

REVIEW

Public Health / Behavior

Consumer willingness to pay for healthier food products: A systematic review

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Summary

Food retail strategies to improve the healthiness of food and beverage options may increase purchasing of healthier options and improve diets. Consumer demand for healthier options is an important determinant of the successful implementation and maintenance of healthy food retail interventions. A systematic review of peer-reviewed literature was undertaken to explore whether consumers are willing to pay more for healthier foods and to determine the key factors that influence willingness to pay. Fifteen studies reported the results of 26 experiments providing willingness to pay estimates for healthier food products across a range of food retail environments. Twenty three out of the 26 experiments included in this review (88.5%) found consumers would pay a 5.6% to 91.5% (mean 30.7%) price premium for healthier foods. Studies consistently found a positive willingness to pay for foods with reduced fat and wholegrains with additional fruit and vegetables, while willingness to pay for foods with reduced salt or a combination of low fat and sugar, or salt showed mixed results. Adults over 60 years, females, those living with obesity, and consumers who aim to maintain a healthy lifestyle were more likely to pay a price premium for healthier food, whereas younger consumers, consumers with healthy weight, and consumers with higher levels of education were less likely to pay higher prices. The results of this review contribute to our understanding of consumer preferences for healthier products and provide information to retailers on consumer surplus (benefits) associated with the provision of healthier food alternatives.

KEYWORDS

dietary guidelines, healthy food retail, healthy interventions, willingness to pay

1 | INTRODUCTION

Non communicable diseases (NCDs) are strongly driven by the globalization of unhealthy lifestyles and poorly planned urbanization.¹ In Australia, dietary risks are among the top modifiable risks contributing

Abbreviations: DCE, discrete choice experiment; NCD, non-communicable disease; WTP, willingness to pay.

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to NCDs after tobacco use and harmful use of alcohol.² Policy interventions to improve food environments may improve diets and assist with NCD prevention and control.³⁻⁵ A key factor that determines what we eat is our community food retail environment and in particular supermarket and grocery stores, which are the main source of food in both developed and developing countries.^{6,7} Currently, food retail environments predominantly consist of food products that are energy dense and nutrient poor, relatively cheap and heavily promoted.⁸

There are promising food retail interventions being implemented by governments, community organizations, and food retailers to promote the purchase and consumption of healthier foods using traditional marketing techniques such as the “4Ps” of marketing (product, promotion, placement, and price).⁹⁻¹¹ Over the last 20 years, the evidence of effectiveness of different healthy food retail strategies has become more robust. Reviews indicate that healthy food retail strategies are effective in increasing the purchasing and availability of healthy food and beverages in both small stores^{12,13} and large supermarkets.^{9,14-20} Interventions were more effective when implemented for longer durations²¹ and with multiple components.^{12,16,20}

Food retailers are businesses, and therefore, any voluntary changes to retail environments to increase their healthiness also need to meet the business's own commercial needs.²² In addition to health impacts on the community, business outcomes such as commercial viability, customer perspectives, and retailer perspectives may influence retailer decision-making related to the adoption and maintenance of healthy food strategies.²³ Consumer perspectives are an important determinant of the successful implementation and maintenance of healthy food retail interventions.^{10,21,23-25}

Historically, there have been two general approaches to estimate consumer preferences and willingness to pay (WTP): stated preference and revealed preference approaches. Revealed preference methods determine the value that consumers place on goods and services by observing consumer purchasing in actual markets. On the other hand, stated preference methods such as contingent valuation, conjoint analysis, and discrete choice experiments (DCEs) use hypothetical scenarios to elicit consumer preferences.

There is a vast marketing literature on consumer WTP for various food attributes. Evidence from WTP studies plays a crucial role in pricing and product development decisions by food manufacturers and retailers.²⁶ WTP studies estimate the maximum price that the consumer would consider paying for a product or service with various attributes. For example, if the market price of a conventional (regular) cheddar cheese product is \$10 per kg and a manufacturer would like to introduce a new product such as a reduced fat cheddar cheese into the market, then they may use a WTP study to determine the maximum price consumers are willing to pay for this type of cheese. The amount could be higher or lower than the price of the original product. In addition to pricing decisions, WTP studies may alert retailers of consumer preferences for various attributes of products and may therefore influence stocking and promotional activities.²⁶

The synthesis of studies investigating the WTP for various food attributes has been limited to systematic reviews that investigated consumer WTP for functional attributes, organic foods, and

sustainability features of food production. Dolgoplova and Teuber²⁷ analyzed the current literature on consumer WTP for health benefits of food products. Their meta-analysis focused on food with functional attributes which they defined as foods enriched with additional nutritional substances that go beyond basic nutrition, such as resveratrol, omega-3 fatty acids, vitamin A, fiber, protein, probiotics, antioxidants, lycopene, and iron. The majority of included studies (34/36) focused on consumer WTP for ultra-processed functional foods, while only two studies examined consumer WTP for low-fat cheese and low-fat beef.^{28,29} The results demonstrated that consumers would pay more for food products that are specifically promoted as having health claims. A systematic review by Li et al.³⁰ examined consumer WTP for organic foods in China. They found that health consciousness is an important factor that influences consumer WTP for organic food. Further, a meta-analysis by Li and Kallas³¹ found that overall consumer WTP for more sustainably produced food products was on average 29.5% higher than regular products.

To date, no reviews have systematically examined consumer WTP for health aspects of food and beverages as defined by Australian Dietary Guidelines or any other equivalent national healthy eating guidelines. Greater knowledge of consumer WTP for healthier foods could help to determine consumer demand for healthy food and beverages and provide the evidence retailers need to move towards healthier food retail environments. The primary objective of the current review was to assess consumer WTP for healthier food and beverage options. This will help to determine consumer preferences for healthier food choices. The secondary objective was to identify factors that may influence consumer preference for healthier food and beverages.

2 | METHODS

This systematic review was undertaken in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) protocol. The protocol for this systematic review was registered in PROSPERO (CRD42021271974) on September 4, 2021.

2.1 | Search strategy

The final search was conducted by the first author (MA) in September 2021 using the following databases: Medline Complete via EBSCOhost, Business Source Complete, Health Policy Reference Center, Global Health, CINAHL, EconLit, Web of Science, Embase, and Google Scholar (first 15 pages). Additional searches were conducted through backward searches (cited studies of included articles) and forward searches using SCOPUS (articles citing included studies) to capture any citations missed by electronic searches. The Cochrane library was searched for any relevant systematic reviews, and the reference list of relevant reviews was examined to identify potentially relevant studies. Search hedges and terms were combined using the following concepts: (i) consumer, (ii) healthy food or beverage, and (iii) WTP. Subject headings, keywords, and acronyms were searched and adapted for

each database as appropriate. Details of the search strategy are included in the supporting information (Tables S1 and S2).

2.2 | Inclusion and exclusion criteria

This review included original peer-reviewed papers published in English from 2000 to September 6th, 2021, with full-text available. Studies using quantitative, qualitative, and mixed methods were included. Conference abstracts, dissertations, protocols, book chapters, reviews, commentaries, letters to editors, editorials, opinion pieces, and newspaper articles were excluded. Consumer WTP-derived through surveys, focus groups, auctions, choice experiments, conjoint analysis, and revealed preference or any other method were included in this review.

This review aimed to assess consumer WTP for healthy food and beverages as defined by the Australian Dietary Guidelines³² or any other equivalent national guidelines (such as Canada's Dietary Guidelines for Health Professionals and Policy Makers,³³ Eating and Activity Guidelines for New Zealand Adults,³⁴ or the Eatwell Guide-UK).³⁵ "Healthy" foods and beverages were defined as fruit; vegetables; grains; lean meat and poultry; milk, yoghurt, cheese, and their non-dairy alternatives; and foods and beverages with limited/reduced content of saturated fat, salt, and sugar. The review excluded studies that assessed consumer WTP for organic or specialty diets such as gluten-free foods. Studies that assessed consumer WTP for functional/fortified food, food safety, alcoholic beverages, environmental, or sustainability aspects of food production (food miles, carbon footprint, etc.), food quality and sensory or flavor attributes of food were also excluded. Table 1 summarizes the review inclusion and exclusion criteria.

2.3 | Study selection

Search results from all databases were imported into an Endnote library in which duplicates were identified and removed. Titles and abstracts of the remaining manuscripts were double screened by the first author (MA) and a second reviewer (MB, TN, or IM) using the Covidence software. The full texts of included articles were double screened by the first author (MA) and a second reviewer (TN or IM), and the reasons for exclusion were noted. Disagreements that arose throughout the screening process were resolved by an additional third reviewer (JA).

2.4 | Data extraction

A standardized data extraction template was developed in Microsoft Excel based on the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Good Research Practices for Conjoint Analysis framework.³⁶ All authors agreed upon the data extraction template in advance. The template was piloted on two studies by the first author (MA), discussed with all authors and then revised. The final data extraction template included the following details: study name, author details, year of publication, objectives, country, target population, context or

TABLE 1 Final review eligibility criteria

Criteria	Inclusion	Exclusion
Language	English	All other languages
Publication date	1st January 2000 to 6th September 2021	Prior to 1st January 2000
Publication type	Peer reviewed publications where full text was available	Conference abstracts, dissertations, protocols, book chapters, reviews, commentaries, letters to editors, editorials, opinion pieces, and newspaper articles
Study design	Real-world studies, observational studies, natural experiments, case studies, and laboratory experiments	-
Healthy food definition	Defined by the Australian Dietary Guidelines or any other equivalent national dietary guidelines	Organic food; functional/fortified food; food safety; alcoholic beverages; environmental aspects of food production; food quality, and sensory or flavor attributes of food
Outcome of interest	Willingness to pay (WTP) results presented in monetary value and/or percentage (increase or decrease)	No reporting of outcome of interest in monetary value or percentage

setting, overall study design, conjoint analysis design, food product categories, attributes (product characteristics), attribute levels, method used to inform attribute levels, number of choice sets, sample size, participant recruitment methods, data collection procedure, statistical methods, and results. The following results were extracted or calculated where able: (i) percentage of consumers who are willing to pay higher prices for healthier food and beverages compared to conventional products, (ii) the price premium consumers are willing to pay in monetary value and/or percentage (increase or decrease), and (iii) factors influencing WTP. The incremental WTP price reported in each study was inflated into 2021 value using the World Bank food price inflation rate³⁷ and then translated into US dollars using purchasing power parities.³⁸ Where able, the results were also reported in 2021 US dollars per 100 g of the product. Data extraction was completed by the first author (MA) and checked for accuracy and completeness by a second reviewer (IM or TN). Inconsistencies were resolved by discussion with MB, MM, and JA.

2.5 | Assessment of study quality

Most of the included studies were conjoint analyses including choice experiments. Therefore, we used the ISPOR Good Research Practices for Conjoint Analysis checklist to assess the reporting quality and considered

this a proxy measure of the methodological quality of included choice experiment studies. The ISPOR checklist assesses 10 criteria, and each criterion has three items (total 30 items). Each item was assessed as “meeting the criteria” (the text sufficiently confirmed the criteria) or “not meeting the criteria” (criteria not met/no evidence or not enough evidence to justify the criteria in the text) and given a score of 1 or 0, respectively. For this study, we assumed that each item was equally weighted. However, the ISPOR checklist has no clear scoring system or cut off values to determine study quality. Quality assessment was completed independently by the first author (MA) and an additional reviewer (IM or TN). Disagreements were discussed and resolved by a third reviewer (JA).

2.6 | Data synthesis

For the primary aim, the data were synthesized by food group, that is, (i) fruit and vegetables, (ii) grains, (iii) lean meat, and poultry and their alternatives and by nutrient (i) low in sugar, (ii) low in fat or cholesterol, and (iii) low in salt. In addition, data synthesis explored how WTP varied across products, settings, and consumer groups. Meta-analysis was not conducted due to the varied methods utilized across studies, heterogeneity of the population and food products, and inconsistency in the reporting of outcomes. For the secondary aim, a qualitative synthesis of the data was undertaken using the following themes determined a priori: “favorable” factors (factors increasing consumer WTP), “unfavorable” factors (factors decreasing consumer WTP), or “neutral” factors (factors having no effect on consumer decisions to pay for healthier food and beverages).

3 | RESULTS

Database searching of peer-reviewed papers identified 9,257 relevant papers. After removal of duplicates, the title and abstract of 7,246 unique papers were screened and resulted in 65 full texts being assessed for eligibility. The inter-rater reliability (IRR) of the titles and abstracts screening showed strong agreement between the independent reviewers (IRR score = 96%). Three publications were excluded because the full text was not available. Another 47 articles were excluded after full text screening, resulting in 15 articles being included in this review (Figure 1). The main reasons for exclusion were irrelevant outcomes such as consumer appreciation of the sensory quality of food products, impact of carbon food print on consumer choice, and experiments that assessed WTP of promotional strategies, functional food, sensory and flavor attributes of food, environmental or sustainable impacts of food production, or food quality. No additional articles were identified through backwards and forwards searches.

3.1 | Features of included studies

A summary of included studies is provided in Tables 2 and 3. The 15 included studies reported the results of 26 experiments. All the

included experiments used quantitative approaches to estimate consumer WTP, with the majority using survey methods. Most of the experiments were conducted in Spain ($n = 10$)^{28,39,43,44,46} and the USA ($n = 5$).^{42,47,48,50,51} Another three experiments took place in the UK,^{29,39} two in Peru,⁴¹ while the remainder (one each) were from Australia,⁴⁰ Italy,⁴⁵ South Korea,⁴⁹ France,²⁹ Belgium,²⁹ and Netherlands.²⁹ In 10 experiments, the choice tasks were conducted online,^{29,39,40,42} while one DCE survey was delivered by mail and completed in the participant's home.⁵⁰ The remaining experiments were conducted on-site (face to face) in the premises of the research agency in metropolitan areas of capital cities or towns ($n = 6$),^{28,44} supermarket and grocery stores ($n = 3$),^{45,46,49} corner stores and food vendor settings in low-income areas ($n = 3$),^{41,47} university campus ($n = 1$),⁴⁸ and in the participant's home ($n = 1$).⁴³ One experiment used sales data obtained from grocery and non-grocery stores to estimate consumer WTP.⁵¹ In the vast majority of experiments (92%), the target population was aged 18 years or older and the primary household shopper or food consumer.^{28,29,39-46,48-50} One experiment assessed youth (10–18 years) WTP for whole grain snacks with either fruit or vegetables.⁴⁷

Most of the experiments (25 of 26)^{28,29,39-50} used stated preference methods to elicit consumer WTP for healthier foods, and only one experiment used the revealed preference method of hedonic pricing.⁵¹ Twenty two of the 25 experiments that used stated preference methods were DCEs or conjoint analyses, while the other three used contingent valuation^{41,47} and experimental auctions.⁴³ Only 5 of the 15 studies^{28,29,39,40,44} included in this review reported that their WTP questions were piloted. The sample size of included experiments ranged from 100⁴⁵ to 1,211³⁹ participants. The wide range in the sample size might be related to the mode of administration of the survey and/or the target population of interest. For example, the number of participants in studies that used an online survey^{29,39,40} were higher than studies that used face to face^{28,41,43,44,46-49} or mail-based surveys.⁵⁰ Also, studies that were conducted at a national level^{29,39,40} had a larger sample size than studies that were conducted at the city level or in specific settings such as in supermarket, home, or university campus. The experiment by Nganje et al.⁵¹ did not involve participants directly and instead used sales data (681 observations) to estimate consumer WTP.

3.2 | Quality appraisal

The methodological quality of included studies varied between 23% (the lowest score achieved) and 97% (highest score achieved). Nine out of 15 (60%) studies reported more than 50% of the recommended items on the ISPOR checklists for conjoint analysis. The ISPOR checklist was specifically designed for conjoint analysis studies; studies that used DCE or conjoint analysis approaches had higher scores in comparison to studies that used different methodology. Some of the ISPOR checklist items such as attribute identification and selection may not be applicable to studies that used experimental auction, contingent valuation, and hedonic pricing

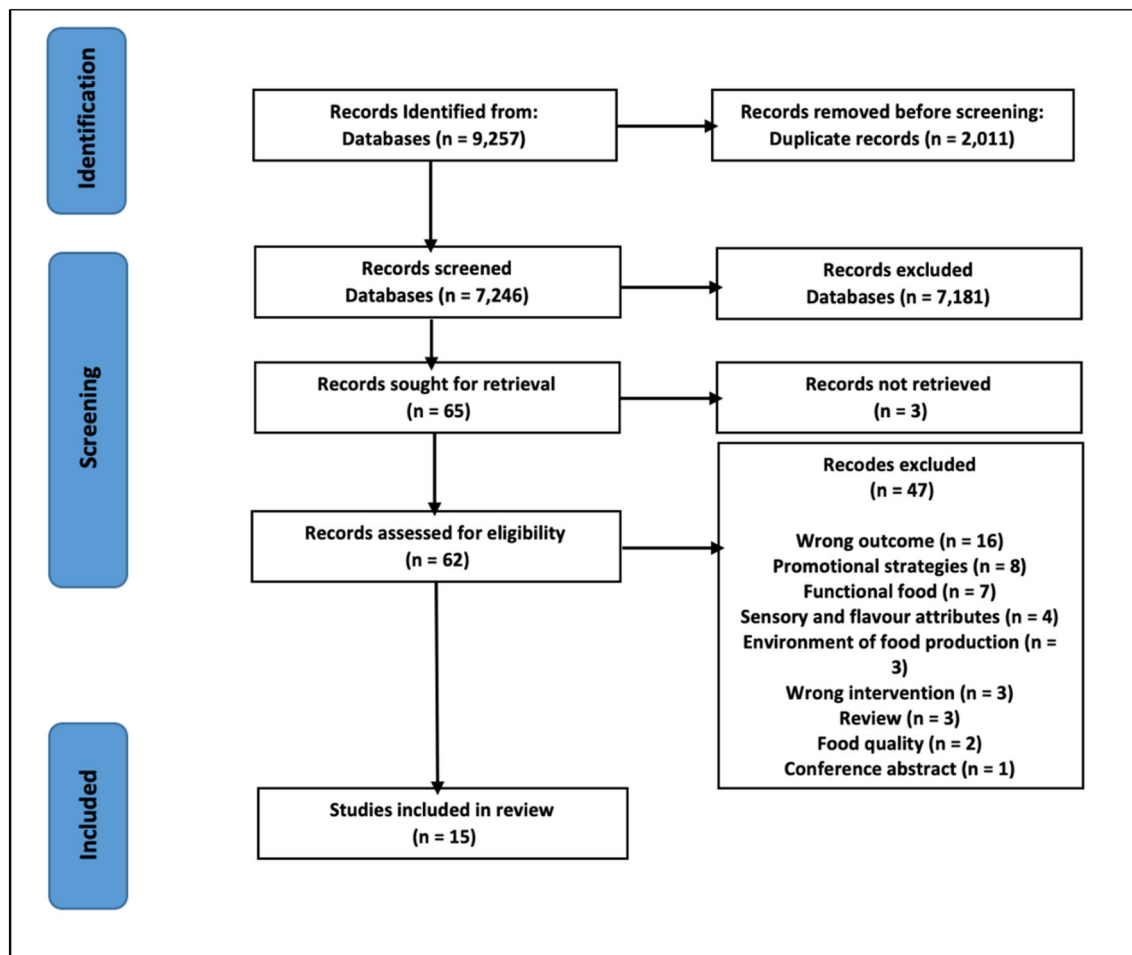


FIGURE 1 Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram of included studies, review of consumer willingness to pay for healthy food, and beverages, 2000–2021

methods (four studies). In the remaining two studies that scored with less than 50% on the ISPOR checklist, the studies were published before the ISOPR checklist, and therefore, the low score might indicate inadequate reporting of the ISPOR items rather than poor quality. The items that scored the lowest and were less frequently reported were item 2.2 (Was attribute selection justified and consistent with theory?); item 4.2 (Were the properties of the experimental design evaluated?); item 5.1 (Was there sufficient motivation and explanation of conjoint tasks?); item 7.3 (Were ethical considerations addressed [e.g., recruitment, information and/or consent, compensation]?); and item 8.2 (Was the quality of the responses examined [e.g., rationality, validity, reliability]?). See Table S3 for quality scores of individual studies.

3.3 | Consumer willingness to pay for healthier food products

Seven experiments reported the percentage of total participants who would pay more for healthier products.^{39,40,45,46} Within these seven experiments, 69.7% to 79% of the participants would pay a price

premium (a higher price) for healthier food. All the included experiments reported the incremental monetary value and/or percentage price (increase or decrease) customers would pay for healthier products. Twenty-three experiments (88.5%)^{29,41–47,49–51} showed that consumers would pay a price premium for healthier products compared to less healthy alternatives (positive WTP), two experiments showed negative WTP results,^{28,48} and in one experiment, the results were inconclusive.⁴⁴ In the 23 (88.5%) experiments that showed positive WTP, consumers were willing to pay a price premium of between 5.6% and 91.5% (mean 30.74%) for healthier products compared to conventional (regular) alternatives.

3.3.1 | Willingness to pay for broad food categories

Only three experiments assessed consumer WTP by food category, with the remainder assessing WTP by nutrient content. Buttorff et al.⁴¹ conducted two experiments to assess food vendor consumers' WTP for a meal with additional fresh salad and a meal with additional fruits in low-income urban areas in Lima, Peru. They found that consumers were willing to pay a mean premium of US\$0.72 per meal (a 74.7% price

TABLE 2 General characteristics of the studies included in this review

Author(s)	Participant characteristics			Setting	
	Country	Food product category	Study setting	Retail setting	
Akaichi et al. ³⁹	UK and Spain	Beef mince	Online	Not applicable	
Bellhouse et al. ⁴⁰	Australia	Pork product	Australia wide online survey	Not applicable	
Buttorff et al. ⁴¹	Peru	Meal with additional fruits or vegetables	Face-to-face	Food vendors in low-income urban area	
Childs and Drake ⁴²	USA	Cheddar and Mozzarella cheeses	Online survey	Not applicable	
De-Magistris and Gracia ⁴³	Spain	Semi-cured, pasteurized sheep milk cheese	Face-to-face	Participants' homes in regional area (Castilla-La-Mancha)	
De-Magistris, and Lopez-Galan ²⁸	Spain	Cheese	Face-to-face	Participants recruited by research agency and the experiment was conducted on the premises of the agency	
De-Magistris, Lopez-alan and Caputo ⁴⁴	Spain	Potato chips	Face-to-face	Participants recruited by research agency and the experiment was conducted on the premises of the agency	
Di Vita et al. ⁴⁵	Italy	Bread	Face-to-face	Large retail store (supermarkets) in Sicily	
Jurado and Gracia ⁴⁶	Spain	Breakfast cereal	Face-to-face	Mock/real-brick supermarket in medium-sized town	
Leak et al. ⁴⁷	USA	Whole grain snack in combination with either fruits or vegetables	Face-to-face	Corner stores in low-income communities in New York	
Lee et al. ⁴⁸	USA	Breakfast cereal	Face-to-face	University campus	
Lee et al. ⁴⁹	South Korea	Canned ham	Face-to-face survey	Supermarkets	
Lusk and Parker ⁵⁰	USA	Ground beef	Delivered through mail survey	Home	
Nganje et al. ⁵¹	USA	Breads	Not applicable	Grocery and non-grocery stores	
Van Wezemael et al. ²⁹	France, Belgium, Netherland, UK	Beef consumers (i.e., people consuming beef at least once a month)	Online questionnaires	Not applicable	

TABLE 2 (Continued)

Author(s)	Design	Sample size (n participants)	Statistical analysis approach	Source of funding
Akaichi et al. ³⁹	Stated preference method - discrete choice experiment survey	UK:1211; Spain:1206	Conditional logit model	The Scottish Government as part of the 2016–2021 Research Program on Food Security
Bellhouse et al. ⁴⁰	Stated preference method - discrete choice experiment	861	Pearson's chi-Squared test	The Pork Cooperative Research Centre (Australian Government)
Buttorff et al. ⁴¹	Stated preference method - discrete choice experiment	432	Conditional and rank-ordered logit models	The International Development Research Centre (Canada)
Childs and Drake ⁴²	Stated preference method - conjoint analysis survey	203 (Cheddar cheese), 198 (Mozzarella cheese);	General linear model	Dairy Management, Inc. (American Dairy Association)
De-Magistris and Gracia. ⁴³	Stated preference method - experimental auction	129	Not available	European Commission
De-Magistris, and Lopez-Galan ²⁸	Stated preference method - discrete choice experiment	219	Random parameters logit model	European Commission
De-Magistris, Lopez-alan and Caputo ⁴⁴	Stated preference method - discrete choice experiment	309	Random parameters logit model	National Institute of Agricultural and Food Research and Technology (Spain) and European Commission
Di Vita et al. ⁴⁵	Stated preference method - contingent valuation method through a face-to-face questionnaire	100	Logistic model	Funded by the Project PO FESR 2007–2013 (supported by Sicily local government, Italian Government and European Union)
Jurado and Gracia ⁴⁶	Stated preference method - discrete Choice Experiment	121	Latent class logit model	Gobierno de Aragón (Government of Aragón)
Leak et al. ⁴⁷	Stated preference method - contingent valuation (a one-and-one-half-bound dichotomous choice approach)	402	Multiple linear regression	The United States Department of Agriculture (USDA)
Lee et al. ⁴⁸	Stated preference method - conjoint analysis	367	Ordinary least squares regression	The Illinois Soybean Association
Lee et al. ⁴⁹	Stated preference method - discrete choice experiment	300	Random parameters logit model	The National Research Foundation of Korea Grant funded by the Korean Government
Lusk and Parker ⁵⁰	Stated preference method - discrete choice experiment	220	Multinomial Logit Model Estimates	Source of funding was not reported
Nganje et al. ⁵¹	Revealed preference method- data obtained from grocery and non-grocery stores in regional market in Minnesota and North Dakota	N/A (used sales data)- number of observations 681 (include both conventional and low- carb bread)	Maximum Likelihood Estimation	Source of funding was not reported
Van Wezemael et al. ²⁹	Stated preference method - discrete choice experiment	2,400 (600 in each country)	Multinomial logit and error component models	The European Union

premium) for the addition of a large salad (vegetables), and US\$0.07 per meal for the addition of fruit (2 bananas), representing a 7.3% price premium. The third experiment by Leak et al.⁴⁷ assessed youth (10–18 years) WTP for whole grain snacks with the addition of either fruits or vegetables in corner stores in low-income areas in New York city (USA). The results suggested that youth on average would pay US\$2.56 (23%) more for the whole grain snack with either fruits or vegetables compared to the whole grain snack alone.

3.3.2 | Willingness to pay for healthier nutrient content of specific food products

Sixteen experiments^{28,29,40,42–44,46,48,50} assessed consumer WTP for various products such as beef, pork, cheese, potato chips, and breakfast cereals with reduced fat content. All of these experiments showed positive results where consumers were willing to pay a higher price (premium) for lower fat products. Price premiums varied by population and by the percentage reduction in fat content; for example, Akaichi et al.³⁹ assessed consumer WTP for reduced fat in beef mince in the UK and Spain in 2020. The study reported that participants would pay a premium of US\$3.06 (26%) for low fat and US\$2.48 (21%) for moderate fat beef mince in Spain, whereas in the UK, participants would pay a mean US\$5.23 (41%) more for low fat and US\$3.41 (27%) more for moderate fat beef mince.

Four experiments assessed consumer WTP for foods with reduced salt or sodium content. One of these experiments suggested that consumers would pay a 33% lower price for cheese with lower salt content compared to regular products.²⁸ Two experiments found that consumers would pay a 20% price premium for healthier bread (with reduced salt)⁴⁵ and between 7.8% to 8.9% for canned ham⁴⁹ with reduced salt content. In one experiment, the results were not conclusive; people with obesity had positive WTP for healthier chips with lower salt and would pay a 34% price premium, while people with healthy weight had negative WTP and would pay 12.5% less for the healthier choice.⁴⁴

Three experiments assessed consumer WTP for products with healthier content of multiple nutrients (e.g., low fat and low salt, and low fat and low sugar). De-Magistris et al.^{28,44} conducted two experiments to assess consumer WTP for cheese and potato chips with reduced fat and salt content in Spain. They found that consumers on average would pay US\$ 0.24/100 g (16%) more for cheese and between US\$0.11 and US\$0.53/100 g (8.5% to 40.5%) more for potato chips with both lower fat and salt content. A third experiment conducted by Lee et al.⁴⁸ found that university employees and students in USA had a mean 28% to 41% lower WTP for healthy breakfast cereals (high in fiber, low fat and sugar and multigrain ingredients) in comparison to regular cereal.

3.4 | Factors influencing consumer willingness to pay for healthier food products

Twelve out of the 15 included studies^{28,29,39–46,48,49} reported at least one factor that influenced consumer WTP for healthier food. These

factors can be classified into two groups: consumer-related factors (gender, age, income, health status, etc.) and product-related factors (sensory attributes, flavor and texture, price, and labeling). Based on their impact on consumer WTP for healthy food, we categorized them into “favorable” factors (factors increasing consumer WTP for healthier products), “unfavorable” factors (factors decreasing consumer WTP for healthier products), or “neutral” factors (factors having no effect on consumer WTP for healthier products). Table 4 provides an overview of these factors and their empirical support across studies.

The results suggest that consumer-related factors such as age, gender, and BMI status impact WTP estimates. People over 60 years, females, those living with obesity, and consumers who participate in regular physical activity were more willing to pay a premium for healthier food. On the other hand, younger consumers with healthy weight and higher levels of income and education were not willing to pay higher prices for healthier food. Household size and body image dissatisfaction of people with obesity were found to have neutral impacts on consumer WTP for healthier products. Also, the results suggested that some product-related factors such as higher price and change in food flavor, and texture may act as barriers to purchasing of healthier food. Information provided through health and nutritional labeling was found to have a favorable impact on consumer WTP.

4 | DISCUSSION

4.1 | Consumer willingness to pay for healthier food products

This is the first systematic review to assess consumer WTP for healthier food according to national dietary guidelines. It reviewed the evidence from 15 articles (26 experiments) and provides a systematic synthesis of the evidence of consumer WTP for healthier products. It advances the existing literature on how consumers value healthier products and contributes to our understanding of consumer preferences for healthier food. Given that customer satisfaction is important to supermarket and grocery store retailers, the findings of this review may be instructive for decision-making related to implementation and maintenance of interventions to improve the healthiness of the food retail environment.

The overall WTP analysis shows that in most of the experiments (88.5%), consumers showed a preference for healthier food in comparison to conventional food, demonstrated by WTP a price premium ranging from 5.6% to 91% (mean 30.74%) for healthier products. These results were consistent with the results of a meta-analysis by Dolgoplova and Teuber,²⁷ who found that 91.4% of included studies showed a positive WTP (range from 50% to 400% price premium) for health benefits associated with food products, and a meta-analysis by Li and Kallas³¹ found that overall consumer WTP for sustainable food products was on average 29.5% higher compared to regular products.

TABLE 3 Results of primary outcome of included experiments

Author(s)	Standard food product	Healthier comparison food product	Mean incremental WTP value reported in original article	Mean incremental WTP in USD/100 g (2021 USD values)	Mean percentage change in price consumers willing to pay
Broad food categories (n = 3)					
Buttorff et al. ⁴¹	Regular main meal	Regular meal plus additional large salad	1.12 Nuevo Soles per meal	\$0.72 ^a	74.7%
		Regular meal plus additional fruit (2 bananas)	0.11 Nuevo Soles per meal	\$0.07 ^a	7.3%
Leak et al. ⁴⁷	Regular whole grain snack	A whole grain snack with either fruit or vegetables and condiments	US\$ 2.38 per snack	\$2.56 ^b	23%
Healthier nutrient content of specific food products (reduced fat claims) (n = 16)					
Akaichi et al. ³⁹	Regular beef mince (2 experiments in UK and Spain)	Low fat beef mince (3 g/100 g serving) (UK)	€ 3.41 per 100 g	\$5.23	41%
		Moderate fat beef mince (12 g/100 g serving) (UK)	€ 2.23 per 100 g	\$3.41	27%
		Low fat beef mince (3 g/100 g serving) (Spain)	€ 1.94 per 100 g	\$3.06	26%
		Moderate fat beef mince (12 g/100 g serving) (Spain)	€ 1.57 per 100 g	\$2.48	21%
Bellhouse et al. ⁴⁰	Regular pork	Lower cholesterol pork (15% less than regular cholesterol pork)	A\$ 1.5/330 g	\$0.42	21.6%
Childs and Drake ⁴²	Regular full fat Cheddar and Mozzarella cheeses	Lower fat Cheddar and Mozzarella cheeses (75% fat reduction or 3 g of fat or less per reference amount)	Range from US\$ 0.25 to 0.5/25 g	Range from 1.24 to 2.48	NA
De-Magistris and Gracia ⁴³	Regular full fat cheese	Light cheese (40% reduced fat content)	€ 0.060/100 g	\$0.1	7%
De-Magistris, and Lopez-Galan ²⁸	Regular full fat cheese	Cheese with reduced fat content (30% less fat)	€ 0.538/100 g	0.89	47.8%
De-Magistris et al. ⁴⁴	Regular potato chips	Potato chips with reduced fat claims (30% less fat compared to regular chips)	People with healthy weight: €0.45/150 g People with obesity: €0.53/150 g	People with normal weight: \$0.49 People with obesity: \$ 0.59	People with normal weight: 38.5% People with obesity: 45%
Jurado and Gracia ⁴⁶	Regular breakfast cereal	Reduced saturated fat cereal (amount of fat reduction is not specified)	€ 1.83 per box (500 g)	\$0.6	91.5%
Lusk and Parker ⁵⁰	Regular ground beef	Ground beef with total fat reduced from 20% to 10% when saturated fat is 30% and 50%, respectively	30% saturated fat: US\$ 2.06/ pound 50% saturated fat: US\$ 0.58/ pound	30% reduced fat claims: \$ 0.57 50% reduced fat claims: \$ 0.16	30% reduced fat claims: 25% 50% reduced fat claims: 12%

(Continues)

TABLE 3 (Continued)

Author(s)	Standard food product	Healthier comparison food product	Mean incremental WTP value reported in original article	Mean incremental WTP in USD/100 g (2021 USD values)	Mean percentage change in price consumers willing to pay
Nganje et al. ⁵¹	Regular bread	Reduced fat bread. (36% fat reduction compared to conventional bread)	0.023 cents per g (\$0.14 per loaf)	\$3.0	5.6%
Van Wezemael et al. ²⁹	Regular beef steak (4 experiments in Netherlands, Belgium, France, and UK)	A beef steak with 10% less fat in four European countries (Netherlands)	€5.78/kg	\$0.97	48%
		A beef steak with 10% less fat in four European countries (Belgium)	€5.60/kg	\$0.96	47%
		A beef steak with 10% less fat in four European countries (France)	€6.73/kg	\$1.10	56%
		A beef steak with 10% less fat in four European countries (UK)	€ 1.20/kg	\$ 0.2	10%
Healthier nutrient content of specific food products (low salt claims) (n = 4)					
De-Magistris, and Lopez-Galan ²⁸	Regular cheese	Cheese with low salt content (0.03 g of salt per 150 g)	-€0.38/100 g	-\$0.63	-33%
De-Magistris et al. ⁴⁴	Regular potato chips	Potato chips with low salt content (0.03 g of salt per 150 g)	People with healthy weight: -€0.15/150 g People with obesity: €0.40/15 g	People with healthy weight: -\$0.16 People with obesity: \$0.47	People with healthy weight: -12.5% People with obesity: 34%
Di Vita et al. ⁴⁵	Regular bread	Breads with low sodium content (no more than 120 mg of sodium/100 g)	€ 0.47/100 g	\$0.76	20%
Lee et al. ⁴⁹	Regular canned ham	Reduced salt canned ham (amount of salt reduction is not specified)	274 KRW to 313 KRW per reduced salt can (340 g)	Range from \$0.12 to \$0.14	7.8 to 8.9%
Healthier nutrient content of specific food products (multiple claims) (n = 3)					
De-Magistris, and Lopez-Galan ²⁸	Regular cheese	Cheese with reduced fat contents (30% less fat compared to traditional cheese) and low salt contents (30 mg of salt per 150 g)	€0.15/100 g	\$0.24	16%
De-Magistris et al. ⁴⁴	Regular potato chips	Potato chips with reduced fat claims (30% less fat compared to traditional chips) and low salt contents (30 mg of salt per 150 g)	People with healthy weight: €0.48/150 g People with obesity: €0.10/15 g	People with healthy weight: \$0.53 People with obesity: \$0.11	People with healthy weight: 40.5% People with obesity: 8.5%

TABLE 3 (Continued)

Author(s)	Standard food product	Healthier comparison food product	Mean incremental WTP value reported in original article	Mean incremental WTP in USD/100 g (2021 USD values)	Mean percentage change in price consumers willing to pay
Lee et al. ⁴⁸	Regular breakfast cereal	Healthy breakfast cereal (high fiber, low fat, low sugar, low calorie) (amount not specified)	Participants favorably rated costs of US\$1.49 and \$2.49 per 14 oz (396.89 g)/ (cost of regular cereal range between US\$2.09 and US\$3.19)	-\$0.50 to -\$0.84	-28% to -41%

Abbreviation: KRW, Korean Won.

^aPer meal.

^bPer snack.

The incremental WTP estimates may be affected by the type of food products, type of elicitation method, setting, and population of study. All experiments that assessed consumer WTP for food with reduced fat showed positive results. This was consistent with the meta-analysis by Dolgoplova and Teuber,²⁷ who found that products with a health claim to lower cholesterol levels had a statistically significant positive impact on consumer WTP. Also, our results showed that consumers are willing to pay a premium for snacks with fruits and vegetables. This result was consistent with an analysis that was conducted by Fang and Levy,⁵² who found that Chinese and French consumers would pay more for organic fruits. Only two of the four experiments that assessed consumer WTP for food with reduced salt or sodium showed positive results. The reasons behind this could be due to consumers' underestimation of the health risks associated with sodium consumption,⁵³ attitudes towards impact of salt reduction on the taste of food,⁵⁴ and the lack of awareness of dietary sources of salt and the daily recommendations for salt intake.⁵⁵ However, when the food product had both reduced salt and fat, our results suggests that consumers would pay a price premium.^{28,44,56} One experiment showed that consumers would pay a lower price for food with both low fat and low sugar.⁴⁸ This result was not consistent with the study conducted by Cadena et al.,⁵⁷ who found that lower fat and sugar ingredients in ice cream did not reduce consumers acceptance of the ice cream. However, there is a paucity of research related to WTP for products with lower sugar content. No experiment assessed consumer WTP for healthier beverage and food with lower sugar levels exclusively. These results suggest that there is strong evidence that consumers are willing to pay a higher price for healthier products and in particular for foods with lower fat content. Future studies need to focus more on consumer WTP for healthier beverage and food with reduced sugar and salt.

Our results also suggest that hypothetical elicitation methods such as DCE, conjoint analysis, and contingent valuation may overestimate the consumer WTP value compared to non-hypothetical methods (auctions). For example, De-Magistris et al.^{28,44} conducted two experiments to assess consumer WTP for cheese with reduced fat content. In the first experiment, they used an experimental auction to assess consumer WTP for light cheese (40% reduced-fat content) and found that the mean percentage change in price consumers would pay was approximately 7%.^{28,44} In the second experiment, they used a DCE (30% reduced-fat content) and found that consumers would pay a mean 47.8% price premium.^{28,44} These results were consistent with the results of the meta-analyses by Dolgoplova and Teuber.²⁷ and Li and Kallas,³¹ who found that hypothetical elicitation methods lead to higher WTP compared to non-hypothetical methods.

Our results suggest that there may be differences in WTP by country. On average, consumers in Europe are willing to pay a mean price premium of 34.8% (range from 7% to 91.5%) for healthier products,^{29,42,45,47,48,50,51} which is higher than values elicited in USA (mean: 16.4%; [range from 5.6% to 25%]).^{42,47,48,50,51} Two experiments conducted in South America (Peru)⁴¹ found WTP ranged from 7.3% to 74.7%. Only one study conducted in Asia (South Korea)⁴⁹ and Australia⁴⁰ where the mean percentage change in price

TABLE 4 Overview of factors influencing consumer willingness to pay for healthier food products

Factor domain	Favorable factors	Unfavorable factors	Neutral factors
Consumer-related	<ul style="list-style-type: none"> • People over 60 years^{39,40,43,45} • Female^{39,40,43,48} • People with overweight or obesity^{44,45} • Physically active people⁴⁵ • People more concerned with their health such as people aiming to control weight and reduce the risk of getting heart diseases^{48,49} 	<ul style="list-style-type: none"> • Healthy weight²⁸ • Younger consumer^{28,46} • High income²⁸ • High level of education^{28,46} 	<ul style="list-style-type: none"> • Household size⁴¹ • Body image dissatisfaction of people with obesity⁴⁴
Product-related	<ul style="list-style-type: none"> • Nutrition and health labeling²⁹ 	<ul style="list-style-type: none"> • Higher price compared to conventional products⁴⁸ • Change in food flavor and texture⁴² 	-

consumers were willing to pay for healthier products was 8.4% and 21.6%, respectively. However, these differences could reflect the varied products tested in these countries, limiting cross country comparisons.

4.2 | Factors influencing consumers' willingness to pay for healthier food products

The results of this review suggest that many factors drive consumer WTP for healthier food. Consumer-related factors included demographics and consumer attitudes regarding their own health. Product-related factors including price, food labeling and flavor, and sensory attributes of the food were reported to have the greatest influence on consumer decisions to purchase healthier foods.

Demographic factors such as age, gender, level of education, and income were the most reported demographic factors that may influence consumer WTP. These results are consistent with a previous review by Katt and Meixner,⁵⁸ who found that age, gender, income, and education were the main drivers that influence consumer WTP for organic food. Our results indicate that people over 60 years and female consumers were more likely to pay higher prices for healthier products, whereas males and younger populations were less likely to pay a premium for healthier food. A potential explanation is that younger consumers are generally healthier and do not have health problems that are impacted by their diet. People over 60 years and women have been shown to be more likely to make food choices based on health considerations.⁵⁹ This review found that a high level of education and income had an unfavorable impact on consumer WTP.^{28,46} This is contrary to previous evidence that suggests that food shoppers with higher levels of education and income are more likely to purchase food that is lower in risk nutrients such as sugar, salt, and fat.⁶⁰ However, it is difficult to make definitive and generalizable conclusions based on the results of two studies.

This review found that consumers who are more concerned with their health^{48,49} and/or who regularly engage in physical activity⁴⁵ would pay a higher price for healthier food. These results are

consistent with the results of the study conducted by Nguyen and Truong,⁶¹ who found that psychological factors and, in particular, health concerns had significant favorable impacts on consumer WTP for organic food. A study by Ali and Ali⁶² found that health consciousness and awareness about health attributes of food were key factors that influenced consumer WTP for healthier food products.

Sensory attributes, flavor and texture, price and food labeling were the most reported product-related factors that influenced consumer WTP for healthier food. We found that increase in price of healthier food products compared to regular alternatives,⁴⁸ and perceived change in flavor and texture⁴² may reduce consumer WTP for healthier products. These results were consistent with the results of a study conducted by Krystallis et al.,⁶³ who found that consumers had lower satisfaction with the sensory characteristics of reduced fat food. Also, our results suggest that increased consumer knowledge through health and nutritional food labelling had a favorable impact on consumer WTP for healthier products.²⁹ These results were consistent with other studies that found food labeling had a favorable impact on consumer WTP.^{27,64,65}

4.3 | Strengths and limitations of the review and included studies

This review has several strengths. Only peer-reviewed studies were included to improve the quality of the results. All study designs that can provide WTP valuations were included to ensure all relevant studies were included in the synthesis. The reporting of results in USD 2021 values per 100 g and calculation of the price premium percentage allowed better comparisons across studies and easier transferability of results. In addition to the assessment of consumer WTP, this review explored factors that may impact on consumers' decisions to purchase healthier products. This may help public health specialists and policy makers to develop and design more effective and targeted health promotion interventions.

However, our review has some limitations. Only studies published in English were included in this review. Also, gray literature and non-

peer-reviewed studies were not included and therefore some studies that have not been published or are published in other languages may have been missed. It is possible that publication bias impacted these results; however, it is not clear whether publication bias would favor studies reporting increased WTP for healthy or less healthy foods. It is possible that publication bias may have resulted in studies demonstrating lower consumer WTP for healthier foods being less likely to be published. It is likely that studies reporting non-significant findings may not have been published which would attenuate the findings of this study.

The majority of studies included in this review used elements of best practice reporting as identified by ISPOR. However, the included studies had several limitations. The quality of included studies varied considerably. Forty percent of included studies had a quality rating of less than 50%, 27% had a quality rating between 50% and 74%, and 33% had a quality rating of 75% or above. Since most studies used stated preference methods, the consumer WTP value could potentially be overestimated because stated preference methods present hypothetical purchasing scenarios rather than real purchasing decisions.⁶⁶ Using an integrated approach that combines both stated preference methods and revealed preference or auctions may improve the accuracy and reduce bias of the results.⁶⁷ However, using integrated methods would entail substantially higher cost and time. Meta-analysis was not possible due to incomparable methods, heterogeneity of population and food products, and inconsistency in the reporting of outcomes. The results of this review have identified the research gaps in assessing consumers' WTP for healthier food products. Reporting guidelines that cover a range of WTP studies are required to increase comparability of results. This will allow for more consistency in methodology and reporting of the outcomes, and improved generalizability of the results. Most studies were conducted in high-income countries in Europe, USA, Australia, and South Korea. Only one study that included two experiments was conducted in low-income neighborhoods in Peru (an upper-middle income country).⁴¹ Future studies that assess consumer WTP for healthy food in low-income countries are required to fill this evidence gap. Also, the target group in most studies was primary household shoppers (most commonly women) and persons aged 18 years or over. Therefore, more studies are required to assess consumer WTP for other populations such as youth and other non-primary household shoppers.

5 | CONCLUSION

Consumer perspectives are important to retailers and customers' perception of healthier food retail environments are an important determinant of the successful implementation and maintenance of retail interventions. This review focuses on assessing consumer WTP for healthier products as per Australian Dietary Guidelines. It is clear from the results of this review that, on average, consumers value healthier food products more than conventional alternatives and are willing to pay a premium for healthier options, demonstrating consumer

preference and therefore potential demand for healthier products. This could provide food retailers with the evidence required to move towards healthier food retail environments. Future studies need to focus more on assessing consumer WTP for healthier beverages and low sugar food products. Also, further studies are required to focus more on younger populations including youth and school students' preferences for healthier products within retail environments and consumers' WTP for healthier products in middle- and low-income countries.

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CONFLICT OF INTEREST

The authors declare that they have no competing interest.

AUTHOR CONTRIBUTIONS

Moosa Alsubhi conceived the study, designed, and conducted the bibliographic search; undertook paper screening, quality assessment, data extraction, and synthesis; interpreted the results; and drafted and edited the paper. Ishani Majmudar and Tan Nguyen undertook paper screening, quality assessment, and data extraction and helped edit the paper. Miranda Blake, Marj Moodie, and Jaithri Ananthapavan contributed to the design of the study, provided methodological input, and assisted in paper screening, quality assessment, and editing the paper. All authors read and approved final version of the paper.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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