

# *Consumer willingness to pay for low acrylamide content*

Article

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## Consumer willingness to pay for low acrylamide content

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## Consumer willingness to pay for low acrylamide content

### Abstract

**Purpose:** Evidence of acrylamide causing tumours in rodents has led to the chemical being classified as 'probably carcinogenic to humans' by the International Agency for Research on Cancer. The purpose of this paper is to examine consumers' willingness to pay (WTP) for a reduction in the acrylamide content of baby food and therefore a reduction in the risk of cancer.

**Design/methodology/approach:** A discrete choice experiment (DCE) is conducted on UK consumers incorporating different levels of seven attributes: packaging, production method (organic, GM and conventional), acrylamide level, sugar, salt, one of five portions of fruit and vegetable per day and price. Consumer WTP for low acrylamide content is estimated using a mixed logit (MXL) model.

**Findings:** The empirical results indicate consumers assign a high value to safer baby food, with low acrylamide content. The WTP premium for baby food with low acrylamide (105%) is the highest of all attributes assessed. Consumers also have a preference for organic baby food, in contrast to an aversion towards GM. The study results indicate that reducing the acrylamide content in baby food is desirable for consumers.

**Originality/value:** This is the first study to estimate consumers' WTP for reducing the acrylamide content of baby food in the UK. Existing research has been limited to examining the exposure of young children, in addition to the potential health risks.

### 1. Introduction

In recent years, food safety has become an increasingly pertinent issue for the UK food industry. Health concerns are often considered a motivation in consumers paying a premium for organic or pesticide-free produce (Popp et al. 2013), with chemical residues perceived as a significant health risk by many consumers (Eom, 1994; Bernard and Bernard, 2010). Parents of young children are

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3 often found to demand more organic food, regarded as a safer and healthier alternative (Pearson et  
4 al., 2010; Krystallis and Chryssohoidis, 2005). Studies examining WTP for organic baby food in the  
5 U.S. have found large price premiums over conventional products. Smith et al.'s (2009) study  
6 suggests the premium for organic baby food increased between 2004 and 2006, from 12-49 percent,  
7 up to 30-52 percent. In addition, Peterson and Li (2011) found consumers were willing to pay a  
8 premium for organic baby food, as well as products which restricted the use of pesticides and GMOs.  
9  
10 Organic baby food has attained success in the UK market, holding a majority share at almost 60% in  
11 2015, the largest of any organic food product (Soil Association, 2016). This achievement is often  
12 considered a result of a parent's desire to provide safe food for their children alongside reducing any  
13 risk of chemical contamination (Maguire et al. 2004; Pearson et al. 2010).  
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### 16 1.1 *Acrylamide exposure*

17  
18 Following animal studies, acrylamide has been found to cause several health problems, including  
19 developmental toxicity and carcinogenicity (Erkekoğlu and Baydar 2010; Mojska et al. 2012; EFSA,  
20 2015). Acrylamide has been classified as 'probably carcinogenic to humans (group 2A)' by the  
21 International Agency for Research on Cancer, albeit there is inadequate evidence from human  
22 studies for the carcinogenicity of acrylamide (IARC, 1994). In 2015, both the Food Standards Agency  
23 (FSA, 2015) and the European Food Safety Authority (EFSA, 2015) published an opinion on  
24 acrylamide, highlighting the possible harmful effects from dietary exposure based on animal studies.  
25 Acrylamide is produced naturally when cooking food high in starch at high temperatures (FSA, 2015)  
26 and the FSA advises 'regularly eating foods containing high levels of acrylamide can increase the risk  
27 of cancer' (FSA 2015, p.8). Particular concern has arisen regarding the levels found in baby food and  
28 starchy food consumed by young children, who are the most exposed aged group, due to their high  
29 consumption of carbohydrate-rich foods and low body weight (Mojska et al. 2012; FSA, 2015; EFSA,  
30 2015). There are no maximum limits for acrylamide in food, however 'indicative values' are set out  
31 by the European Commission (EC). Baby foods, not containing prunes, have an indicative value of 50  
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3  $\mu\text{g}/\text{kg}$  (EC, 2013). On 9th June 2017, the EC published draft regulation for consultation with the food  
4 industry, requiring Food Business Operators to engage in measures reducing acrylamide in baby food  
5 below a benchmark level of 40  $\mu\text{g}/\text{kg}$  (EC, 2017).  
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10 This paper estimates consumers' WTP for a reduction in the acrylamide content of baby food and  
11 therefore a reduction in the risk of cancer using a discrete choice experiment (DCE). This is the first  
12 study to estimate consumers' WTP for reducing the acrylamide content of baby food in the UK.  
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15  
16 Existing research has been limited to examining the exposure of young children and the potential  
17 health risks (Erkekoğlu and Baydar, 2010; Mojska et al., 2012).  
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20  
21 The paper is organised as follows. Section 2 describes the materials and methods. Section 3 presents  
22 the results of the econometric analysis and the WTP estimations. Section 4 provides a discussion of  
23 these results and section 5 conclusions.  
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## 26 27 28 **2. Methods**

### 29 30 *2.1 Survey*

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32 A web-based survey was designed and distributed using the software 'Qualtrics' [1]. A convenience  
33 sample of UK residents over the age of 18 with children aged 5 and under was used [2]. The final  
34 sample was 169 respondents, resulting in 1352 choices ( $169 \times 8$ ) and 5408 observations ( $1352 \times 4$ ).  
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Choice modelling literature indicates a minimum of 500 choices is generally adequate for valid  
estimation of the MXL model (Enneking et al., 2007; Profeta et al., 2008).  
In the DCE participants choose between 3 baby food products: option 1 (status quo), 2 and 3 along  
with a fourth option not to buy any (opt-out). An opt-out choice is often included in food preference  
studies (Balcombe et al., 2010; Van Loo et al., 2011) to make choices realistic (Lusk and Schroeder,  
2004; Lancsar and Louviere, 2008). However, may lead respondents to avoid making demanding  
choices (Dhar, 1997; Beattie and Barlas, 2001). In this set up, a full factorial design would result in  
1080 possible alternatives ( $3^3 \times 2^3 \times 5$ ). To reduce this to a feasible number of choice sets, a D-

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3 optimal design is implemented to produce 48 choice sets. The respondents are presented with 8  
4 choice sets randomly selected from the 48 designed. An example choice set is shown in Figure 1. The  
5 attributes and levels included in the DCE are reported in Table I.  
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9  
10 *[Insert Figure 1]*

11  
12 *[Insert Table I]*

### 13 14 15 *2.2 Acrylamide levels*

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17 For acrylamide level & lifetime cancer risk, since a published consensus is not available, estimated  
18 cancer risks are based on risk estimates provided in the literature. Several studies observe that  
19 children or infants are exposed to a mean acrylamide intake of approximately  $1\mu\text{g}/\text{kg bw}/\text{day}$   
20 (Konings et al., 2003; EFSA, 2015). Risk models estimate this exposure poses a lifetime cancer risk of  
21 13 in 10,000 people (Dybing and Sanner, 2003). Therefore, this risk is considered the status quo or  
22 'typical' lifetime cancer risk for consumption of baby food and included as the medium level in the  
23 choice card [3]. Acrylamide studies also report maximum exposures for children are approximately  
24  $3\mu\text{g}/\text{kg bw}/\text{day}$ , three times greater than the mean intake (Konings et al., 2003; EFSA, 2015).  
25  
26 Therefore, the high level is assigned a lifetime cancer risk of 39 in 10,000; three times the medium  
27 risk. The low acrylamide level is assigned a lifetime cancer risk of 4 in 10,000, approximately one  
28 third of the medium risk and acknowledging that acrylamide exposure from food cannot be  
29 eliminated (FSA, 2015).  
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### 44 *2.3 Econometric analysis*

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46 The DCE data is analysed using the MXL model which is considered highly flexible and able to  
47 approximate any random utility model (McFadden and Train, 2000). Coefficients are considered  
48 randomly distributed across individuals (Ghosh et al., 2013). The MXL model has been used  
49 frequently in WTP studies for organic food (Van Loo et al., 2011; Janssen and Hamm, 2012) and is  
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particularly valuable, requiring less restrictive behavioural assumptions than applied in conventional logit models (Illichmann and Abdulai, 2013; Balogh et al. 2016).

The model estimation in this study uses 100 Halton draws, observed in other DCE studies (Boxall et al., 2009; Campbell et al., 2009; Illichmann and Abdulai, 2013) and found to provide more precise results than 1,000 random draws (Bhat, 2003). As illustrated by Train (2003) and Van Loo et al. (2011), where respondents make repeated choices, one for each time period  $t$ , the simplest method to account for the panel nature, is to treat the coefficients as varying over respondents, but constant over choices for each individual

$$U_{ijt} = \beta_i x_{ijt} + \varepsilon_{ijt} \quad (1)$$

where  $i = 1, \dots, N$  is the number of respondents;  $j$  is the alternative and  $t$  is the choice situation;  $x_{ijt}$  is a column vector of variables related to alternative  $j$  and respondent  $n$ ;  $\beta_i$  is the row vector of individual parameters and  $\varepsilon_{ijt}$  is the extreme value error term, iid (independently distributed) over people, alternatives and time.

#### 2.4 Model specification

The utility function is composed of several explanatory variables included in the DCE:

$$U_{ijt} = \alpha_{1,2,3} + \beta_1 price_{ijt} + \beta_2 jar_{ijt} + \beta_3 pot_{ijt} + \beta_4 GM_{ijt} + \beta_5 conventional_{ijt} + \beta_6 acrylow_{ijt} + \beta_7 acryhigh_{ijt} + \beta_8 nolabelsugar_{ijt} + \beta_9 lows_{ijt} + \beta_{10} oneoffive_{ijt} + \varepsilon_{ijt} \quad (2)$$

where  $i = 1, \dots, N$  is the number of respondents,  $j$  is option 1, 2, 3, 4 (opt-out),  $t$  is the choice index;  $U_{ijt}$  is the utility each respondent  $i$  receives from alternative  $j$  for each choice  $t$ ;  $\alpha_{1,2,3}$  is an alternative specific constant (ASC) of option 1, 2 and 3, with reference to 4;  $price_{ijt}$  is the price for 100g of baby food of alternative  $j$  in choice situation  $t$ ;  $jar_{ijt}$  (glass jar),  $pot_{ijt}$  (plastic pot),  $GM_{ijt}$ ,  $conventional_{ijt}$ ,  $acrylow_{ijt}$  (low acrylamide),  $acryhigh_{ijt}$  (high acrylamide),  $nolabelsugar_{ijt}$  (no label sugar),  $lows_{ijt}$  (low salt) and  $oneoffive_{ijt}$  (1 of 5-a-day) are attributes of alternative  $j$ ; and  $\varepsilon_{ijt}$  is error term. The model specification includes an ASC for J-1 alternatives, capturing the average

effect from factors not incorporated within the model, with option 4 (opt-out) normalised to zero (Kjær, 2005). All the variables are estimated by effects coding, except for the ASCs and price. The ASCs are dummy coded, and price is a continuous numeric variable, in GBP. A normal distribution for the random parameters is assumed allowing the distribution of the coefficient estimate without a strict sign (Ghosh et al., 2013; Yao et al., 2014), since certain attributes (e.g. GM and high acrylamide) may not provide positive utility in comparison to the status quo. Price is modelled as a fixed parameter ensuring WTP for each attribute has the same distribution as the coefficient (Train and Croissant, 2013), providing a negative coefficient sign [4] and retaining stability within the MXL model (Revelt and Train, 2000; Gao et al., 2010). The mean WTP is estimated by the following equation:

$$WTP = \frac{(\beta_k - \beta_{k0})}{-\beta_{price}} \quad (3)$$

Where  $\beta_k$  is a coefficient of an attribute,  $\beta_{k0}$  is a coefficient of an effects coded reference level (status quo) for  $\beta_k$ , and  $\beta_{price}$  is a coefficient of price.  $\beta_{k0}$  is subtracted to convert the effects coded coefficients to dummy coded coefficients (Jaung et al., 2016). Coefficients for the status quo ( $\beta_{k0}$ ), are calculated as the negative sum of the other levels for the attribute (Wongprawmas and Canavari, 2017). The WTP calculation in equation (3) has been used frequently in DCE studies employing effects coding and an ASC, providing the marginal (dis)utility change from the status quo (Jaung et al., 2016; Wongprawmas and Canavari, 2017).

The MXL model is applied to analysed data using the package `mlogit` (Croissant, 2013), available in R version 3.3.3 (R Core Team, 2017).

### 3. Results

#### 3.1 Sample characteristics

The sample socio-demographic data is provided in Table II. The majority of the respondents are female (84%), which may have been anticipated since women are argued to be the main decision



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3 makers concerning food purchases in a UK household (Silayoi and Speece, 2004; Krystallis and  
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5 Chrysohoidis, 2005). Most respondents are university educated, with 40% holding an  
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7 undergraduate degree and 21% holding a postgraduate degree. The majority of the respondents are  
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9 aged 30 to 39 (75%) and have a household income of more than £50,000.

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11  
12 *[Insert Table II]*

13  
14 Nearly 40% of respondents are familiar with acrylamide (n = 67), however only 7% are aware it is  
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16 present in certain baby foods (n =12). The majority indicate they would be in favour of seeing  
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18 acrylamide levels displayed on baby food, with 37% stating 'definitely yes' (n =62) and 46% stating  
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20 'probably yes' (n =78).

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23 The respondents made 1352 (169 × 8) choices, choosing to opt-out on 209 occasions (15%). The  
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25 frequencies of attribute levels chosen are reported in Table I. The status quo levels were chosen  
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27 more frequently, with 'no added sugar' the most frequently chosen (903 choices; 67%). This may  
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29 have arisen since the status quo levels were presented more often in the design of the DCE,  
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31 however, the status quo was also chosen most frequently among the alternatives (457 choices),  
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33 indicating a bias. Whilst the inclusion of a status quo is considered important to best represent real-  
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35 life choices (Hoyos, 2010), this may result in a status quo bias (Boxall et al., 2009; Bonnichsen and  
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37 Ladenburg, 2015). Any systematic effect of the status quo is captured through the inclusion of the  
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39 ASC for option 1 (Scarpa et al., 2005).

### 40 41 42 43 *3.2 MXL model*

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46 The results of the MXL model are presented in Table III. The ASCs are positive and significant at the  
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48 5% level, signifying consumers prefer to purchase the product, rather than opt-out and are willing to  
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50 pay a price to purchase baby food. The coefficient for option 1 is a larger positive figure than for  
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52 options 2 and 3, indicating that the status quo provides greater utility than other alternatives. As  
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54 expected, the coefficient for price is negative and significant at the 1% level; as price increases, the  
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3 consumer's utility decreases. All coefficient means, with exception of the pot packaging, are  
4 significant at the 5% level. The following status quo levels all have a positive coefficient (note to  
5 Table III): pouch, organic, medium acrylamide and a 'no added sugar' label. In contrast to baby food  
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7 which did not include a label for 'low salt' or '1 of 5-a-day', which have negative coefficients.  
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11 The coefficients for acrylamide reveal a strong preference for low acrylamide along with a significant  
12 aversion towards high acrylamide content. A strong aversion towards GM is also found, whereas  
13 organic is preferred to conventional. With regards to the nutritional attribute labelling, the following  
14 labels: 'no added sugar', 'low salt' and '1 of 5-a-day', are all preferred to the no label alternatives.  
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16 Consumers also exhibit a preference for the pouch packaging.  
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22  
23 *[Insert Table III]*

24 The standard deviations of the random parameters (Table III) show there is significant heterogeneity  
25 in consumers' preferences towards baby food attributes. In addition, the standard deviations of the  
26 ASCs are all significant at the 5% level, demonstrating heterogeneity towards the choice of  
27 alternative, as well as, a non-constant status quo bias across respondents, as observed in Meyerhoff  
28  
29 (2009).  
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36 The estimated mean WTP (£) and 95% confidence intervals are presented in Table IV.  
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39 *[Insert Table IV]*

### 40 41 3.3 WTP for acrylamide level & lifetime cancer risk

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43 Each acrylamide level is described by an associated lifetime cancer risk for that exposure. Table V  
44 illustrates the change in risk following exposure to high or low acrylamide content, in comparison to  
45 medium (status quo or base risk level).  
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51 *[Insert Table V]*  
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3 A high acrylamide content results in an increased lifetime cancer risk of 26/10,000 (200%), whereas  
4 low acrylamide reduces the risk by 9/10,000 (69%). This illustrates the change in risk between a  
5 medium and high level is greater than the change between a medium and low level.  
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9 However, the equivalent change in WTP for acrylamide shows an insignificant variation in  
10 comparison to the change in risk. Consumers are willing to pay £1.31 less for high acrylamide  
11 content associated with an increased cancer risk of 200% from the status quo. Conversely,  
12 consumers are willing to pay £1.05 more for low acrylamide content, corresponding to a premium of  
13 105% above the typical price of baby food employed in this experiment (£1.00) and largely  
14 exceeding the associated cancer risk reduction (69%).  
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#### 22 **4. Discussion**

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24 The results of this study show UK consumers have a relatively high WTP for baby food with low  
25 acrylamide content. The results indicate a significant aversion towards a high level of acrylamide,  
26 with consumers willing to pay £1.31 less than the same product with medium acrylamide content  
27 (£1.00). This result suggests consumers would not be willing to purchase baby food reported to  
28 contain a high level of acrylamide, in a real-life situation. An alternative approach to the MXL model  
29 design could involve censoring the normal distribution of the random parameters at zero, resulting  
30 in the marginal utility for high acrylamide being equal to zero and implying the respondent is  
31 indifferent to the attribute (Balcombe et al., 2010). However, given the nature of acrylamide and the  
32 risk it poses to human health, it is considered important to allow negative WTP estimates to  
33 measure negative preferences associated with disutility, as seen in Illichmann and Abdulai (2013).  
34  
35 WTP for a reduction in acrylamide is non-proportional to the change in cancer risk. We found  
36 consumers are willing to pay a higher price for a low acrylamide content (105% premium), in return  
37 for a smaller reduction in risk (69%). Therefore, the proportionality assumption of standard  
38 economic theory (Jones-Lee, 1974; Weinstein et al., 1980) does not hold which is a common finding  
39 in the literature (Hammitt and Haninger, 2010). Under this assumption it is expected that WTP to  
40 reduce the small probability of an adverse health effect (e.g. cancer) should be nearly proportional  
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3 to the change in risk. WTP to reduce the cancer risk from acrylamide exposure appears insensitive to  
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5 the magnitude of the change in risk, also referred to as scale-bias (Andersson and Svensson, 2008).  
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7 As observed in Eom (1994), this may represent consumers' desire to acquire safer food, rather than  
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9 reflecting the risk itself; with consumers regarding the acrylamide content as levels of 'food safety'  
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11 per se and demonstrating less consideration of the associated probabilities [5].  
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14 This study reveals consumers are willing to pay more for organic baby food, which parents are often  
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16 considered to regard as a healthier and safer alternative for their children (Pearson et al., 2010;  
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18 Krystallis and Chryssohoidis, 2005), in comparison to conventional or GM products. This result is also  
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20 consistent with previous WTP studies, which found organic baby food attracts a price premium in  
21  
22 the U.S. (Maguire et al., 2004; Smith et al., 2009). The results also indicate a significant aversion  
23  
24 towards GM baby food. Consumers are willing to pay £1.00 less for GM than organic, representing a  
25  
26 large reduction from the typical price of baby food employed in this experiment (£1.00). As observed  
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28 for high acrylamide, this may indicate consumers would not be willing to purchase GM baby food, in  
29  
30 a real-life situation. Previous studies examining attitudes towards GM food have also found  
31  
32 consumers are opposed to these products (Shaw, 2002; Saher et al., 2006). Reported health risks  
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34 from GM food may have increased the number of consumers choosing organic food for their  
35  
36 children, with a view to reducing this risk (Saher et al., 2006). With regards to packaging, consumers  
37  
38 are willing to pay more for a pouch than a jar. The pouch is often the preferred packaging since it is  
39  
40 more convenient for feeding (Hansen and Kristensen, 2013). Given the importance of nutritious and  
41  
42 safe food for a child's health in their early years (Erkekoğlu and Baydar, 2010), the estimate that  
43  
44 consumers are willing to pay more for baby food labelled with 'low salt', '1 of 5-a-day' or 'no added  
45  
46 sugar', than for an unlabelled alternative is not surprising.  
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## 49 50 **5. Conclusion**

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53 UK consumers may have a high WTP for baby food with low acrylamide content. Acrylamide content  
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55 is therefore considered an important aspect of UK consumers' preferences for baby food. WTP for  
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3 low acrylamide also appears insensitive to the magnitude of the change in risk. This scale-bias may  
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5 be indicative of consumers' desire to acquire safer food, regarding the acrylamide content as  
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7 descriptive indicators of food safety, without significant consideration for the associated probability  
8  
9 of risk.

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12 The results of this study indicate to policy advisors that regulation to reduce the acrylamide content  
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14 in baby food is highly desirable for consumers. Albeit, if reducing the acrylamide in all baby food  
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16 products to a low level is not achievable, a product labelling policy would assist consumers in making  
17  
18 informed choices, enhancing the market. Producers who reduce the acrylamide content in baby food  
19  
20 could attract premium prices, which may also seek to cover any additional costs of producing safer  
21  
22 baby food. In addition, advertising baby food which highlights a low acrylamide content could aid in  
23  
24 differentiating products from their competitors and increasing demand.

25  
26  
27 Consumers' preference for organic baby food suggests the market potential for GM baby food in the  
28  
29 UK may be limited. Consumers are also willing to pay a premium of 41% for a 'low salt' label and 50%  
30  
31 more for a '1 of 5-a-day' label on baby food packaging, as well as 52% less for an unlabelled product,  
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33 in comparison to a 'no added sugar' label. These results suggest producers may have the opportunity  
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35 to increase demand for baby food products which include nutritional content labels and sell these at  
36  
37 a premium price.

#### 38 39 40 **Appendix A. Information given prior to DCE**

##### 41 42 43 *Acrylamide*

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46 Since you may not be familiar with acrylamide, in comparison to other attributes of baby food,  
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48 information is given below:

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50  
51 Acrylamide is a chemical naturally produced from cooking certain starchy foods (grains, potatoes  
52  
53 and fruits) at a high temperature. It is not deliberately added to foods, but is a natural by-product of  
54  
55 the cooking process.

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3 Acrylamide has been found to cause cancer, as well as a number of other health problems in animals  
4  
5 is classified as 'probably carcinogenic to humans' by the International Agency for Research on  
6  
7 Cancer. The Food Standards Agency (FSA) advises: "Regularly eating foods containing high levels of  
8  
9 Acrylamide can increase the risk of cancer".  
10

11  
12 **Notes:**  
13

- 14  
15 1. A pilot survey was conducted to test the functionality and comprehension of the survey,  
16  
17 focusing on the choice card information.  
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- 19  
20 2. 327 individuals visited the survey, 169 individuals had a child aged 5 and under and provided  
21  
22 full responses. We use snowball sampling reflecting the exploratory nature of the research.  
23  
24 We contacted UK residents over the age of 18, with children aged 5 and under, via email and  
25  
26 Facebook, to voluntarily take part in the study. Although the distribution of respondents by  
27  
28 age is similar to the Office for National Statistics (ONS, 2011), female is overrepresented. We  
29  
30 acknowledge there may be low precision and some bias present due to the relatively small  
31  
32 sample. Future research should ensure the use of representative sampling in order to  
33  
34 generalise our findings.  
35
- 36  
37 3. The cancer risk is a result of regular consumption over a lifetime. Respondents are provided  
38  
39 with an outline of acrylamide and the cancer risk from regular consumption prior to the DCE  
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41 (appendix A), which is subsequently described as acrylamide level & lifetime cancer risk. We  
42  
43 acknowledge the possibility of bias derived from giving respondents health information only  
44  
45 related to acrylamide.  
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- 47  
48 4. A normal distribution for the price coefficient would not ensure a negative coefficient,  
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50 whereas a lognormal distribution may result in values close to zero and unrealistically large  
51  
52 WTP values (Revelt and Train, 2000).  
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- 54  
55 5. It is well established that people have difficulty understanding low risk levels tending to  
56  
57 overestimate small probabilities (Hammitt and Graham, 1999).  
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	<b>Option 1 100g</b>	<b>Option 2 100g</b>	<b>Option 3 100g</b>
Packaging			
	Pouch	Plastic pot	Glass jar
Production method	Organic	Conventional	GM
Acrylamide level & lifetime cancer risk	Medium 13 in 10,000	Medium 13 in 10,000	Low 4 in 10,000
Sugar content	No added sugar	No added sugar	No added sugar
Salt content		Low salt	Low salt
5-a-day			1 of 5-a-day
Price	£1.00	£0.50	£1.25

<input type="radio"/> Option 1 <input type="radio"/> Option 2 <input type="radio"/> Option 3 <input type="radio"/> Option 4 - None of these
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Figure 1 Example of a choice set included in the choice experiment

Attribute	Levels	Frequency	%
Packaging	<i>Pouch</i>	723	53%
	Glass jar	207	15%
	Plastic pot	213	16%
Production method	<i>Organic</i>	717	53%
	GM	127	9%
	Conventional	299	22%
Acrylamide level & lifetime cancer risk	Low: 4 in 10,000	428	32%
	<i>Medium: 13 in 10,000</i>	673	50%
	High: 39 in 10,000	42	3%
Sugar	<i>No added sugar</i>	903	67%
	No label sugar <sup>a</sup>	240	18%
Salt	Low salt	426	32%
	<i>No label salt<sup>a</sup></i>	717	53%
1 of 5-a-day <sup>b</sup>	1 of 5-a-day	442	33%
	<i>No label 1 of 5-a-day<sup>a</sup></i>	701	52%
Price	£0.25	198	15%
	£0.50	163	12%
	£0.75	173	13%
	<i>£1.00</i>	553	41%
	£1.25	56	4%

Notes: in italics are the attribute levels for the status quo alternative; <sup>a</sup>these attributes are shown as blank (unlabelled) in the choice card; <sup>b</sup>the attribute '1 of 5-a-day' refers to one of five portions of fruit and vegetable per day; the prices shown represent the range of prices observed in UK supermarkets in April 2017; the frequency of options chosen: option 1 (status quo) = 457, option 2 = 340, option 3 = 346, option 4 (opt-out) = 209

Table I Choice frequency of attribute levels within the DCE, no. of choices = 1352

Characteristics	Frequency	%
<b>Gender</b>		
Male	27	16%
Female	142	84%
<b>Education level</b>		
No qualifications	1	1%
GCSE	13	8%
National diploma/NVQ	23	14%
A-levels	18	11%
Undergraduate degree	67	40%
Postgraduate degree	35	21%
Other	12	7%
<b>Age</b>		
20-29	26	15%
30-39	126	75%
40+	17	10%
<b>Household income (£/year)</b>		
0-10,000	4	2%
10,001-20,000	3	2%
20,001-30,000	10	6%
30,001-40,000	27	16%
40,001-50,000	29	17%
50,001+	96	57%

Table II Socio-demographic characteristics of the sample, no. of respondents = 169



Variable	Coefficient	Std. Error
1:(intercept)	1.899***	0.414
2:(intercept)	1.516***	0.254
3:(intercept)	0.689*	0.272
Price	-2.267***	0.272
Jar (pouch <sup>a</sup> )	-0.372**	0.116
Pot (pouch <sup>a</sup> )	-0.049	0.141
GM (organic <sup>a</sup> )	-1.387***	0.156
Conventional (organic <sup>a</sup> )	0.516***	0.126
Acrylow (acrymed <sup>a</sup> )	2.570***	0.158
Acryhigh (acrymed <sup>a</sup> )	-2.772***	0.176
No label sugar (no added sugar <sup>a</sup> )	-0.586***	0.098
Lows (no label salt <sup>a</sup> )	0.468***	0.096
1 of 5 (no label 1 of 5 <sup>a</sup> )	0.563***	0.098
<b>Standard deviation</b>		
1:(intercept)	1.163***	0.237
2:(intercept)	2.812***	0.244
3:(intercept)	2.877***	0.247
Jar (pouch <sup>a</sup> )	0.983***	0.124
Pot (pouch <sup>a</sup> )	0.611***	0.120
GM (organic <sup>a</sup> )	1.067***	0.131
Conventional (organic <sup>a</sup> )	0.682***	0.114
Acrylow (acrymed <sup>a</sup> )	0.460***	0.125
Acryhigh (acrymed <sup>a</sup> )	1.344***	0.165
No label sugar (no added sugar <sup>a</sup> )	0.173	0.102
Lows (no label salt <sup>a</sup> )	0.214*	0.098
1 of 5 (no label 1 of 5 <sup>a</sup> )	0.287*	0.112
Number of observations		5408
Log-likelihood		-1198.7
Mcfadden pseudo R <sup>2</sup>		0.344
LR test $\chi^2$		1256.1***
Halton draws		100

\*\*\*significant at 0.1%; \*\* significant at 1%; \*significant at 5%

Notes: <sup>a</sup>Reference levels of the attributes (means): pouch = 0.420; organic = 0.871; acrymed = 0.202; no added sugar = 0.586; no label salt = -0.468; no label 1 of 5 = -0.563

Table III Estimation of MXL model results

Attribute level	WTP
Jar (pouch)	-0.350 (-0.482; -0.249)
Pot (pouch)	-0.207 (-0.331; -0.080)
GM (organic)	-0.996 (-1.215; -0.842)
Conventional (organic)	-0.156 (-0.266; -0.030)
Acrylow (acrymed)	1.045 (0.818; 1.398)
Acryhigh (acrymed)	-1.312 (-1.698; -1.060)
No label sugar (no added sugar)	-0.517 (-0.641; -0.427)
Low salt (no label salt)	0.413 (0.329; 0.519)
1 of five (no label 1 of 5)	0.497 (0.400; 0.633)

Note: reference category in brackets.

Table IV Consumer WTP and 95% confidence intervals for baby food attributes (£/100g)

British Food Journal

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<b>Acrylamide content</b>	<b>WTP (£)</b>	<b>Base risk level</b>	<b>New risk level</b>	<b>Risk reduction</b>	<b>Risk reduction (%)</b>
High	-1.312	13/10,000	39/10,000	-26/10,000	-200%
Medium	0.000	13/10,000	-	0	0%
Low	1.045	13/10,000	4/10,000	9/10,000	69%

Note: negative risk reduction figures represent an increase in risk (medium to high)

Table V Change in lifetime cancer

British Food Journal