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## **Are diets healthier when they contain branded foods?**

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### **Abstract**

Purpose: Market trend data show a growing popularity of discount food stores and of cheaper food products as opposed to more expensive leading brands. Unexpectedly little is known about how these economic food choices affect diet quality and/or health. The aim of this study was therefore to examine differences in nutrient content and cost of daily food intake data modeled to contain food exclusively from either leading brands (LB), generic brands (GB) or discount brands (DB).

Methodology: This study analyzed nutrition information of 430 food products that were selected based on dietary intake data from a sub-sample of the Amsterdam Growth and Health Longitudinal Study. Data were collected in Dutch supermarkets, where information was copied from back-of-pack nutrition tables.

Findings: Results showed that there were no statistically significant differences between the LB, GB or DB daily intake models in energy (kJ), protein, carbohydrates, total fat, saturated fatty acids, fiber, or added sugar contents. However, there were significant differences in sodium content where LB had significant less sodium compared to GB and DB. Also, there were significant price differences: LB vs. GB +€2.75/day; LB vs. DB +€7.17/day; GB vs. DB +€4.42/day.

Originality/value: To our knowledge, this is the first study analyzing differences in nutrient content and price of leading, generic and discount food brand formats on a diet level. Our analysis revealed that there is little reason to suggest that dietary nutrient quality is negatively affected by an increased consumption of discount brand products. Indeed, the substantial price difference between leading and discount brands suggests that discount products provide a reasonable alternative to leading brands.

## **Introduction**

Numerous studies have shown a positive association between food quality and food price (e.g., healthier foods are generally more expensive) (Darmon & Maillot, 2010; Drewnowski, 2010). The first studies that revealed this positive association for both single foods and food groups were based on French data (Darmon, Darmon, Maillot, & Drewnowski, 2005; Darmon, Ferguson, & Briend, 2003; Maillot, Darmon, Darmon, Lafay, & Drewnowski, 2007), followed by similar findings in numerous later studies (Drewnowski, 2010; Katz et al., 2011). Generally, these studies compared the energy density (kcal/gram) and energy costs (price/kcal) of different food items and found that energy-dense products (high in fat and sugar) were relatively cheaper than more nutrient rich products such as fruits and vegetables. Moreover, at a diet level, studies showed that comparatively healthier diets are relatively more expensive than unhealthier diets (Cade, Upmeier, Calvert, & Greenwood, 1999; Drewnowski, Darmon, & Briend, 2004; Drewnowski, Monsivais, Maillot, & Darmon, 2007; Maillot, Darmon, Vieux, & Drewnowski, 2007; Waterlander, de Haas, et al., 2010).

While the studies mentioned above show a clear relationship between nutrient content and price, some issues remain unresolved. Most importantly, the cited studies did not take differences between individual products into account such as dissimilar nutrient contents and prices of cheaper versus more expensive brands. Analyses distinguishing product characteristics and nutrient content at brand level would be relevant for numerous reasons. First, Dutch market trend data show that the popularity of cheap discount stores is growing and that people buy more general or home brands compared to leading brands. For example, in 2009, 20% of the Dutch consumers switched from the leading brand to the cheaper brand of soft drinks and dairy products (Strien A. & Wierenga, 2009). Second, supermarkets add more of these lower cost options to their assortment and make effort to increase their sales (Strien A. & Wierenga, 2009). While consumers trust that cheaper home brands provide good quality and probably better value for money than more expensive brands (Strien A. &

Wierenga, 2009), unexpectedly little scientific evidence on this aspect is available. Also, it is uncertain how an increased consumption of cheaper brands could affect people's diet and/or health.

As mentioned above, evidence on the product characteristics of food items from different brands is relatively limited. The most comprehensive data come from a French study by Darmon *et al* that compared 220 food items from 17 food categories on nutritional quality and cost (Darmon, Caillavet, Joly, Maillot, & Drewnowski, 2009). The study found that, compared to the low-cost items, the branded products: cost 2.5 times more; had a similar energy and lipid content; and had a slightly higher ingredient quality score (Darmon et al., 2009). In addition, Cooper and Nelson performed a laboratory analysis on five frequently purchased products by low-income households and found that discount brands provide more nutrients per penny than leading brands (Cooper & Nelson, 2003). Finally, a recent study by Menard *et al* examined nutrient contents and other labeled nutrition parameters provided on the packaging of the 1,646 most consumed dairy products. They found that the nutrient content of the cheaper brand did not vary systematically from more expensive ones (Menard et al., 2012). While these studies provide a good first insight into quality differences between different food brands, the available evidence is limited to a small number of food products. Moreover, it is unclear how nutritional differences at product level impact on total nutrient intakes.

The increasing popularity of cheaper brands plus the small amount of studies examining the nutrient quality of different brands and/or the effects on diet quality and health warrants further research. Moreover, such analyses would increase transparency for consumers and might inspire manufacturer to reformulate their products (Lobstein & Davies, 2009; Roodenburg, Popkin, & Seidell, 2011; van Raaij, Hendriksen, & Verhagen, 2009). Therefore, the aim of this study was to examine the difference in nutrient content and price of daily food intake data designed to contain

food products exclusively from either leading brands (LB), generic brands (GB) or discount brands (DB).

## **Methods**

This study examined the difference in nutrient content and price of daily food intake data designed to contain food products exclusively from either leading brands (LB), generic brands (GB) or discount brands (DB). In addition, the nutrient values of these three daily intake models were evaluated against national dietary guidelines.

### *Sample of foods studied*

Our choice of food products was based on dietary intake data from a small sub-sample of the Amsterdam Growth and Health Longitudinal Study (AGHLS). The original aim of this study was to investigate the natural development of health, fitness and lifestyle in adolescents and young adults aged 13 to 36. More details about this on-going cohort study can be found elsewhere (Bakker, Twisk, van Mechelen, Mensink, & Kemper, 2003). In AGHLS, dietary intake was assessed using a computer assisted version of the face-to-face interview (FTF) method, using the preceding four weeks as a reference period. Subjects were asked about meal types, number of meals and times of meals consumption for both average school or work days, and weekends or holidays. Consumption amounts were recorded in household measures or grams for which models of glasses and spoons were used to illustrate portion sizes. The described method was validated and was found to be of similar quality as the original FTF method (Bakker et al., 2003).

AGHLS data were collected in the year 2000 and included n=698 subjects (mean age = 36). However, since it was unfeasible to model dietary intake data for such a large sample (e.g., making three models where each consumed product was designed to be of one brand type), we selected a smaller subsample. Selection criteria for this subsample were based on income (below the median gross annual income of the Netherlands, <€25,000, since the study outcomes are most relevant to this group) and a normal calorie intake (within one SD of the mean of 9327 kJ/day). The final

sample included n=40 participants who reported having consumed a total of 430 different individual food products (Figure 1).

#### *Selection of brands and nutrition information*

We collected the nutrition information from the LB, GB and DB option for all 430 products by copying the back-of-pack nutrition information panels (NIP). The collected nutrient values included energy (kJ), protein (g/100g), carbohydrates (g/100g), mono- and disaccharides (g/100g), total fat (g/100g), saturated fatty acids (SFA, g/100g), monounsaturated fatty acids (MUFA; g/100g) polyunsaturated fatty acids (PUFA; g/100g), trans fatty acids (TFA; g/100g), fiber (g/100g) and sodium (g/100g). We also collected details on package content (g), price (€), added sugar (yes/no) and added sodium (yes/no).

LB were defined as well-known national or international brands that are sold by various retailers. GB were home brands sold under the retailer's name (for example Albert Heijn). DB were the cheapest product alternative (e.g., Euro Shopper or C1000 Basic product range). Data were collected in the two supermarkets with the largest market share in the Netherlands. When these stores had no DB available, we first went to the main discount store (e.g, Aldi) to assess that item and, when the item also was not available there, to a Lidl store. While Lidl also sells LB, these were not assessed as their market share is considerably lower as the other two supermarkets, and only a few DB were assessed in Lidl stores. Aldi does not sell LB. For some products, multiple leading brands were available (e.g., Coca Cola and Pepsi Cola). In such cases we selected the brand with the highest market share using data from a large retailers' specialist journal (DistriFood, 2011). In addition, for some products no LB, GB and/or DB option was available. For products where only one brand type was available, we used the values of the accessible brand in all three models. Finally, for fresh products, such as fruits and vegetables (for which no brand distinction could be made) nutrient values were taken from the Dutch Food Composition Database (Dutch Nutrition

Center (Voedingscentrum), 2006) and prices were collected within a two-week period in the winter of 2011 (Figure 1).

### *Statistical analysis*

Dietary intake data from the 40 subjects were modeled to contain either products exclusively from LB, GB or DB. For each model we then calculated the total nutrient intake for the listed nutrients. MUFA, PUFA, mono and disaccharides and added salt were excluded from analysis due to many missing values (>30%) (Table1). Differences in nutrient intakes between the three models were analyzed using one-way ANOVA followed by Bonferroni post-hoc tests. Sodium values were log-transformed, since they showed a non-normal distribution. Furthermore, price values had unequal variances and this outcome was therefore analyzed using Mann Whitney U tests. Subsequently, we conducted a sensitivity analysis excluding values for fresh products (e.g., that have no brand differentiation). Finally, we analyzed to what extent each of the three models adhered to the national dietary recommendations as provided by the Dutch Public Health Council (Public Health Council (Gezondheidsraad), 2006) using Chi-square tests. All analyses were conducted using SPSS Statistical Software (version 15.0, SPSS Inc, Chicago, IL).

## Results

### *Available nutrient information*

Results revealed that all examined food products displayed information on energy content, protein, carbohydrates and saturated fat on their nutrition label. However, of all tested nutrients, at least one nutrient value was missing for 10.7% of the products (Table 1). There were no clear differences in nutrient value information between the different brand types, except for TFA values that were present on 43% of the GB products and only on 28% of the LB and DB products.

### *Comparison between the three dietary intake models*

Table 2 shows mean daily nutrient intake values and prices for all three dietary intake models (LB, GB, DB). The LB model had significantly lower sodium contents compared to the GB and DB models ( $p=.003$ ). Also, the LB model was significantly more expensive compared to the GB (+€2.75/day,  $p<.001$ ) and DB models (+€7.17/day,  $p<.001$ ). Likewise, the GB model was significantly more expensive than the DB model (+ €4.42/day,  $p<.001$ ). No statistically significant differences in any other nutrient intake values were observed between the three models. Moreover, sensitivity analyses excluding fresh products (which have no brand differentiation) showed similar outcomes.

### *Comparison with daily intake recommendations*

Table 3 shows how well the three daily intake models (LB, GB, DB) complied with national daily intake recommendations as provided by the Dutch Public Health Council (Public Health Council (Gezondheidsraad), 2006). Here we also made a distinction between dietary recommendations for men and women. Again, statistically significant differences between the three models were only observed for sodium intakes. However, it must be noted that the LB and GB model complied clearly better with carbohydrate recommendations than the DB model. Also, the LB model scored notably higher on fiber intake. On the other hand, DB scored evidently best on total fat and saturated fatty acid intakes.

## Discussion

This study examined the difference in nutrient content and price of real daily food intake data modeled to contain food products exclusively from either leading brands (LB), generic brands (GB) or discount brands (DB). Data included  $n=40$  diets and  $n=430$  food products. Results revealed that daily intake models designed containing exclusively discount brands were significantly cheaper but had, except for sodium, similar nutrient contents compared to daily intake models designed containing leading or generic brands. While there were some observable differences in other nutrient contents, these were not statistically significant and had different directions for different nutrients. These results indicate that discount brands are both an economic and good quality option for people with limited financial resources.

To our best knowledge, this is the first study modeling the nutrient content of actual food intake data into three different food brand formats (e.g., LB, GB, DB). A strength of our study is that we included a large number of products ( $n=430$ ) in our analysis and were able to evaluate energy value (kJ), protein, carbohydrates, total fat, SFA, fiber, sodium, added sugar and price (€). Generally, we found that the daily intake models containing exclusively leading brands were 1.8 times more expensive, but had, except for sodium, similar contents for all the listed nutrients as the discount brand models. These results are important in the context of food pricing research and further confirm some earlier findings on this topic. Darmon *et al* examined nutritional quality and cost for 220 single food products. They studied price, energy value, protein, fat and carbohydrate contents (Darmon et al., 2009). In addition, they examined the ingredient list by developing an ingredient quality score for each food category. Food products were given +1 for an ingredient improving the quality and -1 for the converse. For example, a positive criteria for vegetable soup was the position of vegetables in the list of ingredients and a negative criteria the presence of animal fat. This study found that the branded products cost 2.5 times more than the low-cost products, for an equivalent energy and lipid content, and a slightly higher (1.3 times) ingredient quality score (Darmon et al.,

2009). Cooper and Nelson performed a laboratory analysis on five frequently purchased products by low-income households (tinned tomatoes, long-life orange juice, potatoes, sausages and white bread). Nutrients analyzed in this study were fat, sodium, potassium, iron, calcium, vitamin C, and energy (Cooper & Nelson, 2003). The authors found that discount brands provide more nutrients per penny than leading brands (e.g., 3.2 to 3.5 times better value for money). In many cases, the lower cost options were even found to be nutritionally superior. Finally, Menard *et al* examined nutrient contents and other labeled nutrition parameters provided on the packaging of the 1,646 most consumed dairy products. They included energy values, protein, fat, saturates, carbohydrate, sugars, dietary fiber, calcium and sodium in their analysis. This study found that the nutrient content of the cheaper brand did not vary systematically from more expensive ones (Menard *et al.*, 2012).

The results listed above show that there are limited reasons to suggest that leading brands provide better nutrient quality for money than cheaper brands nor that the consumption of cheaper brands may lead to a diet that is less nutritious. A limitation of our study is that it only focused on eight macro-nutrients leaving out other factors that may distinguish product quality of more expensive brands such as high quality ingredients, vitamins, minerals or additives. However, Darmon *et al.* did examine the complete ingredient list of 220 food products and found no clear differences between the brand types either (Darmon *et al.*, 2009). Moreover, Cooper *et al.* did include potassium, iron, calcium and vitamin C in their analysis, again with no observed differences between the brand types. An explanation for the relative similar nutrient contents of different brand types is that there is mostly one single manufacturer behind different brands, meaning that leading and generic brand types are produced in the same factory. In addition, the cost of food ingredients is low in relation to other factors such as packaging, transport and advertising (Jackson, Minjares, Naumoff, Shrimali, & Martin, 2009; Nestle, 2007). This basically means that the higher prices of branded products is not explained by a superior quality but more by the high marketing and packaging costs. Nevertheless,

we did find that LB had significant lower sodium contents. Decreased sodium consumption is associated with improved health outcomes and therefore an important component of a healthy diet (Taylor, Ashton, Moxham, Hooper, & Ebrahim, 2011). Processed foods generally contain high levels of sodium, particularly because this is a cheap ingredient that improves the taste and texture of products (McGuire, 2010). In response to growing public health concerns, some food manufacturers have started reformulating their food products with a key focus on sodium (Vyth, Steenhuis, Roodenburg, Brug, & Seidell, 2010). Since reformulation is a costly process, it is likely that this primarily happened in leading brands, which could explain our findings.

A second limitation of our study is that our analyses were based on the nutritional values that were listed on the food package. These numbers may not display the precise nutrient content of the product. The current European guidelines state that the declared values can be average values based on a) the manufactures' analysis of food; b) a calculation from the known or actual average values of the ingredients used or; c) a calculation from generally established and accepted data (Official Journal of the European Communities, 1990). So in theory, manufactures can use the same data to calculate the nutrient contents of their branded and non-branded products from which the differences in nutrient values between these products is expected to be small. A better way to determine the nutrient content of food products would therefore be an objective laboratory analysis; however this method is very costly and was not feasible for our study. Nevertheless, if manufactures of leading brand products do in fact invest a lot of time and money to improve the products' nutrient profile, it can be expected that they highlight this on the package instead of using average nutrient values.

A strength of our study was that we used actual food intake data and that we were therefore able to model the impact of differences in nutrient qualities between single food products on a diet level.

Likewise, the studied food products were not a random sample, but represented foods that were consumed by our study population. Nevertheless, the studied number of diets in this study was relatively small (n=40) making it less likely to detect any statistical significant differences. For example, the average fibre content in LB diets was 28 gram versus 26 en 25 gram in the GB and DB diets respectively, which seems to be a relevant difference. Nevertheless, the number of products studied was much larger than that in previous studies and the price differences for the three brand formats show clear statistical significant results.

## **Conclusion**

Price is one of the most important factors in food choice and especially people with a lower socio economic status may experience barriers in selecting certain foods (Inglis, Ball, & Crawford, 2005; Steenhuis, Waterlander, & de Mul, 2011; Waterlander, de Mul, Schuit, Seidell, & Steenhuis, 2010). The current worldwide financial crisis makes that the purchasing power of many consumers is declining and that a growing number of consumers is forced to make economic driven food choices. Dutch market trend data show that the popularity of cheap discount stores is growing and that people buy more general or home brands compared to leading brands (Strien A. & Wierenga, 2009). So far, there was limited evidence showing how these economic food choices would affect diet quality. The large and persistent social inequalities in obesity and overweight by education level and socio-economic status in OECD countries warrant close examination of economic food choices on nutrient intake and health (Devaux & Sassi, 2012).

This study shows that there is little reason to suggest that the nutrient quality of peoples' diets is negatively affected by an increased consumption of discount brand products, except maybe for sodium. The large price difference between leading and discount brand products suggests that discount products are a reasonable alternative for leading brands. Further work is needed to determine the difference in nutrient quality between different brands more closely; here there is a

particular need for studies that examine the nutrient contents of foods objectively (e.g., laboratory analysis).

**Conflict of interest**

The authors declare they have no conflicts of interest.

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