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Preferences for School Milk - How Juveniles Differ

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ABSTRACT

Snacks and lunches offered at school can decisively influence children's dietary habits. In the light of discussions to establish prevention and intervention programs to abate current trends of rising childhood obesity, children's preferences for food items with lower calorie content gain on importance. But youths preferences concerning different school milk products are not well-known. Therefore, the objective is to investigate if the milk products offered at school still meet older children's preferences or if modifications could prove to be useful. Based on outcomes of an online survey covering a choice experiment and conducted among juveniles in Germany the probability that youths benefit from different products as well as varying prices, sugar and fat contents is estimated. Socio-demographics, psycho-metrics and perceived weight status are employed to explain youths choices preferring novel school milk products yet unavailable in German schools. Results of the choice experiment show that youths aged 15-18 are a heterogeneous group. They prefer a wider range of different products including drinking yoghurt as an option as well. Results indicate that nutritional aspects (low sugar/fat content, artificial sweetener) and body image are important for some of them.

***Keywords**: school milk, youths, preferences, choice experiment, body image*

Introduction

Childhood obesity has become one of the most serious public health challenges of the 21st century (WHO, 2007). Studies show that eating habits and nutrition behaviour are almost resistant to dietary changes attempted after adolescence (Kelder et al., 1994, p.1121; Kemm, 1987, p.210; Köster, 2009; Lien et al., 2001, p.217). Therefore, it is important to focus on children's dietary behaviours as to limit the unhealthy behaviours as an adult.

In addition to family meals, snacks and lunches offered at school can decisively influence children's dietary habits (Crawford et al., 2008; Story et al., 2002; Vereecken et al., 2008, p.723). At school, children are freer to decide what they want to eat than they are at home. At home, children's food choices are more strongly influenced by their parents, although children often provide suggestions or refuse products or preparations that do not taste well. At school, children can make their own eating decisions within limits, trading food with friends, deciding whether and how much to buy at school, or even dispose food they do not want to eat. Thus, it is assumed that children reveal their real food preferences at school as long as peer influence is limited and the availability is provided.

One type of product regularly offered at school is milk or milk products. Milk is an important part of a child's diet for several reasons: milk contains significant amounts of calcium, milk protein has high biological value, and milk fat is easily digestible (Biesalski et al., 1999; DGE, 2008). Milk provides important nutrients in a relatively optimal combination (Heine, 1999) and ensures sufficient calcium intake. In turn, optimal bone development and general good health has been particularly emphasised (Jacobson, 1961; Promar International, 2002). Although the dairy consumption of younger children tend to be nearly sufficient,

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consumption often declines with age and often becomes insufficient (Mensink et al., 2007a). Moreover, girls consume less dairy than boys do (Mensink et al., 2007a) and seldom consume milk at school (Weible, 2013). On average, the calcium consumption of German children under 18 years of age is insufficient, and it is particularly low for girls (Mensink et al., 2007b; DGE, 2008), with 74% of girls and 51% of boys aged 14 and 18 failing to consume the recommended amounts (MRI, 2008, p.259). The provision of subsidised milk and milk products in educational establishments through specific programmes, such as the EU School Milk Scheme is one option for increasing adolescent milk consumption. But it is no panacea and has its own difficulties:

- The Scheme strictly regulates which products can be sold as subsidised school milk (European Commission 2007; European Commission 2008). Some EU member states, such as Germany, even restrict the number of permitted milk products[1]. Although artificially sweetened milk products have been allowed in the EU Scheme since 2008 (European Commission, 2008), the German School Milk Programme does not permit them.
- In general, schools are supplied by only one dairy company, and only that company's products are offered. Because the distributors normally only supply limit types due to cost reasons children cannot choose which milk fat levels, sugar content or flavour to buy. For further information on problems concerning school milk supply, please see the works of Weindlmaier and Fallscheer (1997), Wietbrauk (1976) and Salamon et al. (2012).
- In Germany, dietary recommendations for school catering are provided by the German Nutrition Society (DGE) and supported by the German Federal Ministry of Food and Agriculture (BMEL). Although milk and milk products are recommended in children's diets, the DGE notes that they can be high in fat and sugar and consequently recommends the consumption of only half-fat and unsweetened milk products (DGE, 2013). However, sales of plain milk drinks in schools are low (Salamon et al., 2010).
- There is considerable evidence that children like milk products. However, changing preferences during adolescence will require a well-adapted product range. This fuels the on-going discussion that school milk no longer satisfies children's preferences and that secondary school children require different product ranges (Louie et al., 2011).

To increase consumption of milk and milk products at school, children's preferences must be matched with the products offered because the level of consumption is influenced by individual preferences (Baxter et al. 2000), especially taste and convenience (Noble et al., 2003).

Based on the above-mentioned figures, this articles objective is to investigate whether the milk products offered at German primary schools still meet pupils preferences in secondary school. And, if they do not, whether modifications to the products should be made. For topical reasons, the paper will examine whether and to which extent fat and sugar content is relevant to children's preferences. In particular, the question of whether youths which perceive themselves as over weighted choose calorie-reduced products more often than others is examined. That way products can be adapted according to pupil's preferences and expectations and the policy can try to influence producers to provide them.

This article is structured as follows. Section 2 discusses the paper's methodological approach. Section 3 provides additional information on the data and presents the results. Section 4 discusses their implications and the final section provides a brief conclusion.

Theory and Method

Theoretical background

When products are affordable, consumers generally choose the product that provides the maximum utility. To measure this product utility, a choice experiment is applied in this paper. Further, a latent class model is applied to explain pupils heterogeneity.

Product's attributes are used to determine pupils' preference for school milk. Such attributes include for instance the type of product, ingredients, taste and price. The characteristics of the attributes and their levels may differ across various products. It is assumed that consumers will compare the different alternatives

[1] For details on the German programme, see BMELF (1985).

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offered in the decision-making process. Finally, consumers choose the product that has the best combination of attributes and attribute levels. If they do not find any product that satisfies them they will not choose a product at all.

Lancaster was the first to establish this concept of attributes and levels in the 1960s (Lancaster, 1966). McFadden extended this approach in the 1970s using his random utility model (McFadden, 1974). Both, Lancaster and McFadden, described the alternatives chosen by using a number of attributes, *k*. Individual *n* chooses alternative *i*, resulting in utility $U_{ni} = U(X_{ki})$, where X_{ki} is a vector describing the attributes embedded in alternative *i*. Applying random utility models, utility is composed of a deterministic and a random part $U_{ni} = V_{ni} + \varepsilon_{ni}$. Here, $V_{ni} = f(X_{ni})$ is deterministic and depends on the product attributes, whereas $\mathcal{E}_{ni}$ represents the random component. Total product utility is the sum of all single utilities that arise from different attributes: $U_{ni} = \sum_{k=1}^{K}(\beta_{nk} * X_{nk}) + \varepsilon_{ni}$ (Hensher et al., 2006, p. 74-78; Louviere, 2001). β presents a weighting of the regarded attribute.

The measurement of product utility is, in addition to determining the willingness to pay, the major purpose of choice experiments (CEs). CEs are not the only method for measuring product utility, but they have several advantages compared with other methods: (i) it is easier for respondents to choose the most preferred product rather than ranking many different alternatives, as in a conjoint analysis (Adamowicz et al., 1998; Hair et al., 1998, p.394); (ii) CEs are less susceptible to respondents' strategic behaviour, which is a major problem in contingent valuation method applications (Breyer et al., 2004, p.61); and (iii) compared with the alternative methods, it is easier to check for internal consistency, to compute single attribute parameters, to detect substitutive relationships between different attributes and to allow for heterogeneity among respondents using different econometric models (Hanley et al., 1998a). Furthermore, following Hanley et al. (1998b), choice experiments should be the favoured method to assess particular attributes.

The models for analysing choice experiments calculate the probability that an individual chooses a special product out of the presented products. Additionally, it is assumed that the individual chooses the product that offers the highest degree of utility. The probability of individual *n* choosing product *i* out of *J* is

$\Pr(i \mid J) = \Pr\left((V_{ni} + \varepsilon_{ni}) \geq \left(V_{nj} + \varepsilon_{nj}\right)\right)\ ;\ \forall\, j\ \in j = 1,2,\dots,J; i \neq j$ (Hensher et al. 2006, p.82).

Practical implementation of the choice experiment

The attributes selected for the choice experiment are listed in table 1. The content levels were chosen based on widely available products in Germany. The types of products are two novel school milk products and one conventional school milk. The latter was a type of school milk that is widely offered in German schools and was provided as a constant "opt-out" option in all choice sets.

Table 1: Attributes and attribute levels.

Attribute	**Levels**
Products	Novel school milk, yoghurt, conventional school milk
Price (in cents)	30, 35, 40
Fat content	0.3%, 1.5%, 3.5%
Sweetening agent	Sugar, artificial sweetener

Source: Own illustration.

The sweetening agent was chosen as an attribute, as sweetening agents are permitted within the EU school milk scheme but not in the German school milk programme. Price was included as an attribute to simulate a shopping situation. The average price of school milk in Germany is 35 cents for 250 ml. As previously mentioned, schools are typically catered by only one dairy company with a limited product range. Consequently, we did not include attributes such as brand or type of packaging. Overall, novel products represent those products that are not currently sold as school milk.

Combining four attributes and two respective three levels, 54 different product combinations (3*3*3*2) are possible. Choice scenarios were constructed using orthogonal main-effects designs in SPSS (compare Hensher et al., 2006, p.116), which led to 27 different product combinations. To facilitate respondents' decision-making process, these 27 product combinations were segmented into nine blocks with three choice sets each. A

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sample of a choice set from the CE is provided in table 2. Each respondent got three of these sets. To ensure a real life decision process the possibility not to choose any of the offered products was included.

Table 2: Sample choice set.

Please check the option that you would most likely purchase.			
Product attribute	**Novel school milk 250 ml**	**Novel yoghurt 150 ml**	**Conventional school milk 250 ml**
Price in cents	40	30	35
Fat content	0.3%	1.5%	3.5%
Sweetening agent	sweetener	sugar	sugar
I would choose.....	☐	☐	☐
I would not choose any of these products ☐ because _____			

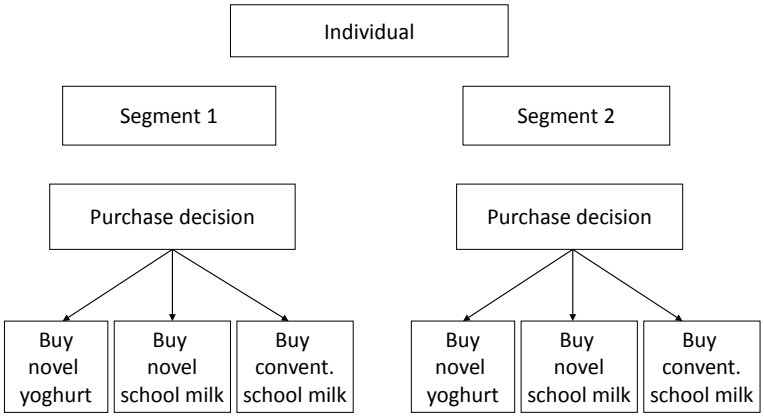
Source: Own illustration.

In a first step of the analysis the test of independence of irrelevant alternatives (IIA), the Hausman-Test, was carried out. The test showed clearly that a multinomial logit model is inappropriate for the data set. As the main research objective is to explain children's heterogeneity regarding their school milk choice a latent class model was applied.

Latent Class Model

The latent class model is an approach to account for preference heterogeneity among consumers. Based on observed (hypothetical) choices consumers are grouped into classes. The presentation of the latent class model follows Boxall & Adamowicz (2002) and Greene & Hensher (2003).

The utility function $U_{ni} = V_{ni} + \varepsilon_{ni}$ discussed earlier is the starting point for the Latent Class Model (LC). The underlying idea is graphically shown in figure 1.



Source: Based on Ryan and Skåtun (2004).

Figure 1: Decision process and basic idea of a Nested Logit Model.

The multinomial logit model can be used to estimate these probabilities under the assumption that the error term is following the extreme-value-type-I distribution.

Substituting a linear functional form of product attributes into the deterministic utility part, the probability results in a multinominal logitmodel

$$\pi_{\text{n}}(\text{i}) = \frac{\exp(\mu\beta X_i)}{\sum_{k \in C} \exp(\mu\beta X_k)}$$

Here μ is a scale parameter, normalized to unity and β is a vector of parameters to be estimated.

In the traditional multinomial logit model, a common vector β is estimated for all individuals. In the latent class model, it is supposed, though, that consumers are heterogeneous. The population consists of *S* classes or

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segments. If consumer *n* belongs to segment *s* (s=1, 2, ..., S), then the utility function can be specified as follows:

$$U_{ni|s} = \beta_s X_{ni} + \varepsilon_{ni|s}.$$

Therefore, parameters are class specific and the likelihood of choosing alternative *i* given that consumer *n* belongs to segment *s* results as

$$\pi_{ni|s}(i) = \frac{\exp(\mu_s \beta_s X_i)}{\sum_{k \in C} \exp(\mu_s \beta_s X_k)}$$

where $\beta_s \mu_s$ presents the class specific utility or scale parameter. It is important to note, that the classes are latent, that means they cannot be observed directly. Based on attitudinal factors identified in the factor analysis and possibly based on sociodemographic characteristics, the latent classes can be identified in the estimation procedure. The probability of belonging to a certain class can be specified with a multinominal logit model

$$\pi\,[\text{class=s}] = Q_{ns} = \frac{\exp(\theta'_s z_n)}{\sum^{S}_{s=1} \exp(\theta'_s z_n)} \text{ with } \theta_S = 0$$

Z_n is an optional set of person invariant characteristics. It is possible that the class specific probabilities are a set of fixed constants if there are no other observed characteristics. In our case the class probabilities are simply functions of *S* sets of parameters, θ_s, where the last one is fixed at zero.

Results

Questionnaire and data

The data used in the analysis were collected from an online survey developed in winter 2010/11 and completed by 509 German pupils aged 15 to 18 years. The questionnaire underwent cognitive pretesting. As pretesting showed that children under the age of 15 were overstrained by the CE, these children will not be considered in this analysis[2].

Youths were recruited by a market research agency and quotas concerning age (25% each), gender (50 % male, 50 % female), and region (25 % in North, South, East and West) were given in advance. Unfortunately, quota concerning age was not met. Eighteen years old youths were underrepresented, 15-17 years old were overrepresented.

The questionnaire consisted of three parts. The first part included information on regularly consumed milk products, preferred product attributes and general attitudes towards milk products and nutrition. Additionally, the question of whether the youths viewed themselves as overweight or too thin was posed. The second part consisted of a CE in which the respondents had three options in each choice set. The third part of the questionnaire contained socio-demographic variables, such as age, gender, household size, (im)migration background, school year and type of school.

In the beginning of the analysis correlation coefficients and cross tables were used to check variables for possible associations and to detect possible relationships between the variables that could influence the probability of choosing novel school milk products. Several significant but weak relationships (< 0.1 to 0.23 using Pearson's contingency coefficient) were found. Further information of the cross-tables can be send on request. Table 3 presents some descriptive characteristics of the data. Because of space limitations, only the variables that were regarded as having a significant influence after carrying out cross tables or correlations indices are presented. Further information on tested variables can be send on request. Regarding the body image it has to be mentioned that the numbers are based on self-assessment. Nevertheless, it cannot be determined whether these youths are actually over- or underweight.

Table 3: Sample characteristics.

[2] Younger children completed a pair comparison.

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Variable	Youths
Gender (1 if male, 0 if female)	50.0 %
Mean age (in years)	16.28 years
Mean household size (in persons)	3.64 persons
Number of brothers and sisters (in persons)	0.73 persons
Immigration background (1 if appropriate)	7.0 %
My figure is ok (1 if appropriate)	60.0 %
Think I'm too corpulent (1 if appropriate)	31.0 %
Think I'm too thin (1 if appropriate)	9.0 %
Low fat content is important (1 if appropriate)	47.0 %
Low sugar content is important (1 if appropriate)	55.0 %
Low calorie content is important (1 if appropriate)	44.0 %
Low price is important (1 if appropriate)	73.0 %
Product brand is important (1 if appropriate)	23.0 %
I like milk products (1 if appropriate)	92.0 %
Would like to eat milk products daily (1 if appropriate)	78.0 %
I'm interested in a healthy nutrition (1 if appropriate)	67.0 %
Care about good nutrition (1 if appropriate)	63.0 %
My parents take care that I consume enough milk products (1 if appropriate)	68.0 %
Might buy milk products at school (1 if appropriate)	76.0 %
Consume milk product at school (1 if appropriate)	56.0 %
Given a range of flavoured and plain milk products, I would choose a plain milk product (1 if appropriate)	7.3 %

Source: Own calculations.

Econometric results

In the choice experiment, calculated using NLOGIT 4.0, 24 youths (4.7%) refused to choose any of the three presented products. Their primary reasons were the ingredients (because of the sugar, fat, artificial sweetener or lactose) or a general refusal of (the presented) milk products. Hence, LC estimation was conducted with 485 youths (1,419 choices in total).

We estimated latent class models with 1, 2, 3, 4 and 5 class solutions to find out the appropriate solution. We used $\rho 2$, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) to answer that question. Table 4 presents their results as well as those of the log likelihood (LL) and the restricted log likelihood (LL0).

Table 4: Information on the converged latent segment models for the paper estimation

Seg.	Parameter	LL	LL0	ρ^2 1-(LL/LL0)	AIC -2(LL-P)	BIC -LL+(P/2)*lnN
2	16	-1334.447	-1558.93	0.14399813	1.90338	1.96266
3	27	-1256.370	-1558.93	0.19408184	1.80884	1.90888
4	38	-1216.097	-1558.93	0.21991558	1.76758	1.90838
5	49	-1198.174	-1558.93	0.23141257	1.75782	1.93938

Source: Own calculations.

Version with four classes can be accepted as suitable that is associated with the minimum BIC value. The AIC is still decreasing but at a lower rate than for a lower number of class, the same holds true for the $\rho 2$ values.

The results of LC estimation are presented in Table 5.

Table 5: Results of Latent Class Estimation.

	Class 1	Class 2	Class 3	Class 4
Number of respondents	129	123	118	139
Beta				
Novel School milk	1.856***	0.873***	1.372***	-1.081***
	(0.407)	(0.231)	(0.222)	(0.175)

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Yoghurt	-2.509***	2.713***	-0.512*	-2.042***
	(0.659)	(0.231)	(0.302)	(0.224)
Price	-0.379***	-0.080***	-0.046**	-0.134***
	(0.084)	(0.019)	(0.021)	(0.025)
Fat content	0.017	0.255***	-0.665***	0.181**
	(0.135)	(0.068)	(0.081)	(0.075)
Artificial sweetener	-2.067***	0.093	0.255	-1.281***
	(0.542)	(0.158)	(0.172)	(0.267)
Theta				
Constant	0.589	0.376	-0.807	-
	(0.647)	(0.493)	(0.709)	
Low price is important	-0.171	-1.194***	-1.101**	-
	(0.467)	(0.354)	(0.451)	
Low fat content is important	0.271	1.028***	3.019***	-
	(0.460)	(0.335)	(0.535)	
My figure is ok	-0.935**	-0.493	-0.740*	-
	(0.410)	(0.332)	(0.381)	
Would like to eat milk products daily	0.931*	-0.041	-0.406	-
	(0.560)	(0.385)	(0.453)	
Care about good nutrition	-1.651***	0.480	0.551	-
	(0.434)	(0.371)	(0.512)	

*,**,*** presents significance at the 0.1, 0.05, 0.01 level, standard error is written in parenthesis
Source: Own calculations.

The parameters to the attitudinal variables of the fourth class are normalized to zero. Parameters of the other three classes have to be interpreted in relation to this fourth class.

The first group, 129 pupils belong to this group, is the most price sensitive one and rejects most often products with artificial sweeteners. They prefer novel milk a lot but yoghurt is less liked compared to the other groups. They assess themselves rarely as having a normal weight and say that they do not care about good nutrition. But they would like to eat milk products daily.

The seconds group, with 123 respondents, is somewhere in between the other groups. On the one hand they argue that low fat contents are important for milk products on the other hand product utility of offered milk products increases with increasing fat contents. This is an interesting gap between stated opinion and behaviour. The presence of artificial sweetener has no considerable impact on product choice. Product utility of novel milk and yoghurt is higher compared with the conventional product. There is no significant influence of the body perception and the attention to healthy nutrition.

The third group is the smallest one. Characterizing for this group is that product utility declines the most with increasing fat content. This group prefers artificial sweetener considerably compared to sugar. However, this variable is not significant. As they also assess themselves rarely as having a normal weight it could be concluded that these youths try to reduce calories. All other groups are more price sensitive than this third group.

For the fourth group product utility decreases with both novel products and if artificial sweeteners are used. Utility increases with higher fat contents. This group prefers the already offered types of school milk.

Discussion

Milk drinks appear to be preferred over yoghurt for consumption at school by most of the respondents. This may arise by the easier handling and due to the higher chance to avoid to staine one's clothing compared to yoghurt because milk is served with a straw[3]. Christoph et al. (2012) conducted a pair comparison with children aged 10 to 14, and some respondents explicitly explained that they were afraid of making a mess when eating yoghurt and preferred milk for that reason. In another study conducted by Stead et al. (2011), British youths

[3] Children in Germany are typically provided with packages of school milk and a drinking straw. They do not receive the milk in a glass.

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between 13 and 16 explained in focus groups that a spoon is “not cool”. Because the novel yoghurt still has a higher level of utility compared to conventional milk, this finding appears to be less relevant to the respondents of our study.

As expected, children care about prices, as younger children already exhibit economic behaviour and understanding (Strauss, A., 1952; Webley, 2005; Weible et al., 2013). Hence, in this study, the price parameter is close to zero (-0.086). This result may be interpreted as an indication of low levels of price sensitivity due to the small differences among the three product prices (30, 35 and 40 cents).

The negative parameter for artificial sweeteners in two of the found classes is consistent with public discussions regarding artificial sweeteners in Germany. This ingredient is often considered unhealthy and unnecessary (Focus, 2011). The arguments raised in this context are that artificial sweeteners induce ravenous appetite, may trigger cancer and may promote attention deficit hyperactivity disorder (ADHD). Nevertheless, there is a lack of serious scientific studies proving these arguments (Academy of Nutrition and Dietetics, 2012; Shankar et al., 2013). As this artificially sweetened milk was chosen 278 times it is at least interesting for a minority of students. Many of the respondents, identifying themselves as overweight, appear to have general interest in lower-calorie milk products, such as low-fat and low-sugar products as well as products containing artificial sweeteners.

In the case of the fat content of the offered products three classes prefer higher fat contents (two significantly) and one lower ones. This implies that it is important to offer different fat levels for school milk products. Other studies also show the relevance of different fat levels. Porubcan and Vickers (2005) found that people do not like milk who perceive a “sour” taste. This perception increases with higher fat content and decreases with increasing levels of sucrose. Babicz-Zielinska (1999) found that Polish students increasingly prefer low-fat milk products rather than full-fat products. Kim et al. (2013) proved in a conjoint analysis that 1% and 2% fat content is the most desired with chocolate milk, followed by fat-free and whole milk. Lower-fat milk drinks may help to increase milk consumption of those pupils who do not like milk because of its sourness.

The variables price and fat content, satisfaction with the own figure, attention to good nutrition and the fact that milk products are preferred at all influence product decision as well. The found classes differ with respect these variables.

Conclusion

Aim of the paper was to analyse whether milk products provided in Germany meet pupils preferences in secondary school or whether they require a different range of milk products which could offer, in addition to the product range, some nutritional add-ons with respect to health like reduced fat content or artificial sweetener. School milk choices are driven by various factors, but the results of this paper are valid only for the limited product range tested. Other products, such as kefir and curd should be considered as well. Furthermore, this paper considers stated preferences so in the end revealed preferences might look different due to different factors like i.e. availability of products or contextual factors.

An apparent factor in the analysis is the existence of distinct groups within the age group considered. Four different groups of juveniles were found. The choice experiment clearly showed that most youths preferred different school milk products implying that conventional school milk no longer meets youth preferences and that modifying and widening the range of milk products offered in schools may be useful. Consideration of nutritional aspects (low sugar content, artificial sweetener and low fat content) and taste aspects are important to ensure successful modifications. When extending school-based programmes, it is important to allow youth to choose between different milk products as an active choice supports habit formation. In addition, politics may promote a wider product range comprising also healthier options so that behaviours may shift in a self-interested direction and not feel forced (compare Just and Wansink, 2009)

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