard P, Lee C, Tsiountsioura M., Noreik M, Astbury NM, et al. Evaluation of an intervention to provide brief support and personalized feedback on food shopping to reduce saturated fat intake (PC-SHOP): A randomized controlled trial. *PLoS Med.*

- 2020;17:e1003385. <https://doi.org/10.1371/journal.pmed.1003385>
33. Moran AJ, Khandpur N, Polacsek M, Thorndike AN, Franckle RL, Boulos R, et al. Make It Fresh, for Less! A Supermarket Meal Bundling and Electronic Reminder Intervention to Promote Healthy Purchases Among Families With Children. *J. Nutr. Educ. Behav.* 2019;51:400–8. <https://doi.org/10.1016/j.jneb.2019.01.012>
34. Harrington RA, Scarborough P, Hodgkins C, Raats MM, Cowburn G, Dean M, et al. A Pilot Randomized Controlled Trial of a Digital Intervention Aimed at Improving Food Purchasing Behavior: The Front-of-Pack Food Labels Impact on Consumer Choice Study. *JMIR Form. Res.* 2019 Apr.;3:e9910. <https://doi.org/10.2196/formative.9910>
35. Polacsek M, Moran A, Thorndike AN, Boulos R, Franckle RL, Greene JC, et al. A Supermarket Double-Dollar Incentive Program Increases Purchases of Fresh Fruits and Vegetables Among Low-Income Families With Children: The Healthy Double Study. *J. Nutr. Educ. Behav.* 2018;50:217–28. <https://doi.org/10.1016/j.jneb.2017.09.013>
36. Franckle RL, Levy D E, Macias-Navarro L., Rimm EB, Thorndike AN. Traffic-light labels and financial incentives to reduce sugar-sweetened beverage purchases by low-income Latino families: a randomized controlled trial. *Public Health Nutr.* 2018;21:1426–34. <https://doi.org/10.1017/S1368980018000319>
37. Bangia D, Shaffner DW, Palmer-Keenan DM. A Point-of-Purchase Intervention Using Grocery Store Tour Podcasts About Omega-3s Increases Long-Term Purchases of Rich Food Items. *J. Nutr. Educ. Behav.* 2017;49:475–80. <https://doi.org/10.1016/j.jneb.2017.02.008>
38. Ball K, McNaughton SA, Le HN, Abbott G, Stephens LD, Crawford DA. ShopSmart 4 Health: results of a randomized controlled trial of a behavioral intervention promoting fruit and vegetable consumption among socioeconomically disadvantaged women. *Am. J. Clin. Nutr.* 2016 Aug.;104:436–45. <https://doi.org/10.3945/ajcn.116.133173>
39. Gamburzew A, Darcel N, Gazan R, Dubois C, Maillot M, Tomé D, et al. In-store marketing of inexpensive foods with good nutritional quality in disadvantaged neighborhoods: increased awareness, understanding, and purchasing. *Int. J. Behav. Nutr. Phys. Act.* 2016 Sept.;13:104. <https://doi.org/10.1186/s12966-016-0427-1>
40. Rains T, Longley P. The provenance of loyalty card data for urban and retail analytics. *J. Retail. Consum. Serv.* 2021 Nov.;63:102650. <https://doi.org/10.1016/j.jretconser.2021.102650>
41. Mansilla R, Long G, Welham S, Harvey J, Lukinova E, Nica-Avram G, et al. Detecting iodine deficiency risks from dietary transitions using shopping data. *Sci. Rep.* [Internet] 2024;14. Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85181878086&doi=10.1038%2fs41598-023-50180-7&partnerID=40&md5=a168e85ebd8cabef7ca0928750d17c22>. <https://doi.org/10.1038/s41598-023-50180-7>
42. Burgess R, Dolan E, Poon N, Jenneson V, Pontin F, Sivill T, et al. Harnessing digital footprint data for population health: a discussion on collaboration, challenges and opportunities in the UK. *BMJ Health Care Inform.* 2024 Sept.;31:e101119. <https://doi.org/10.1136/bmjhci-2024-101119>
43. Fernandez ID, Johnson BA, Wixom N, Kautz A, Janciuras J, Prevost S, et al. Longitudinal trends in produce purchasing behavior: a descriptive study of transaction level data from loyalty card households. *Nutr. J.* [Internet] 2022;21. Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85141569515&doi=10.1186%2fs12937-022-00814-9&partnerID=40&md5=869de962c1daac2c567477dc0181a3cb>. <https://doi.org/10.1186/s12937-022-00814-9>
44. Vogel C, Dijkstra C, Huitink M, Dhuria P, Poelman MP, Mackenbach JD, et al. Real-life experiments in supermarkets to encourage healthy dietary-related behaviours: opportunities, challenges and lessons learned. *Int. J. Behav. Nutr. Phys. Act.* 2023 June;20:73. <https://doi.org/10.1186/s12966-023-01448-8>
45. Shiells K, Di Cara N, Skatova A, Davis OSP, Haworth CMA, Skinner AL, et al. Participant acceptability of digital footprint data collection strategies: an exemplar approach to participant engagement and involvement in the ALSPAC birth cohort study. *Int. J. Popul. Data Sci.* 5:1728. <https://doi.org/10.23889/ijpds.v5i3.1728>
46. UK Government E. The Food (Promotion and Placement) (England) Regulations 2021 [Internet]. Statute Law Database; 2021 [cited 2025 14]. Available from: <https://www.legislation.gov.uk/uksi/2021/1368>