

A NEW FRAMEWORK FOR THE ANALYSIS OF HOUSEHOLD FOOD CONSUMPTION DATA: A CONSUMER- ORIENTED CLASSIFICATION SYSTEM FOR HOME MEAL REPLACEMENTS¹

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Abstract

A previously developed classification system for Home Meal Replacements (HMR) based on household convenience criteria was used to analyse the data from the 1997-98 Dutch National Food Consumption Survey (DNFCS). All HMR consumed by the 2.774 surveyed households were classified in a 4x4 'shelf-life' by 'required preparation' matrix. The number of households using HMR and the consumption frequency per product were tallied and sorted per matrix class. Results indicate that Dutch HMR consumption was low and concentrated in a handful of products. The developed system proved to be a valuable framework for a convenience-based analysis of household food consumption.

Keywords: Classification, convenience, food consumption analysis, Home Meal Replacements.

1. INTRODUCTION

1.1 THE NEED FOR SPEED

Of the many trends assigned to today's "Western" food consumer by marketers and manufacturers, lack of time is certainly the one we can least argue against. For most of the active population there is not much time to eat and even less for shopping and cooking. According to Hollingsworth (1997), 60% of the US consumers do not know at 4 p.m. of a week day what they will do for dinner, but expect to lose only about 30 minutes with its preparation, cooking, eating and cleaning up. Moreover, 40% of Americans consider cooking at home a bother and meal preparation a highly time-consuming activity (Sloan, 1997). This trend has also been extensively reported in EU countries, along with

increasingly shorter shopping cycles (Dade, 1992; Datamonitor, 1998; McHugh *et al.*, 1991; Ritson & Hutchins, 1995).

However, and in spite of the generalised “need for speed”, consumers do not always seem ready to compromise the pleasure of eating a tasty meal for the sake of earning extra time. According to Sloan (1997), there are indeed situations in which American consumers willingly spend time preparing and eating meals, for instance on weekends or if they have guests. Eating remains a key part of leisure or socialising, as well as a valued personal experience (Marshall, 1995; Gofton, 1995; Datamonitor, 1998). It is, thus, not surprising that there is a growing interest of all food chain partakers - manufacturers, caterers and retailers alike-, in supplying high-quality meals that can bring more choice for the hurried consumer (Bond, 1992; Larson, 1998).

1.2 WHAT ARE HOME MEAL REPLACEMENTS?

The concept of Home Meal Replacements (HMR) was created in the US to designate meals that have been produced away from home for household consumption (Datamonitor, 1998; Ghazala, 1999). This concept, or food category, has been recently redefined (Costa *et al.*, 2000a), in order to clarify its domain and increase its degree of consumer orientation. According to Costa *et al.* (2000a), *HMR are main courses or pre-assembled main course components of a meal - a protein (animal/plant), a carbohydrate (starch) and a vegetable source -, in single or multiple portion containers, designed to fully and speedily replace the main course of a home-made main meal.* This concept excludes, therefore, main course components packed in non-assembled, separate containers as well as all kinds of desserts, breakfast cereals, yoghurts, candy bars, etc. Some snacks (foods usually eaten in-between main meals), starters, soups or salads can be considered as HMR as long as they respect the readiness and compositional requisites set by the definition and can be regarded by consumers as a meal’s main dish (Costa *et al.*, 2000a).

The benefits of this redefinition are twofold: it considers the meals’ production chain from the consumer’s (and not the supplier’s) perspective, making no distinction between technological

processes or distribution channels, and thus reflects better the current integration movements (both horizontal and vertical) within food chains.

1.3 A CONSUMER-ORIENTED CLASSIFICATION SYSTEM FOR HMR: DEVELOPMENT, VALIDATION AND APPLICATION

A study has been conducted with the aim of developing tools which, by meaningfully linking consumer perceptions, product attributes and enabling technologies, could help streamline consumer-oriented food product development and marketing. The result of that study was the development and validation of a convenience-based, consumer-oriented classification system for HMR (Costa et al., 2000a).

Regarding the classification's development, two convenience attributes were chosen as classifying criteria for Home Meal Replacements - shelf-life (S_n) and the level of preparation required before consumption (C_n). The shelf-life criterion encompassed the convenience aspect of storage extension. For this purpose 'shelf-life' was defined as the period within which an HMR can be kept by the consumer at home, under the recommended storage conditions, without it being rendered unfit for consumption. Taking into account the shelf-life range displayed by commercialised HMR products, four shelf-life classes were chosen:

- $S_1 < 1.5$ weeks
- $1.5 \text{ weeks} \leq S_2 < 1.5$ months
- $1.5 \text{ months} \leq S_3 < 1.5$ years
- $S_4 \geq 1.5$ years.

Within the criterion related to the level of preparation, and based on the range of preparation activities displayed by commercialised HMR products, four classes (C_1 to C_4) were defined (Table 1). This definition explicitly encompassed the HMR regeneration process – the time/temperature couple required for bringing a HMR to a state of readiness for consumption-, which was 'translated' as the consumer preparation instructions displayed in the products' package. Additionally, it implicitly

included storage/preservation methods, since relationships between these methods and the levels of required preparation described by the classes could be established (Pepper, 1980). From C1 to C4, classes have an increasing level of time, appliances and energy inputs required before consumption. Culinary skills were kept minimal throughout the classes, except for C4, where higher cooking expertise or the addition of other ingredients may be required. Other aspects of convenience such as reduced time and effort in purchasing and logistic activities, the meaning of “convenience” for different groups of consumers/customers or the situational context in which meals are taken, were not considered. The pre-assembly aspect was already contemplated in the HMR definition presented (Costa et al., 2000a).

CONVENIENCE CLASS	DESCRIPTION	EXAMPLES OF COMMERCIALISED PRODUCTS
<i>Ready to eat (C1)</i>	HMR consumed as purchased, requiring no prior preparation	Chilled sandwiches and salads, chilled pies, canned salads, take-away main courses and snacks
<i>Ready to heat (C2)</i>	HMR requiring only mild heating ^a before consumption (includes products processed up to a stage rendering them fit for immediate consumption after thawing or warm water addition)	Chilled pizzas and other main courses, frozen pizzas, frozen main courses and snacks or soups, dehydrated soups and spaghetti dishes, canned soups and main courses.
<i>Ready to end-cook (C3)</i>	HMR requiring sufficient heating ^b to finalise cooking before consumption.	Chilled and frozen lasagne, some frozen menus, dehydrated pasta dishes.
<i>Ready to cook (C4)</i>	HMR which have been minimally prepared for cooking (trimmed, shelled, peeled, cut, washed, etc.) but still require full cooking of some or all of its components	Frozen seafood paella, raw chilled meat/fish cuts with side dishes, raw frozen fish cut with breadcrumbs and vegetable sauce.

^a ≤15 minutes in a pan, or ≤ 20 minutes in a conventional oven/“au bain marie”, or ≤ 10 minutes in a microwave oven

^b > 15 minutes in a pan, or > 20 minutes in a conventional oven/“au bain marie”, or >10 minutes in a microwave oven

Table 1 – Four convenience classes for a HMR classification system (Costa et al. 2000a).

Finally, the two chosen criteria were arranged in a four by four ‘shelf-life by preparation required’ matrix structure ($S_4 \times C_4$). This was thought to better enable HMR classification according to these criteria. The matrix structure provided a higher level of detail by extending the number of classes from eight (the 4+4 granted by a separate criteria use) to sixteen. This matrix system was expected to classify all products defined as HMR without ambiguities (Costa et al., 2000a).

Pearson et al. (1985) have developed, validated and made use of a degree-of-readiness classification system to analyse the food consumption data from the household portion of the 1977-78 USDA Nationwide Food Consumption Survey. In order to demonstrate the validity of the approach followed, Costa et al (2000a) tested their HMR classification system with the help of the testing methodology developed by Pearson et al. (1985). This validity test demonstrated that the convenience criteria chosen and its organisation in a matrix structure provided a sound and effective classification system for the universe of Home Meal Replacements considered. (Costa et al., 2000a).

The validation procedure followed implied the allocation of HMR products selected from the 1997-98 Dutch National Food Consumption Survey (DNFCS) database to the classification system (Voedingscentrum, 1999). Hence, Costa et al. (2000a, 2000b) were able to, based on the methodology developed by Pearson et al. (1985), directly apply the developed system as framework in a convenience-based qualitative analysis of Dutch HMR consumption. In order to facilitate this analysis, the number of HMR products allocated to each class combination during validation was calculated in a percentage form. The results of this qualitative analysis are displayed in Table 2 (Costa et al., 2000a; Costa et al., 2000b).

The convenience-based qualitative analysis performed pointed out that the use of a narrow range of HMR was characteristic of Dutch food consumption in 1997-98. Moreover, it revealed the concentration of HMR consumption at two convenience levels: top convenience products with minimum shelf-life ($S_1 \times C_1$), mainly sandwiches and prepared meals supplied by foodservice, and long durability convenient meals ($S_3 \times C_2/S_4 \times C_2$), mostly frozen or canned ethnic meals (Costa et al., 2000a; Costa et al., 2000b).

	C1 Ready to eat	C2 Ready to heat	C3 Ready to end-cook	C4 Ready to cook
S1 Shelf-life < 1.5 weeks	32 (18 %)	2 (1 %)	0	0
S2 1.5 weeks ≤ shelf-life < 1.5 months	11 (6 %)	11 (6 %)	3 (2 %)	0
S3 1.5 months ≤ shelf-life < 1.5 years	2 (1 %)	55 (32 %)	14 (8 %)	0
S4 Shelf-life ≥ 1.5 years	0	41 (24 %)	3 (2 %)	0

Table 2 – HMR classification system displaying the allocation of the 174 HMR products and the percentage of products per $C_n \times S_{n(n=1,\dots,4)}$ class (Costa et al., 2000a).

Three possible explanations for these results have been provided (Costa et al., 2000a; Costa et al., 2000b). The first explanation is that the results obtained are an artefact caused by the HMR classification system. This hypothesis can only be dismissed once the classification's validity with other product lists (i.e., its reproducibility) has been verified. The reproducibility of the developed HMR classification system is currently being tested and its results will be reported in the near future (Costa et al., 2000 a).

The second explanation is that the concentration of Dutch HMR consumption is an artefact caused by the data sample used – the DNFCS qualitative results. This is highly unlikely since the survey was carefully designed to provide a representative picture of Dutch nation-wide food consumption in the years of 1997-98 (Voedingscentrum, 1999). However, we can not completely dismiss this hypothesis since no comparable surveys were performed at the time with representative samples of the Dutch population (Costa et al., 2000a).

The last, and most likely, explanation is that indeed Dutch HMR consumption in 1997-98 was practically limited to products belonging to the two referred convenience levels (and probably still is today), although many other products with different convenience levels were widely available (Costa

et al., 2000a; Costa et al., 2000b). This hypothesis is partially corroborated by ready meals' (the manufacture share of HMR) sales for The Netherlands in 1997-98, in which canned and frozen ready meals together represented over 70% of total sales volume (Datamonitor, 1998). This can be either due to the nature of Dutch consumer preferences or to the characteristics of the HMR assortment available. How much each of these causes actually contributes to such concentration in HMR consumption and ready meals' sales is a topic worthy of further investigation (Costa et al., 2000a; Costa et al., 2000b). Nevertheless, it should be mentioned that forecasts for the next three years indicate that while frozen meals will still represent half of total ready meals' sales, chilled meals will gradually surpass their canned counterparts as the second most sold ready meals in The Netherlands (Datamonitor, 1998).

The qualitative analysis of Dutch HMR consumption in 1997-98 through the use of the developed classification highlighted a mismatch between the diversity of convenience levels inherent to current HMR offer and the narrowness of those inherent to the products actually consumed. It therefore demonstrates that such a system can provide valuable guidance for more consumer-oriented food product development and marketing activities (Costa et al., 2000a; Costa et al., 2000b).

1.4 AIM

The aims of the study described in this paper are:

- To use a previously developed and validated classification system (Costa et al., 2000a) as a framework for a quantitative analysis of the Dutch household HMR consumption in 1997-98;
- Based on the results of this quantitative analysis, to verify the hypothesis presented in previous studies (Costa et al.2000a; Costa et al. 2000b), which states that the Dutch household HMR consumption in 1997-98 was (and to a certain extent probably still is today) highly concentrated in two specific convenience levels ;
- To evaluate the use of the HMR classification system developed as a framework for the analysis of household food consumption data.

2. APPLYING THE HMR CLASSIFICATION SYSTEM IN AN ANALYSIS OF THE DUTCH HOUSEHOLD FOOD CONSUMPTION

2.1 METHODOLOGIE

In order to quantitatively analyse the 1997-98 Dutch household HMR consumption using the developed classification system (Costa et al.2000a), we employed the methodology developed by Pearson et al. (1985) in their study of food's degree of readiness for consumption. In the first step of this procedure we have resorted to the Dutch National Food Consumption Survey 1997-98's (DNFCS) database to obtain an HMR product list. The DNFCS database records the types of food consumed by a representative sample of the Dutch population during the surveyed period, and contains about 3100 items. More specifically, it records all the foods reported to have been eaten, either at home or outside, at least once by one of the respondents during the survey (the 2-day food consumption diary method) (Voedingscentrum, 1999). It does not contain, however, any information regarding the quantities of each recorded food product that have been consumed during the survey. From the DNFCS database, and with the help of a Dutch dietician, all food products complying with the given HMR definition (174 items) were selected and its description recorded. Next, information about shelf-life and required preparation for the manufactured share of the 174 items was collected directly from the packaging of products displayed in supermarkets. In this way the information level was the same as that available to consumers. HMR products that can only be bought at a foodservice outlet and are intended for immediate consumption were given a shelf-life of one day. It was assumed that they did not require any further preparation before consumption. Finally, each item was classified according to the pre-defined criteria and assigned to its respective $S_n \times C_{n, (n=1, \dots, 4)}$ class combination within the matrix system (Costa et al.2000a).

In a second stage, the food consumption diaries of 2.774 Dutch households were screened for in-house HMR consumption¹. All the households in which one or more of the 174 products previously chosen was consumed during the 2 days of the survey were selected, and its HMR consumption (type of product and frequency of consumption) recorded. The household identification code and the demographic characteristics of the household member (s) who actually consumed the product were

also recorded. The number of households using HMR in each of the $S_n \times C_{n, (n=1, \dots, 4)}$ class combination within the developed matrix system was tallied, as well as the number of households using each of the HMR products. These products were then arranged in descending order by frequency of households consuming each item and the ten most frequently consumed HMR were sorted by its position within the matrix-shaped classification system.

2.3 RESULTS AND DISCUSSION

A total number of 388 Dutch households consumed HMR products during the 1997-98 National Food Consumption Survey, which represents only approximately 14% of the households participating in the survey. This result is corroborated by the results of DNFCS itself, which show that the group of 'samengestelde gerechten' (a category of foods roughly comparable to the HMR category) was not even among the 10 most used nutritional food groups in The Netherlands (Voedingscentrum, 1999).

Table 3 shows the number and percentage of households using HMR products in each of the $S_n \times C_{n, (n=1, \dots, 4)}$ class combination within the classification matrix system. The percentages displayed add to more than 100% since there were households that during the survey consumed HMR products belonging to different class combinations. This overlapping was, however, not relevant, and it was limited to the class combinations $S_3 \times C_2$ and $S_4 \times C_2$. This may indicate that Dutch households consistently choose to consume HMR products with the same level of shelf-life and convenience in preparation. However, no definite conclusions can be drawn regarding this matter, since the DNFCS was limited both in time-span and the number of participating households.

The results shown in Table 3 confirm to a large extent the results displayed in Table 2 and, therefore, the conclusions of the qualitative analysis of Dutch household HMR consumption previously presented (Costa et al., 2000a; Costa et al., 2000b). The Dutch HMR household consumption in 1997-98 was, both from a qualitative and a quantitative point of view, concentrated in two well-defined levels of convenience. These levels were, more concretely, top convenience products with minimum shelf-life ($S_1 \times C_1$), mainly sandwiches and prepared meals supplied by foodservice,

and long durability convenient meals ($S_3 \times C_2/S_4 \times C_2$), mostly frozen or canned ethnic meals (Costa et al., 2000a; Costa et al., 2000b).

	C1 Ready to eat	C2 Ready to heat	C3 Ready to end-cook	C4 Ready to cook
S1 Shelf-life < 1.5 weeks	140 (36 %)	19 (5 %)	0	0
S2 1.5 weeks ≤ shelf-life < 1.5 months	15 (4 %)	21 (5 %)	6 (2 %)	0
S3 1.5 months ≤ shelf-life < 1.5 years	0 (0 %)	95 (25 %)	30 (8 %)	0
S4 Shelf-life ≥ 1.5 years	0	91 (24 %)	9 (2 %)	0

Table 3 – HMR classification system displaying the number and percentage of surveyed households using HMR products in each $C_n \times S_{n(n=1,\dots,4)}$ class (total number of households = 388).

Differences between the values presented in Tables 2 and 3 were only relevant (above 2%) for class combinations $S_1 \times C_1$, $S_1 \times C_2$ and $S_3 \times C_2$. These differences indicate that the importance of the consumption of top convenience products with minimum shelf-life was reinforced by the quantitative analysis, namely in what regards the consumption of chilled ready meals and, above all, the consumption of HMR supplied via the foodservice.

Only 150 out of the 174 food products initially selected from the DNFCS's database as HMR could be traced back in the household diaries. This discrepancy was due to inaccuracies existing in the database and the exclusion of some products from the HMR category after concluding that the surveyed households had not seen them as complete main courses. Table 4 shows the six most frequently consumed types of HMR in the surveyed households, the percentage of households that have consumed these items and their respective classification in the matrix system. These results show that 74% of the households participating in the DNFCS consumed HMR only within four main groups

of products – take-away meals, frozen pizzas, canned soups and chilled ready meals. These groups were all belonging to HMR classes that require none to minimal preparation before consumption (C_1 and C_2), but displayed a wide range of shelf-life when classified according to the shelf-life criteria (S_1 to S_4).

The results obtained with both the qualitative and quantitative analysis support the widely accepted idea that there are currently two main trends in HMR consumption in The Netherlands, and in Western Europe in general. On one hand, there is a steady increase in the consumption of chilled ready meals – at the expense of their canned and frozen counterparts -, and on the other hand there is a sharp increase of HMR consumption *via* the foodservice and/or Internet ordering. Both of these trends (or threats?) should be very carefully considered by more conventional food manufacturers (Datamonitor, 1998).

Top 6 HMR products	Percentage of consuming households	Classification
Chinese take-away meals	24 %	$S_1 \times C_1$
Frozen pizzas	17 %	$S_3 \times C_2$
Canned soups	17 %	$S_4 \times C_2$
Take-away pizzas	6 %	$S_1 \times C_1$
Chilled ethnic and Dutch ready meals	5 %	$S_1 \times C_2$
Chilled ethnic and Dutch ready meals	5 %	$S_2 \times C_2$

Table 4 – The six most frequently consumed types of HMR consumed by the DNFCS' households, the percentage of households that have consumed those items and its respective classification (total number of consuming households = 426).

Once more the conclusions of the qualitative analysis of Dutch household HMR consumption previously presented were confirmed (Costa et al., 2000a; Costa et al., 2000b). The HMR consumed in

1997-98 in Dutch households consisted only of a handful of products (mostly ethnic meals) that display a consistently high level of convenience regarding the preparation they require before consumption. The range of shelf-life exhibited by these main products is somewhat wider but tends to concentrate either on products with minimum shelf-life - 35 % of the consumed products belonged to class S_1 -, or on products with long durability (34% of the consumed products in classes S_3 and S_4).

3. CONCLUSIONS AND FUTURE RESEARCH

The study reported in this paper showed that the consumption of HMR products in Dutch households in 1997-98 was low, and concentrated in a handful of products with a restricted convenience level. This trend in Dutch HMR consumption is very likely to be found still today. Therefore, the quantitative results presented here support the hypothesis put forward in the previous qualitative analysis of HMR household consumption in The Netherlands (Costa et al., 2000a; Costa et al., 2000b).

The developed HMR classification system (Costa et al., 2000a) proved to be a valuable framework for a convenience-based analysis of household food consumption. In future research in this area we will consider the uncovering of potential relationships between Dutch household HMR consumption, as discussed in this paper, and consumers' socio-demographic characteristics. This research is expected to highlight areas where the introduction of new, more consumer-oriented food products and marketing strategies could bring great benefit.

ⁱ Each household participating in DNFCs was given two different diaries to record the household members' food consumption during the two days of the survey: an individual diary for individual, out of the house food consumption, and a household diary for in-house consumption of all household members (Voedingscentrum, 1999).

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