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# Effects of marketing claims on toddler food products on parents' product preferences, perceptions and purchasing intentions: an online experiment

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## Abstract

**Background** The retail market for toddler-specific packaged foods is growing. Many of these products are ultra-processed and high in nutrients of concern for health, yet marketed in ways that may make them appear wholesome. This study aims to assess parents' responses to claims on unhealthy, ultra-processed toddler food products and test whether removing such claims promotes more accurate product perceptions and healthier product preferences.

**Methods** Parents of toddlers aged 12 to <36 months ( $N=838$ ) were recruited for an online experiment testing four on-pack claim conditions: control (no claim); 'contains "good" ingredient'; 'free from "bad" ingredient'; and unregulated 'child-related' claim. Participants were randomly assigned to one condition, then viewed images of toddler food products that varied in nutrition content and the claims displayed. Participants completed tasks assessing product preferences (unhealthy product displaying claim vs. a healthier option with no claim, across four food categories (banana bars, strawberry snacks, blueberry yogurt snacks and veggie snacks)), purchase intentions and product perceptions. Poisson regression (count variable) and linear regression (continuous outcomes) analyses were employed to test for mean differences by marketing claim conditions.

**Results** For the overall sample, brief exposure to 'free from "bad" ingredient' claims increased participant's intentions to purchase unhealthy food products for their toddlers, but there was no clear evidence that 'contains "good" ingredient' claims and 'child-related' claims significantly impacted parent's preferences, purchase intentions and perceptions of toddler foods. However, certain claims influenced particular parent subgroups. Notably, parents with three or more children chose more unhealthy products when these products displayed 'contains "good" ingredient' or 'free from "bad" ingredient' claims; the latter claims also promoted stronger purchase intentions and enhanced product perceptions among this subgroup.

**Conclusions** Findings indicate that 'free from "bad" ingredient' claims on unhealthy toddler foods are of most concern, as they boost the appeal of these products to parents. 'Contains "good" ingredient' claims and 'child-related' claims showed limited effects in this study. Considering available evidence, we recommend claims should not be permitted on child-oriented foods, as they may promote inaccurate product perceptions and unhealthy product choices by parents, that can detract from their children's diets and health.

**Keywords** Toddler foods, Marketing claims, Parents, Online experiment, Policy, Food marketing

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## Introduction

Young children (<3 years) need good nutrition for optimal growth and development, to establish healthy habits and reduce the risk of chronic disease later in life [1, 2]. It is recommended that from 12 months of age, toddlers (aged 12–36 months) should eat family foods, consistent with the Australian Dietary Guidelines (ADGs) [3]. Unhealthy foods of low nutritional value and high saturated fat, sugar and or salt should be restricted for toddlers. Parents play a critical role in shaping their children's eating habits and food choices as the primary provider and influencers of their children's diet [4, 5]. However, broader socio-ecological factors such as availability and affordability of healthy foods, the marketing and promotion of unhealthy foods, and cultural and social norms around food and eating habits can impact parents' ability to provide nutritious foods for their children [6].

There has been steady market growth for readymade infant and toddler foods in Australia over recent decades [7–9], including a notable increase in the availability of toddler-specific foods [10]. Concerningly many of these products are ultra-processed foods (UPFs) and contain high amounts of fat, salt and/or sugar [7, 11, 12]. As per the NOVA food classification system, UPFs have little similarity to traditional food items as they are comprised of formulations of ingredients, mostly of exclusive industrial use. UPFs often contain additives, preservatives, and other chemicals and are typically high in unhealthy nutrients such as sugar, fat, and salt [13]. In the last decade, new toddler-specific products launched in Australia have contained more sugar, fat and saturated fat, but lower sodium, than in earlier years [10]. While some clear standards exist in relation to infant foods (e.g., limiting sodium), Australia's food regulatory system allows infant and toddler-specific food products that are UPFs and particularly high in added sugars to be produced and sold [11, 14]. The food industry's increasing reliance on ultra-processed ingredients has raised concerns about the nutritional quality and health impacts of processed foods, particularly those marketed for infants and toddlers.

Many parents rely on ready-made foods for their infants and toddlers [15]. A parent poll, conducted in Melbourne, Victoria, found that almost one in two infants and toddlers consume ready-made foods at least 2–3 times weekly, with less educated and sole parents reporting more frequent consumption [15]. Two out of five parents agreed these foods must be healthy, or the government wouldn't allow them to be sold; parents with less education were more inclined to agree that ready-made foods are healthier than food made at home [15]. These findings are particularly concerning from an equity perspective, as they indicate that more disadvantaged

parents are especially reliant on ready-made foods, and more likely to perceive them as healthier than homemade foods.

In addition to concerns surrounding the composition of infant and toddler foods, the claims commonly displayed on these products also warrant scrutiny. Food Standards Australia New Zealand's (FSANZ's) Food Standard Code (FSC) sets out strict criteria for claims that suggest that a food or property of food, has, or may have, a health effect. For example, for a product to carry a claim that calcium enhances bone mineral density, it must contain no less than 200 mg of calcium per serving. Other nutrition content claims, that simply state the presence or absence of a property in a food (e.g., 'contains whole grains' or 'free from artificial flavours') are expressly permitted by the FSC but there are no criteria that the products need to meet – claims like these are only permitted to state that the product contains that particular property or not, and, if present, how much it contains [16]. Consequently, products may display claims about the presence or absence of certain nutrients or ingredients, irrespective of the healthfulness of their overall nutritional profile.

More general claims also commonly appear on toddler food products, which are not regulated under the FSC. These unregulated claims are varied but often focus on the source or nature of ingredients (e.g., all natural or organic), or the child consumer (e.g., perfect for little hands) [7]. Between 1996 and 2020, the number of claims per package increased for toddler foods, coupled with an increase in unregulated claims [7]. Claims appearing on these products often imply they are superior to whole foods and essential to children's healthy growth and development, despite many having a poor nutritional profile. For example, Simmonds et al.'s cross-sectional audit conducted in August 2019 found the majority (85%) of fruit and vegetable-based infant foods displaying statements suggesting low sugar content were sweetened with fruit puree (free sugars) [17], resulting in high total sugar [18].

Consumers are known to be influenced by marketing on food packaging at the point-of-sale and during consumption [19]. The concern about claims highlighting isolated positive attributes of otherwise unhealthy products is that they produce a cognitive bias, known as the 'health halo effect', whereby consumers generalise from this positive attribute to their overall appraisal of a product's healthiness, regardless of the total nutritional profile [20, 21]. A direct choice experiment found that nutrition content claims were especially influential, followed by unregulated claims, in increasing parent's perceptions of the healthiness of UP toddler foods and milks, providing a 'health halo' for these products, leading the authors to call for further controls to regulate the use of such claims

to facilitate informed consumer choice [10]. Previous experiments with school-aged children and their parents found nutrient content claims on child-oriented food products can tip preferences towards unhealthy food options displaying these claims [22, 23].

Concerns about the nutritional suitability and marketing of infant and toddler foods are not unique to Australia, with the World Health Organization (WHO) Europe proposing a Nutrient and promotion profile model (NPPM) to address this issue [18]. The NPPM sets requirements relating to the composition of infant and toddler food products as well as to promotional messages and packaging, including that no compositional, nutritional, health or marketing claims be permitted on these products. A 2022 audit applying WHO's NPPM model to infant and toddler foods sold in major Australian supermarket chains found a minority (28%) met all compositional requirements, with toddler foods least likely to be compliant (18%). Notably, every product was found to carry multiple claims that would not be permitted under WHO Europe's NPPM [24].

In addition to considering different types of claims (e.g., health, nutrient, or marketing claims), psychological theory and advertising research draws attention to specific motivational appeals that are commonly used within such claims. Claims highlighting the presence of positive product attributes (e.g., 'high in "good" ingredient') appeal to benefit-seeking motivation, whereas claims highlighting the absence of negative product attributes (e.g., 'free from "bad" ingredient') appeal to risk-avoidance motivation [21]. Research testing responses to nutrition content claims in food and drink marketing in women's magazines found that both benefit-seeking and risk-avoidance appeals enhance the perceived healthiness of marketed products (even though the product may be generally unhealthy), and women report preferring risk avoidance appeals [21]. Multi-disciplinary theory and research from other food product domains demonstrates that consumers' responses to health claims results from an interplay between characteristics of the claims displayed (ingredients, wording, positioning, visual aids, scientific communication) and the consumer (socio-demographic, knowledge, familiarity, attitudes) [25]. There is every reason to expect that similar factors may be at play in determining parents' responses to claims on toddler foods.

Research is needed to improve our understanding of how common types of claims and motivational appeals that appear on unhealthy toddler foods influence parents' and carers' perceptions of the healthfulness of these products, and ultimately their decisions on what to purchase and feed their young children. To our knowledge, no published research has yet examined how various claim types and motivational appeals appearing on

unhealthy toddler snack foods influence parent's preferences, purchasing intentions and perceptions of product healthiness.

The present study aims to assess parents' responses to the following archetypal, claims that appear on unhealthy, toddler snack foods: *contains 'good' ingredient* (ingredient-related claim emphasising benefit-seeking motivational appeal); *free from 'bad' ingredient* (ingredient-related claim emphasising risk-avoidance motivational appeal); *has 'good' child-related feature* (child-related claim emphasising benefit seeking motivational appeal), and whether removing such claims promotes more accurate product perceptions and healthier product preferences. It is hypothesised that displaying these types of claims on unhealthy toddler snack foods will enhance parent's perceptions of the healthiness and appropriateness of these products for toddlers, as well as their preferences and purchase intentions for these products compared to when no claim is displayed. We also explore whether some claims are more influential than others (especially risk-avoidance claims [21, 26]), and whether certain demographic sub-groups of parents are more susceptible to influence by the respective claims.

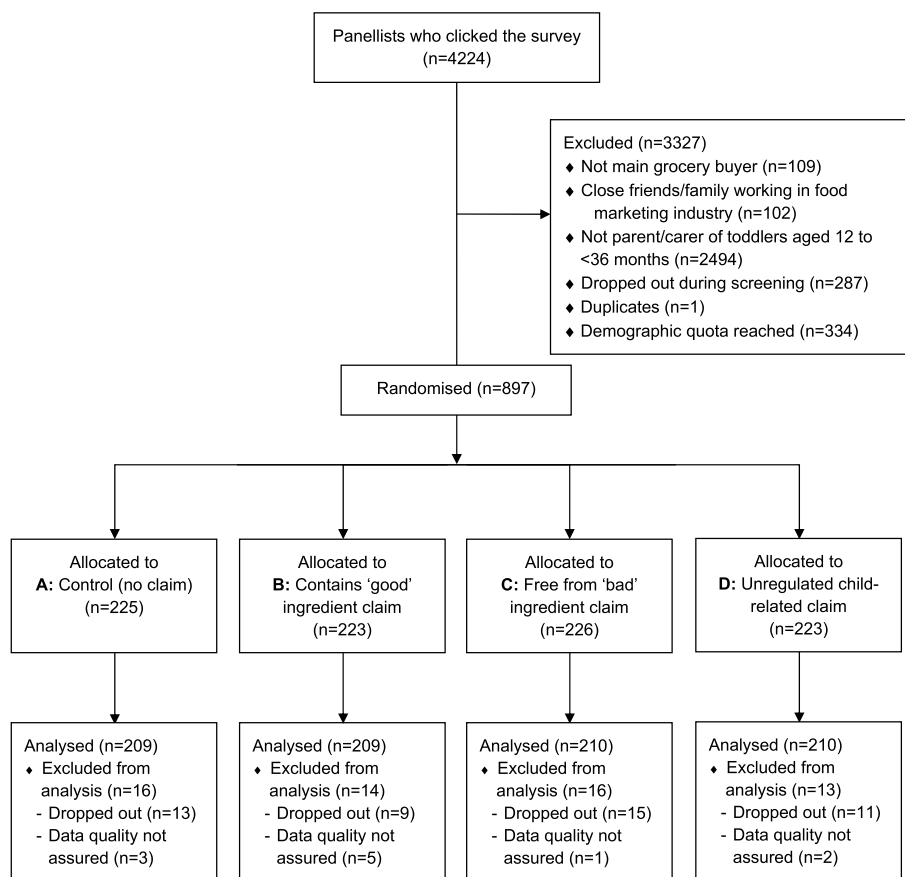
## Method

### Design and procedure

Using a between-subjects online experimental design, parents/carers of toddler/s (aged 12 to <36 months) who are responsible for most food purchases for their toddler/s were randomly assigned to one of four claim conditions: A, Control (no claim, simulating ban); B, Contains 'good' ingredient claim (e.g., made with wholegrain); C, Free from 'bad' ingredient claim (e.g., no additives); and D, Unregulated child-related claim (e.g., perfect for little hands) (Fig. 1). Participants viewed images of toddler food products that displayed claims reflecting their assigned condition, then completed the response measures. Upon completion, participants were debriefed on the study aims and provided with weblinks to summary information about the ADGs for Children.

### Participants

Participants were recruited through a non-probability online panel managed by Ipsos Social Research Institute, with members sent an email invitation with a link to an explanatory statement, consent form, and survey. The online consent form described the study as being about parent's product choices for their toddler (the experimental manipulation was not revealed until the end of the survey). Screening questions at the beginning of the survey assessed eligibility (e.g., parent of toddler (12 to <36 months)). Parents with more than one qualifying child responded in relation to their youngest toddler.



**Fig. 1** Participant flow diagram

**Stimuli**

Full-colour digital images of eight mock toddler snack food products were created by a graphic designer. The eight product images consisted of two products (an unhealthy and a healthier option) from each of the four product categories listed in Fig. 2. The product images were created to mimic common Australian toddler snack foods, with packaging features altered to avoid known products or brand preferences. Within each product pair, the flavour (e.g., banana) was held constant to minimise potential confounding. Participants could click on each product image to view its nutrition information panel (NIP) and ingredients list. The *unhealthy products*' NIPs indicated they were high in added sugars ( $\geq 20\text{g}/100\text{g}$ ) and sodium ( $\geq 360\text{mg}/100\text{g}$ ) and were UP (as per the NOVA system, i.e., containing 5 or more ingredients, including substances extracted from foods and derived from further processing, and may contain food additive classes such as colours, flavours, non-sugar sweeteners, and processing aids [27]). The *healthier products*' NIPs indicated they were lower in these nutrients of concern (added sugars  $< 20\text{g}/100\text{g}$ ; sodium  $< 120\text{mg}/100\text{g}$ ) and

were not UP. The experimental manipulation was operationalised by displaying claims reflecting each condition on the front of the package of the unhealthy product in each pair. Here, we tested nutrition content claims as well as claims that are not regulated under the FSC. The unregulated claims tested relate to the child rather than any property in the food (e.g., perfect for little hands). Figure 2 shows the product pairs and the respective front-of pack marketing claims tested in each condition. For each product pair, participants viewed the image of the unhealthy product with a claim reflecting their assigned condition (A, B, C or D) alongside the healthier option with no claim.

**Outcome measures**

**Product preferences**

To measure parents' product preferences, participants were presented with the four product pairs in random order and asked to choose which snack they would be most likely to purchase for their toddler. Each pair consisted of an unhealthy and a healthier option, with claims reflecting the respective conditions displayed on the unhealthy

Product pair	Healthier option (without claim)	Unhealthy option (displaying claim for each condition)*			
	n/a	A: Control (Simulates ban on claims)	B: Contains 'good' ingredient	C: Free from 'bad' ingredient	D: Unregulated child-related claim
<b>Banana bars</b>		 <i>(No claim)</i>	 <i>Made with whole grains</i>	 <i>Nothing artificial</i>	 <i>Right texture to encourage chewing</i>
<b>Strawberry Snacks</b>		 <i>(No claim)</i>	 <i>Only sweetened with real fruit</i>	 <i>Preservative free</i>	 <i>Encourages self feeding</i>
<b>Blueberry yogurt snacks</b>		 <i>(No claim)</i>	 <i>Made with the goodness of milk</i>	 <i>Free from additives</i>	 <i>Developed with child nutritionists</i>
<b>Veggie snacks</b>		 <i>(No claim)</i>	 <i>Contain real vegetables</i>	 <i>No nasties</i>	 <i>Perfect for little hands</i>

Note: For each product pair, participants were shown one image of the healthier option (with no claim) alongside one image of the unhealthy option (displaying the claim reflecting their assigned condition).

**Fig. 2** Images of mock toddler snack food product pairs, where the healthier option displayed no claim and the unhealthy option displayed a claim representing participant's assigned condition

option (Fig. 2). The order of presentation of the two products on screen for each pair (e.g., left vs. right) was also randomised. A count variable (possible range: 0–4) was created to indicate the number of times an unhealthy option was chosen across the four product pairs.

**Product purchase intentions**

Participants were shown the unhealthy option from each product pair on its own and asked how likely they would be to buy that product for their toddler if it were available where they normally shop. Responses were recorded on a

7-point scale ranging from ‘very unlikely’ to ‘very likely’. A mean score was computed by averaging the four product ratings.

### Product perceptions

Participants’ perceptions of each unhealthy product option, including their health and nutritional value, were assessed. To gauge general perceptions, participants were asked to rate their level of agreement (ranging from 1 = ‘strongly disagree’ to 7 = ‘strongly agree’) that the food product is ‘good for toddlers’ health, growth, and development; ‘suitable as part of a healthy diet for toddlers;’ and ‘an everyday food for toddlers.’ Participants also rated how healthy they considered each unhealthy option on a 7-point scale ranging from ‘not healthy at all’ to ‘very healthy.’ A mean agreement score was created by averaging the four product ratings.

### Demographics

Participants were asked their gender, age, highest level of educational attainment, parental status (sole/co-parent), language, residential postal code, and number of children in the household. Additionally, the frequency with which their toddler eats ready-made toddler foods in a typical week was recorded. Area-based socio-economic status (SES) was estimated according to the Australian Bureau of Statistics’ Index of Relative Socio-Economic Disadvantage using participant’s residential postal code.

### Statistical analysis

Data were analysed using Stata/MP V.16.1 (Stata Corp) [28]. Descriptive statistics, including chi-square tests were used to test differences in proportions of participants’ demographic characteristics across marketing claim conditions. Poisson regression (count variable: number of times choosing unhealthy products) and linear regression (continuous outcomes: product purchase intention, overall product perceptions and perceived healthiness of the product) analyses tested for mean differences by marketing claim condition, with the no claim (control) condition specified as the reference category.

Exploratory analyses tested for interactions between marketing claim condition and participant’s socio-demographic characteristics listed in Table 1 (potential moderators) on each outcome measure. To examine interaction effects, each regression model was rerun with indicators for condition, potential moderator (socio-demographic characteristics), and interaction terms between condition and levels of the moderator. Since detecting interactions often requires a larger sample size compared to detecting a main effect, interactions are particularly difficult to detect and prone to Type II error; therefore, an interaction effect was considered statistically significant

if the  $p$ -value for the interaction term was  $< 0.20$  [29, 30]. Several recent studies have also used a similar approach, employing a  $p$ -value threshold of  $< 0.20$  for testing interactions [31–33]. Where a significant interaction was found overall, separate analyses were conducted for each level of the moderator variable and  $p < 0.05$  was accepted.

## Results

### Sample characteristics

A total of 838 parent/carers of toddlers participated (Fig. 1). The sample’s socio-demographic profile is summarised in Table 1, with characteristics balanced across claim conditions. Most participants were female (72%), and 42% were aged 30–39 years. Nearly half of the participants (49%) had completed tertiary education, 30% reported that their toddlers consumed readymade foods 2–3 days per week, and the majority (70%) were co-parents. Around one in five spoke a language other than English (18%) or had three or more children (21%).

### Purchase preference

For the overall sample, participants’ preferences for purchasing unhealthy products were not affected by claim conditions compared to control (no claim) (Fig. 3 and Supplemental Table 1). However, for this outcome, there were interactions between claim condition and parental status ( $\chi^2(3) = 5.12, p = 0.1633$ ), language ( $\chi^2(3) = 5.96, p = 0.1133$ ), and number of children ( $\chi^2(6) = 9.8, p = 0.1332$ ) respectively. Despite the weak strength of interaction effects, co-parents (M: 1.77 vs. 1.54,  $\beta = 0.14$ , 95%CI -0.00, 0.28,  $p = 0.053$ ), only English speakers (M: 1.75 vs. 1.57,  $\beta = 0.11$ , 95%CI -0.02, 0.23,  $p = 0.099$ ) and those with three or more children (M: 2.02 vs. 1.41,  $\beta = 0.36$ , 95%CI 0.14, 0.58,  $p = 0.001$ ) who were exposed to ‘free from “bad” ingredient’ claims chose unhealthy toddler products on more occasions compared to control (Fig. 3). Whereas parents who speak a language other than English (M: 1.52 vs. 1.97,  $\beta = -0.26$ , 95%CI -0.47, -0.05,  $p = 0.015$ ) who were exposed to unregulated ‘child-related’ claims chose unhealthy toddler products on fewer occasions compared to such parents in the control condition (Fig. 3d and Supplemental Table 2). Additionally, parents with three or more children (M: 1.76 vs. 1.41,  $\beta = 0.22$ , 95%CI -0.03, 0.47,  $p = 0.081$ ) exposed to ‘contains “good” ingredient’ claims chose unhealthy toddler products a moderately higher number of times compared to those in the control condition (Fig. 3c and Supplemental Table 2).

### Purchase intentions

Compared to the control group, only those who were exposed to ‘free from “bad” ingredient’ claims had significantly higher purchase intentions for unhealthy products (M: 4.36 vs. 4.64;  $\beta = 0.28$ , 95%CI 0.04, 0.53;  $p = 0.025$ )

**Table 1** Socio-demographic characteristics of the sample

Characteristic	Total (N = 838)	Control (no claim) (n = 209)	Contains 'good' ingredient (n = 209)	Free from 'bad' ingredient (n = 210)	Unregulated child-related claim (n = 210)
<b>Gender<sup>a</sup></b>					
Male	232 (27.7)	49 (23.4)	68 (32.5)	54 (25.7)	61 (29.1)
Female	602 (71.8)	160 (76.6)	139 (66.5)	154 (73.3)	149 (71.0)
Other	4 (0.50)	0 (0)	2 (0.96)	2 (0.95)	0 (0)
<b>Age</b>					
18–29 years	225 (26.9)	59 (28.2)	58 (27.8)	50 (23.8)	58 (27.6)
30–39 years	350 (41.8)	84 (40.2)	88 (42.1)	89 (42.4)	89 (42.4)
40+ years	263 (31.4)	66 (31.6)	63 (30.1)	71 (33.8)	63 (30.0)
<b>Highest level of education</b>					
Did not complete tertiary	427 (51.0)	107 (51.2)	108 (51.7)	105 (50.0)	107 (51.0)
Tertiary or higher	411 (49.1)	102 (48.8)	101 (48.3)	105 (50.0)	103 (49.1)
<b>SEIFA<sup>b</sup></b>					
Low (Q1 & 2)	285 (34.0)	68 (32.5)	78 (37.3)	79 (37.6)	60 (28.6)
Medium (Q3 & 4)	399 (47.6)	101 (48.3)	93 (44.5)	92 (43.8)	113 (53.8)
High (Q5)	154 (18.4)	40 (19.1)	38 (18.2)	39 (18.6)	37 (17.6)
<b>Frequency that toddler eats ready-made toddler foods</b>					
≤ 1 day/week	203 (24.2)	58 (27.8)	45 (21.5)	45 (21.4)	55 (26.2)
2–3 days/week	250 (29.8)	59 (28.2)	65 (31.1)	69 (32.9)	57 (27.1)
4–6 days/week	185 (22.1)	44 (21.0)	49 (23.4)	48 (22.9)	44 (21.0)
Every day of the week	200 (23.9)	48 (23.0)	50 (23.9)	48 (22.9)	54 (25.7)
<b>Language other than English</b>					
Yes	152 (18.1)	36 (17.2)	35 (16.8)	39 (18.6)	42 (20.0)
No	686 (81.9)	173 (82.8)	174 (83.3)	171 (81.4)	168 (80.0)
<b>Number of children</b>					
One	315 (37.6)	81 (38.8)	88 (42.1)	68 (32.4)	78 (37.1)
Two	344 (41.0)	84 (40.2)	80 (38.3)	90 (42.9)	90 (42.9)
Three or more	179 (21.4)	44 (21.1)	41 (19.6)	42 (20.0)	42 (20.0)
<b>Sole (single) parent</b>					
Yes	250 (29.8)	64 (30.6)	55 (26.3)	64 (30.5)	67 (31.9)
No	588 (70.2)	145 (69.4)	154 (73.7)	146 (69.5)	143 (68.1)

Numbers in parentheses are percentages. Percentages may not sum to 100% due to rounding. Exploratory analyses were performed comparing male vs. female by excluding the 'other' category to observe gender specific effects, and there were no changes in the pattern of results

<sup>a</sup> For multivariable analyses, participants who reported their gender as 'male' or 'other' were grouped together to retain sufficient statistical power

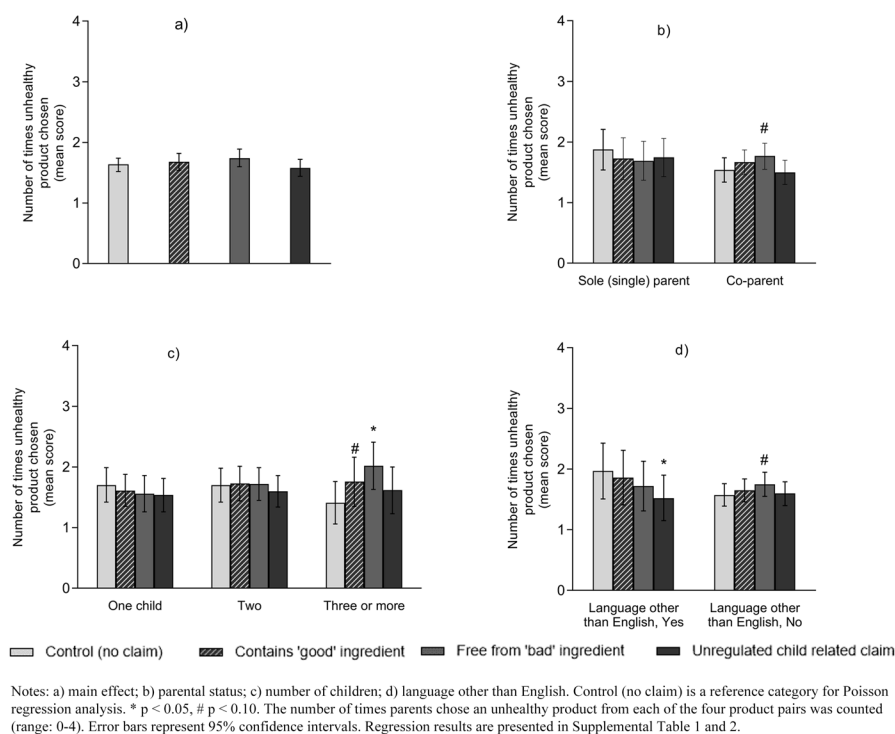
<sup>b</sup> SEIFA, socio-economic index for areas, which was determined according to the Australian Bureau of Statistics Index of Relative Socio-Economic Disadvantage ranking for Australia using participant's residential postcode. This index ranks areas on a continuum of disadvantage (from most disadvantaged to least disadvantaged) taking into consideration characteristics that may enhance or reduce socio-economic conditions of the area

(Fig. 4a and Supplemental Table 1). Two factors modified the effect of claim conditions on product purchase intentions: parental status and number of children in the household (Fig. 4b, c and Supplemental Table 2). Co-parents (M: 4.64 vs. 4.28,  $\beta=0.36$ , 95%CI 0.07, 0.65,  $p=0.015$ ) and those with three or more children (M: 4.96 vs. 4.22,  $\beta=0.74$ , 95%CI 0.16, 1.31,  $p=0.012$ ) had higher intentions to purchase unhealthy products when exposed to the free from "bad" ingredient claims compared to those in the control group (Fig. 4 b, c and Supplemental

Table 2). Additionally, sole parents (M: 5.00 vs. 4.54,  $\beta=0.45$ , 95%CI -0.00, 0.91,  $p=0.051$ ) exposed to unregulated 'child-related' claims had moderately higher intentions to purchase the unhealthy products for their toddler compared to control (no claim) (Fig. 4b and Supplemental Table 2).

#### **Product perceptions: suitability for toddlers**

For overall perceptions of the suitability of the products for toddlers, compared to control (no claim), there were



**Fig. 3** Mean score of participants' unhealthy product choices from each of the four product pairs ( $N=838$ )

no significant differences in perceptions of unhealthy products by claim condition. However, a significant interaction effect was observed between claim condition and participant's gender ( $\chi^2(3) = 2.33, p = 0.0726$ ) and number of children ( $\chi^2(6) = 1.61, p = 0.1399$ ) respectively. Specifically, male/other participants and those who had three or more children, who were exposed to 'free from "bad" ingredient' claims had higher agreement (non-significant difference) that the products were appropriate for toddlers (Fig. 5 and Supplemental Table 2).

**Perceived healthiness rating**

Participants' mean rating of the perceived healthiness of toddler products did not vary by claim condition (Fig. 6). In addition, there were no subgroup differences by claim conditions except for participants who only speak English. When this subgroup was exposed to 'free from "bad" ingredient' claims, they showed higher agreement that the products were healthy compared to control ( $M: 4.37$  vs.  $4.14, \beta = 0.23, 95\%CI -0.04, 0.49, p = 0.098$ ) (Fig. 6 and Supplemental 2).

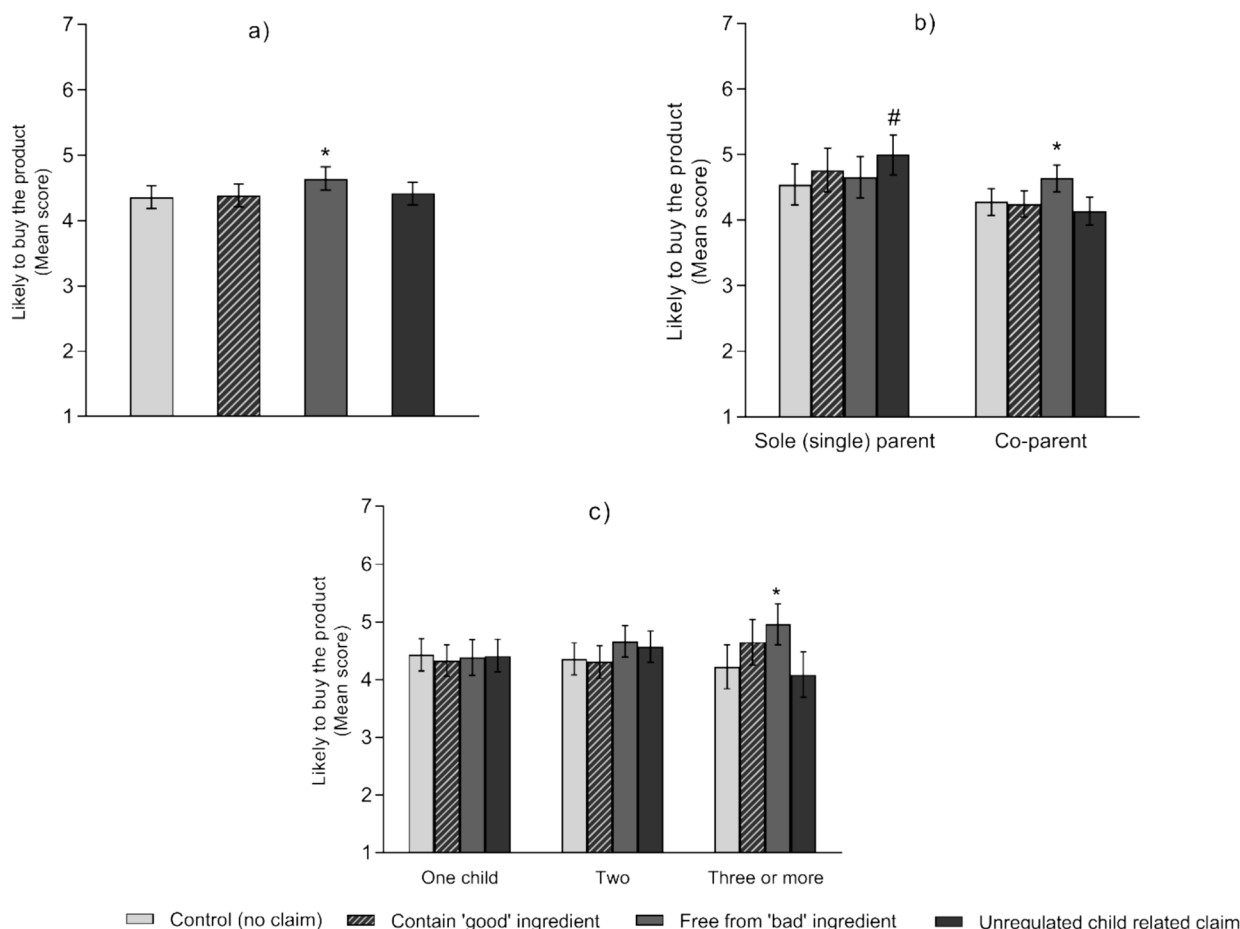
**Discussion**

This online experiment tested whether displaying common claims on unhealthy toddler snack foods influenced parents' preferences, perceptions, and purchasing intentions for such products. As hypothesised, 'free from "bad"

ingredient' claims tipped parent's purchasing intentions towards unhealthy products displaying these claims, with more pronounced effects for certain parent subgroups. These claims also led some demographic subgroups of parents to rate unhealthy products displaying these claims as healthier, perceive them to be more appropriate for toddlers, and to show a greater preference for these products over healthier options, compared to when no claim was displayed. While there was no evidence for the overall sample that 'contains "good" ingredient' claims and 'child-related' claims enhanced parents' preferences and purchase intentions for unhealthy toddler snack foods, these two claim types did influence these outcomes for some subgroups of parents. However, there was no evidence these types of claims influenced parent's views on the healthiness or appropriateness of these products for toddlers. Together, findings indicate that certain claims exert influence on parents' inclination to buy unhealthy snack foods to feed their young children. As the claims tested here are prevalent on unhealthy infant and toddler food products sold in retail settings [14], the potential reach and impact of such claims on what parents select to purchase to feed their young children is likely to have detrimental effects for young children's nutrition and diet-related health.

Claims that a product is 'free from a "bad" ingredient' (e.g., 'no additives', or 'preservative free') appear to be





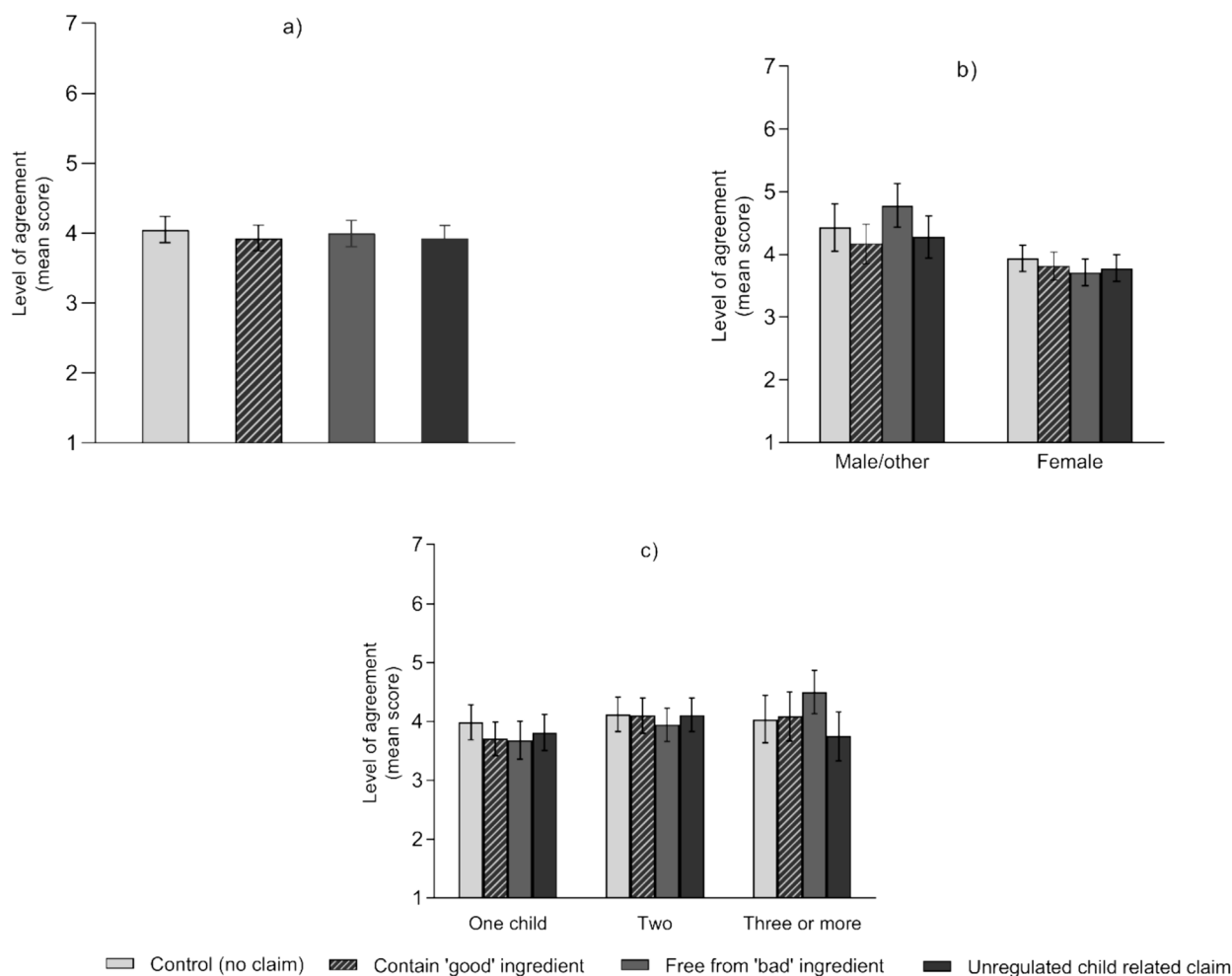
a) All sample (main effect; b) parental status; c) number of children. Control (no claim) is a reference category for linear regression analyses. \*  $p < 0.05$ , #  $p < 0.10$ . Error bars represent 95% confidence interval. See Supplemental Table 1 and 2 for regression results.

**Fig. 4** Mean score of participants' purchase intentions for unhealthy toddler food products by claim conditions ( $N=838$ )

most influential, due to their power to promote increased purchasing intentions, and nudge some parent subgroups towards perceiving these products as healthier, more appropriate for toddlers, and leading them to choose these products for their children over healthier alternatives. These findings echo those of McCann et al.'s discrete choice experiment, whereby claims that a toddler snack product is 'free from a "bad" nutrient' (regulated claim) or 'free from a "bad" ingredient' (unregulated claim) both boosted parents' perceptions of product healthiness, effectively putting a 'healthy halo' on otherwise unhealthy products [10]. It seems that claims stating that an otherwise unhealthy product is free of one negative attribute mislead consumers to assign a more favourable overall evaluation to a product, even though it is high in nutrients of concern such as sugar, salt and saturated fat. As these influential 'free from "bad" nutrients/

ingredients' claims are the most common types of claims appearing on infant and toddler foods in Australian supermarkets [11, 14, 34], their consumer reach and impact is likely to be widespread.

On-pack claims stating that a toddler snack food 'contains a "good" ingredient' (e.g., 'contains real vegetables') did not influence all parents' product preferences, purchase intentions or perceptions of unhealthy toddler foods. However, these claims did influence the sub-group of parents with three or more children to show a greater preference for unhealthy toddler snack foods displaying these claims. Thus, our findings are partially consistent with previous studies conducted with parents of young children in different populations and for different products. For example, several studies with United States (US) parents found that similar, nutrition-related claims (e.g., 100% all natural) led parents to believe sugary drinks



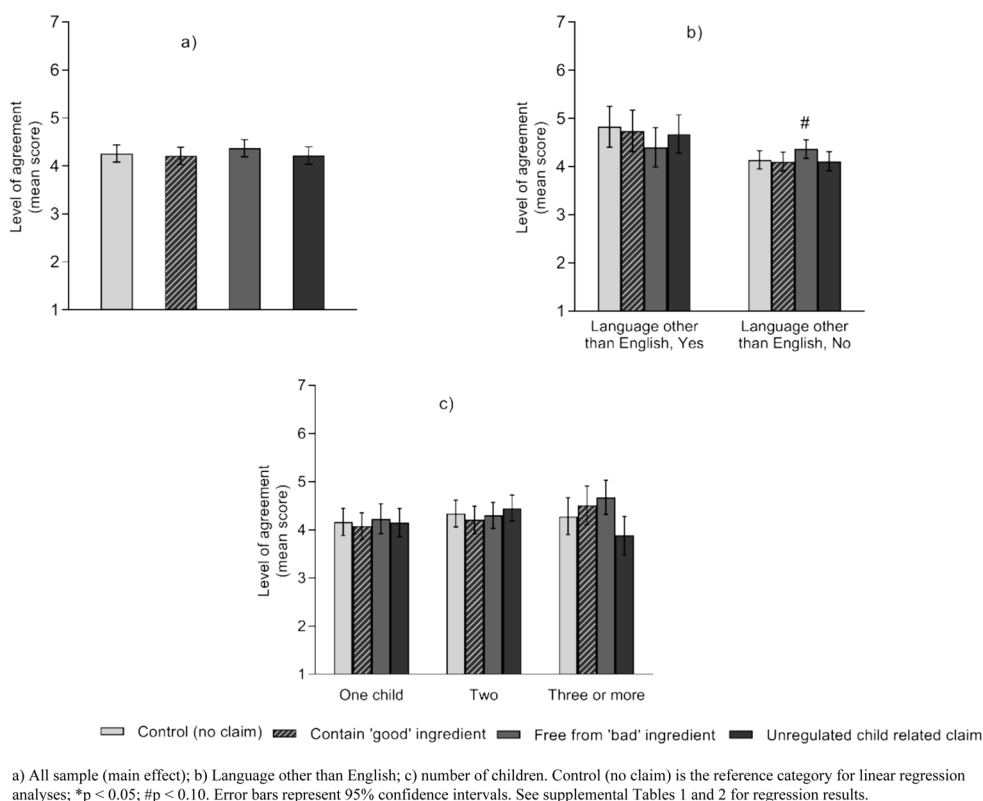
Mean score of participant's level of agreement with statements about whether the unhealthy toddler food products were good for toddlers' health, growth, and development, suitable as part of a healthy diet for toddlers, and could be an everyday food for toddlers. a) All sample (main effect); b) Gender; c) number of children. Control (no claim) is the reference category for linear regression analyses. \* $p < 0.05$ ; # $p < 0.10$ . Errors bars represent 95% confidence intervals. See Supplemental Tables 1 and 2 for regression results.

**Fig. 5** Mean score of participants' perception of unhealthy toddler food products by claim conditions ( $N=838$ )

and cereals were healthier and encouraged preference for such products over healthier alternatives [35, 36]. Similarly, on-pack claims such as 'high in fibre' and 'contains whole grains' influenced Chilean adults to perceive unhealthy cereals more favourably and increased intentions to purchase and recommend these products [20]. The lack of effect of 'contains "good" ingredient' claims on parents' purchase intentions and perceptions of toddler snack foods in our study is not clear. It could be that most parents disregarded these claims as mere marketing, or that some aspect of our study methodology was not sensitive to detect effects of these claims (see limitations). Nonetheless, our overarching finding that claims that a product is 'free from a "bad" ingredient' were more influential than claims that a product 'contains a "good"

ingredient' aligns with evidence from other studies which have found that claims with *risk-avoidance* appeals are more appealing and persuasive than *benefit-seeking* claims in influencing consumer's product perceptions [21, 26].

Our study also tested parent's responses to unregulated 'child-related' or developmental claims (e.g., 'right texture to encourage chewing', 'encourages self-feeding', 'perfect for little hands'). In general, results indicated that such claims did not significantly affect parents' product choice, purchasing intentions or perceptions, with the exception that sole parents who viewed unhealthy products displaying these claims showed higher purchase intentions for these products. Despite the common practice of displaying 'child-related' claims on toddler foods



**Fig. 6** Mean score of participants' agreement on overall healthiness of the unhealthy products by claim conditions (N=838)

in Australia and elsewhere [37, 38], few published studies appear to have assessed effects of such claims on consumers [10, 39, 40]. Further studies are needed to expand our understanding of how 'child-related' claims impact parent's perceptions, preferences, and intentions to purchase these foods for their children.

A study with US parents' found that neither the demographic characteristics of the parent, or their child, moderated the impact of nutrition-related claims on drink selection, suggesting these claims were equally impactful with all parents [22]. However, our moderation analyses revealed that some demographic subgroups of Australian parents were more susceptible to influence by the claims tested than others. 'Free from "bad" ingredient' claims were particularly influential with co-parents and parents with three or more children, prompting them to choose a higher number of unhealthy toddler snack foods and show stronger intentions to buy these products for their toddlers. 'Free from "bad" ingredient' claims also enhanced perceptions of the appropriateness of these products for toddlers among parents with three or more children and male/non-binary parents. Additionally, parents with three or more children were influenced by 'contains "good" ingredient' claims to choose

unhealthy products more often. The finding that parents with larger families were more vulnerable to influence by both types of ingredient-related claims is especially concerning as parents with larger families are responsible for shopping for and feeding a greater number of children. The busy schedules of parents caring for multiple children may also lead them to rely more on ready-made toddler foods for convenience rather than preparing home-cooked meals [15, 41]. Interestingly, sole parents, who may also be especially time-poor, showed stronger intentions to buy unhealthy toddler snack foods when they displayed 'child-related' claims, suggesting these claims appealed to this parent subgroup. Unexpectedly, parents with a language other than English chose fewer unhealthy products when exposed to 'child-related' claims, suggesting these claims backfired as a promotional strategy with this subgroup. Further research testing additional beliefs and behaviours surrounding household food purchasing and preparation could help unravel our observed moderating effects of demographic characteristics on responses to certain types of claims. Overall, it seems that some types of claims are an effective promotional tactic with some parent target audiences and not others.

### Strengths & limitations

Conducting a controlled experiment and testing the appearance of claims on professionally designed, mock products should have helped minimise bias and confounding factors, since participants held no prior knowledge or brand attitudes towards the products tested. Our sample comprised parents/carers of toddlers who varied in demographic characteristics, enabling us to assess whether certain sub-groups of parents are more influenced by claims than others. We also assessed a wider range of responses to the claims than some previous studies, that have assessed a single outcome, such as perceived healthfulness.

Limitations should be also noted. Firstly, brief exposure to claims in an online environment may have been insufficient to yield strong evidence of the impact of claims across all parents on all the response measures. Future research employing designs with stronger ecological validity (e.g., assessing parents' purchasing behaviour in response to claims appearing on real toddler food products) would expand our understanding of how these claims operate. Secondly, this study assessed single claims on toddler foods and this may not have as strong an impact as when multiple claims are displayed on a single product, as is common in Australia, with some infant and toddler foods found to display up to 26 claims [11]. Future research could overcome these limitations by testing the impact of multiple claims and repeated exposure to claims on parent's product perceptions, preferences and purchase intentions. Third, social desirability bias may have led participants to select healthier product options than they would have otherwise, but this potential influence is likely to have been consistent across all randomised subgroups.

The use of  $p < 0.20$  for interaction analysis may increase the risk of Type I errors, potentially leading to false positives, so these results should be interpreted with caution. Conversely, employing a low alpha level ( $p < 0.05$ ) for the interaction term can result in false negatives, particularly in studies involving complex human behaviours and interactions. Increasing the alpha level or error rate to 20% to detect potential interactions can enhance test power. Therefore, it is crucial to use a higher Type I error rate when assessing interactions, as previously suggested. However, careful consideration of the trade-off between the increased likelihood of detecting true effects and the risk of Type I errors is essential when interpreting findings.

Our sample of Australian parents of toddlers was recruited from an online panel, rather than being drawn from the general population, and while our sample achieved a spread of demographic characteristics, it is unclear to what extent our findings are generalisable to

the broader Australian population. As this online experiment was conducted in an artificial setting with relatively brief exposure to claims, findings may not necessarily generalise to actual purchasing preferences in 'real world' food retail settings. A previous US study that used a virtual convenience store to assess effects of claims found stronger evidence of influence for nutrition-related claims than we detected in our study [36].

### Implications for policy/practice

Together with prior research, findings from this study will help inform policy decisions and evidence-based advocacy regarding the regulation of claims on packaged toddler foods. While the present study did not find as clear effects of claims on parent's product perceptions and preferences as some previous studies, the effects observed generally indicated that claims enhanced the appeal of unhealthy toddler snack food products. Furthermore, the no claim condition was least conducive to parents favouring unhealthy products over healthier alternatives, suggesting the best way to eliminate potential detrimental effects of claims on consumer's food choices would be to ban such claims on unhealthy products altogether. Setting nutritional thresholds, such as those proposed by WHO Europe's NPPM [18] and prohibiting infant and toddler food products from displaying such claims would enable parents to more accurately evaluate the healthfulness of products, and reorient their preferences and purchases towards healthier options. Additionally, Government could require that warning labels be displayed on products high in nutrients of concern, as warning labels have been found to mitigate but not eliminate 'health halo' effects of nutrition-related content claims on product perceptions and preferences [20, 26, 42]. More specifically, studies with US parents have found that displaying added sugar warning labels on sugary snacks and drinks encourages parents to choose healthier options for their children [39, 43]. Overall, available evidence suggests that stricter regulation surrounding the marketing and labelling of toddler foods needs to be introduced to protect parents against potentially misleading claims and encourage healthier choices. Ultimately, this could promote population-level improvements in the foods consumed by toddlers, improving their dental health, and reducing their longer-term risk of obesity and diet-related chronic disease.

Additionally, our finding that certain subgroups of parents may be especially vulnerable to being misled by marketing claims on toddler foods suggests that until stronger restrictions on nutritional composition and claims on unhealthy toddler foods are implemented, targeted educational interventions are needed to increase parents' awareness of the suboptimal nutritional profile

of many ready-made infant and toddler foods, and to enhance their ability to critically evaluate claims and product ingredients to identify the healthiest options for their young children. More stringent regulation of claims alone may not be a sufficient approach to address the disproportionately impacted parents, as other underlying causes may be at play. Some parents may need additional support to make informed and healthy food choices for their children and to ensure regulations have equitable impacts.

### Conclusions

This study adds a valuable contribution to understanding how various on-pack claims influence the product preferences, purchase intentions and perceptions of parents of toddlers aged 12 to <36 months. Findings suggest that certain claims, especially the most common types of claims, that a product is 'free from "bad" ingredients,' increase parents' preferences and purchase intentions for unhealthy toddler snack foods. Some demographic subgroups, including co-parents and parents with three or more children may be more influenced by these claims. This study found weaker evidence that claims a product 'contains a "good" ingredient' and unregulated 'child-related' claims influence parents' preferences, intentions, and perceptions towards unhealthy toddler foods. However, considering mounting evidence from other studies, we recommend such claims should not be permitted on infant and toddler foods, for their possible role in promoting inaccurate product perceptions and unhealthy product choices by parents for their young children.

### Abbreviations

ADGs	Australian Dietary Guidelines
UP	Ultra-processed
UPFs	Ultra-processed foods
FSANZ	Food Standards Australia New Zealand
FSC	Food Standard Code
mg	Milligram
g	Gram
NPPM	Nutrient promotion and profile model
WHO	WORLD Health Organization
NIP	Nutrition information panel
SES	Socio-economic status
SEIFA	Socio-economic index for areas
US	United States

### Supplementary Information

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Supplementary Material 1.

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### Authors' contributions

HD conceptualised and designed the study, with input from MS, AS, JMc, JM, AM, BM and AR. MS coordinated the online experimental manipulation and data collection. MA conducted the statistical analyses in consultation with MS and HD. HD and MA wrote the initial draft of the paper. MA, HD and MS interpreted the findings and finalised the manuscript, with substantial input from all authors. All authors have checked and approved the submitted manuscript.

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### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

The Cancer Council Victoria's Human Research Ethics Committee approved all study procedures (reference number HREC 2216). Informed consent was obtained from all participants.

#### Consent for publication

Not applicable.

#### Competing interests

Most of the authors (MA, MS, AS, BM, JM, AM & HD) work for an organisation that conducts public health interventions, research, and advocacy aimed at reducing diet related health risks, obesity, and cancer.

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### References

- Mameli C, Mazzantini S, Zuccotti GV. Nutrition in the first 1000 days: the origin of childhood obesity. *Int J Environ Res Public Health*. 2016;13(9). <https://doi.org/10.3390/ijerph13090838>.
- World Health Organization. Infant and young child feeding. 2023. <https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding>. Accessed 8 May 2024.
- National Health and Medical Research Council. Australian Dietary Guidelines. Canberra: National Health and Medical Research Council; 2013. <https://www.health.gov.au/sites/default/files/australian-dietary-guide-lines.pdf>. Accessed 8 May 2024.
- Mahmood L, Flores-Barrantes P, Moreno LA, Manios Y, Gonzalez-Gil EM. The influence of parental dietary behaviors and practices on children's eating habits. *Nutrients*. 2021;13(4):1138.
- Birch L, Savage JS, Ventura A. Influences on the development of children's eating behaviours: from infancy to adolescence. *Can J Dietetic Prac Res*. 2007;68(1):1.
- Scaglioni S, De Cosmi V, Ciappolino V, Parazzini F, Brambilla P, Agostoni C. Factors influencing children's eating behaviours. *Nutrients*. 2018;10(6):706.
- McCann JR, Russell CG, Woods JL. The Nutritional Profile and On-Pack Marketing of Toddler-Specific Food Products Launched in Australia between 1996 and 2020. *Nutrients*. 2021;14(1):163.

8. Katiforis I, Fleming EA, Haszard JJ, Hape-Cramond T, Taylor RW, Heath A-LM. Energy, sugars, iron, and vitamin B12 content of commercial infant food pouches and other commercial infant foods on the New Zealand market. *Nutrients*. 2021;13(2):657.
9. Mounin NA, Green TJ, Golley RK, Netting MJ. Are the nutrient and textural properties of Australian commercial infant and toddler foods consistent with infant feeding advice? *Br J Nutr*. 2020;124(7):754–60.
10. McCann J, Woods J, Mohebbi M, Russell CG. Regulated nutrition claims increase perceived healthiness of an ultra-processed, discretionary toddler snack food and ultra-processed toddler milks: a discrete choice experiment. *Appetite*. 2022;174:106044. <https://doi.org/10.1016/j.appet.2022.106044>.
11. McCann JR, Russell CG, Campbell KJ, Woods JL. Nutrition and packaging characteristics of toddler foods and milks in Australia. *Public Health Nutr*. 2021;24(5):1153–65. <https://doi.org/10.1017/S1368980020004590>.
12. Scully M, Schmidtke A, Conquest L, Martin J, McAleese A. Commercially available foods for young children (<36 months) in Australia: an assessment of how they compare to a proposed nutrient profile model. *Health Promot J Austr*. 2023. <https://doi.org/10.1002/hpja.705>.
13. Monteiro CA, Cannon G, Levy RB, et al. Ultra-processed foods: what they are and how to identify them. *Public Health Nutr*. 2019;22(5):936–41. <https://doi.org/10.1017/S1368980018003762>.
14. Brunacci KA, Salmon L, McCann J, Gribble K, Fleming CAK. The big squeeze: a product content and labelling analysis of ready-to-use complementary infant food pouches in Australia. *BMC Public Health*. 2023;23(1):656. <https://doi.org/10.1186/s12889-023-15492-3>.
15. The Royal Children's Hospital National Child Health Poll. Ready-made baby foods: Do parents know the facts? Melbourne: The Royal Children's Hospital Melbourne; 2022.
16. Food Standards Australia New Zealand. Australia New Zealand Food Standards Code – Standard 1.2.7–13. Nutrition content claims about properties of food not in section S4—3. Canberra: Food Standards Australia New Zealand; 2016. <https://www.legislation.gov.au/F2015L00394/latest/text>. Accessed 8 May 2024.
17. Simmonds L, Brownbill AL, Zee A, Netting MJ. Health-related marketing messages on product labels of commercial infant and toddler food packaging in Australia: a cross-sectional audit. *BMJ Paediatrics Open*. 2021;5(1):e001241. <https://doi.org/10.1136/bmjpo-2021-001241>.
18. World Health Organization Regional Office for Europe. Nutrient and promotion profile model: supporting appropriate promotion of food products for infants and young children 6–36 months in the WHO European Region. Copenhagen: World Health Organization; 2022. <https://www.who.int/europe/publications/i/item/WHO-EURO-2022-6681-46447-67287>. Accessed 8 May 2024.
19. Hawkes C. Food packaging: the medium is the message. *Public Health Nutr*. 2010;13(2):297–9. <https://doi.org/10.1017/S1368980009993168>.
20. Stoltze FM, Busey E, Taillie LS, Carpentier FRD. Impact of warning labels on reducing health halo effects of nutrient content claims on breakfast cereal packages: a mixed-measures experiment. *Appetite*. 2021;163:105229.
21. Choi H, Yoo K, Hyun Baek T, Reid LN, Macias W. Presence and effects of health and nutrition-related (HNR) claims with benefit-seeking and risk-avoidance appeals in female-orientated magazine food advertisements. *Int J Advert*. 2013;32(4):587–616.
22. Dixon H, Scully M, Niven P, et al. Effects of nutrient content claims, sports celebrity endorsements and premium offers on pre-adolescent children's food preferences: experimental research. *Pediatr Obes*. 2014;9(2):e47–57.
23. Dixon H, Scully M, Wakefield M, Kelly B, Chapman K, Donovan R. Parent's responses to nutrient claims and sports celebrity endorsements on energy-dense and nutrient-poor foods: an experimental study. *Public Health Nutr*. 2011;14(6):1071–9.
24. Scully M, Jinnette R, Le L, Martin J, Schmidtke A. Compliance of Australian commercial foods for young children (<36 months) with an international nutrient and promotional profile model. *ANZJPH* (accepted, May 2024).
25. Nocella G, Kennedy O. Food health claims – What consumers understand. *Food Policy*. 2012;37(5):571–80. <https://doi.org/10.1016/j.foodpol.2012.06.001>.
26. Hall MG, Lazard AJ, Grummon AH, Mendel JR, Taillie LS. The impact of front-of-package claims, fruit images, and health warnings on consumers' perceptions of sugar-sweetened fruit drinks: three randomized experiments. *Prev Med*. 2020;132:105998.
27. Food and Agriculture Organization of the United Nations. Ultra-processed foods, diet quality, and health using the NOVA classification system. Rome: Food and Agriculture Organization of the United Nations; 2019.
28. StataCorp. Stata Statistical Software: Release 16. College Station TX: Stata-Corp LLC; 2019.
29. Selvin S. Statistical analysis of epidemiologic data. 3rd ed. New York: Oxford University Press; 2004.
30. Marshall SW. Power for tests of interaction: effect of raising the Type I error rate. *Epidemiol Perspect Innov*. 2007;4:4. <https://doi.org/10.1186/1742-5573-4-4>.
31. Schenkelaars N, van Rossem L, Willemsen SP, Faas MM, Schoenmakers S, Steegers-Theunissen RPM. The intake of ultra-processed foods and homocysteine levels in women with (out) overweight and obesity: The Rotterdam Periconceptional Cohort. *Eur J Nutr*. 2024:1–13. <https://doi.org/10.1007/s00394-024-03334-w>.
32. Viljakainen H, Sorlí JV, Dahlström E, Agrawal N, Portolés O, Corella D. Interaction between genetic susceptibility to obesity and food intake on BMI in Finnish school-aged children. *Sci Rep*. 2023;13(1):15265.
33. Zha L, Liu R, Sobue T, et al. Dietary acrylamide intake and the risk of hematological malignancies: the Japan Public Health Center-Based Prospective Study. *Nutrients*. 2021;13(2):590.
34. Simmonds L, Brownbill AL, Zee A, Netting MJ. Health-related marketing messages on product labels of commercial infant and toddler food packaging in Australia: a cross-sectional audit. *BMJ Paediatrics Open*. 2021;5(1):e001241. <https://doi.org/10.1136/bmjpo-2021-001241>.
35. Harris JL, Thompson JM, Schwartz MB, Brownell KD. Nutrition-related claims on children's cereals: what do they mean to parents and do they influence willingness to buy? *Public Health Nutr*. 2011;14(12):2207–12.
36. Hall MG, Lazard AJ, Higgins ICA, et al. Nutrition-related claims lead parents to choose less healthy drinks for young children: a randomized trial in a virtual convenience store. *Am J Clin Nutr*. 2022;115(4):1144–54. <https://doi.org/10.1093/ajcn/nqac008>.
37. World Health Organization Regional Office for Europe. Ending inappropriate promotion of commercially available complementary foods for infants and young children between 6 and 36 months in Europe. Copenhagen: World Health Organization; 2019.
38. World Health Organization Regional Office for Europe. Commercial foods for infants and young children in the WHO European Region: A study of the availability, composition and marketing of baby foods in four European countries. Copenhagen. 2019. <https://www.who.int/europe/publications/i/item/9789289057783>.
39. Taillie LS, Higgins ICA, Lazard AJ, Miles DR, Blitstein JL, Hall MG. Do sugar warning labels influence parents' selection of a labeled snack for their children? A randomized trial in a virtual convenience store. *Appetite*. 2022;175:106059. <https://doi.org/10.1016/j.appet.2022.106059>.
40. Richter APC, Duffy EW, Smith Taillie L, Harris JL, Pomeranz JL, Hall MG. The Impact of Toddler Milk Claims on Beliefs and Misperceptions: A Randomized Experiment with Parents of Young Children. *J Acad Nutr Diet*. 2022;122(3):533–40.e3. <https://doi.org/10.1016/j.jand.2021.08.101>.
41. The Royal Children's Hospital National Child Health Poll. Ready-made baby food: Do parents know the facts? Poll Number 24. The Royal Children's Hospital: Parkville, Victoria. 2022. [https://rchpoll.org.au/wp-content/uploads/2022/04/NCHP24-Poll-report-A4\\_FA\\_WEB.pdf](https://rchpoll.org.au/wp-content/uploads/2022/04/NCHP24-Poll-report-A4_FA_WEB.pdf). Accessed 8 May 2024.
42. Nobrega L, Ares G, Deliza R. Are nutritional warnings more efficient than claims in shaping consumers' healthfulness perception? *Food Qual Prefer*. 2020;79:103749. <https://doi.org/10.1016/j.foodqual.2019.103749>.
43. Musicus AA, Roberto CA, Moran AJ, Sorscher S, Greenthal E, Rimm EB. Effect of front-of-package information, fruit imagery, and high-added sugar warning labels on parent beverage choices for children: a randomized clinical trial. *JAMA Netw Open*. 2022;5(10):e2236384-e.

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