Food service in hospital: an indicative model for patient satisfaction.

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Abstract

Purpose: The aim of this research was to explore the antecedents to patient satisfaction with food quality within a hospital setting and develop an indicative model.

Methodology: A consumer opinion card concentrating on the quality indicators of core foods was used to measure patient satisfaction and compare two systems of delivery; plate and trolley.

Findings: Results show that the bulk trolley method of food distribution enables all foods to have a better texture, and for some foods (potato, poached fish and minced beef) temperature, and for other foods (broccoli, carrots, and poached fish) flavour than the plate system of delivery, where flavour is associated with bad opinion or dissatisfaction.

Practical implications: This research confirms patient satisfaction is enhanced by choice at the point of consumption; however, portion size was not the controlling dimension. Temperature and texture were the most important attributes which measure patient satisfaction with food, therefore defining the focus for hospital food service managers.

Originality: An indicative model outlining patient satisfaction with hospital food service has not been previously published and adds to the body of knowledge in this field.

Key Words patient satisfaction, food service, food quality, research paper

Total word count

Introduction

The provision of hospital meals is a complex and difficult operation, perhaps the most diverse within the healthcare industry, aggravated by the number of stakeholders. Catering systems can have a major impact on the nutritional intake of hospitalised patients where the potential for malnutrition is well recognised (McWhirter and Pennington, 1994; Mowe *et al,* 2006). An essential component in successful catering management is customer satisfaction; however, in a hospital setting, this is a complicated phenomenon and influenced by many factors. The public generally view hospitals as institutions and institutional catering has a reputation for being poor (Bender, 1984). Customer satisfaction with hospital food service is multifactorial and difficult to assess, particularly as each patient has his or her own expectations. Some studies report that food quality is the most important indicator (Dubé *et al.*, 1994; O'Hara *et al.*, 1997; Lau and Gregoire, 1998; Hwang *et al.*, 2003) while other studies suggest that 'interpersonal' or service aspects are the most pertinent (DeLuco and Cremer, 1990; Gregoire, 1994; Bélanger and Dubé, 1996). Previous research has shown that food preference and acceptance constitutes 50% of the variability in consumption (Cardello *et al*, 1996), and is not only a result of the intrinsic quality of the food; but can also be related to consumer expectations and the degree to which the food item matches them (Oh, 2000).

As 'eating out' increases, consumers are becoming more sophisticated and demanding, and their expectations of quality are high (Mintel, 2000). This is reflected in all areas of public health food service including hospitals. Food quality is problematic to define as it is dependent on the evaluation of the consumer; it is both perceptually based and evaluative. Notwithstanding, perceptions of a food product have been shown to be affected by many individual factors including taste, odour, information from labelling,

attitudes and memories of previous experiences (Imram, 1999). Sensory characteristics such as appearance, flavour, texture and temperature have been found to be most important to hospital patients when judging food quality (Cardello, 1982; Clark, 1998). Texture and flavour have a profound effect on perception and acceptability, however 'the first taste is almost always with the eye' (Szczesniak, 1972). The role of texture is very product dependent however, attributes such as soggy, watery, lumpy, sticky, slimy, crumbly and tough, all which give a lack of control in the mouth are generally disliked (Cardello, 1996). The relative importance of any one attribute is dependent on the particular food item. For example, for chicken soup the predominant factor determining acceptance may be flavour, whereas for bread, texture could be the most important factor.

Perceived control over a situation also influences satisfaction (Bélanger and Dubé, 1996). It is predicted that where patients have increased involvement with the food service process (Sheehan-Smith L.M., 2004), such as in the trolley style of delivery where choice is at the point of consumption, satisfaction would be increased. For patients, food service, to a certain extent, provides one of the few hospital experiences that they can control.

Notwithstanding, food quality, preference and satisfaction of each patient group will need to be addressed if hospital food service is to fulfil both physiological and psychological requirements. Patient malnutrition can be reduced by better catering services (O'Flynn *et al*, 2005). The reported study formed part of a larger research programme and was designed to enhance and validate information already gathered. The aim of this research was to explore the antecedents to patient satisfaction with food quality within a hospital setting and develop an indicative model.

Methodology

A NHS hospital was identified in the South of England where a plated system of food delivery was in place (June 2000) but where a bulk trolley system was due to be introduced (June, 2001). Permission was sought and granted by the Local Research Ethics Committee to conduct this research and an information sheet together with a patient consent form was given to participating patients.

The hospital selected for the case study serves approximately 800 meals at each main meal using a four week menu cycle and was allowed £1.98 per patient per day (July 1999) for food and beverage costs.

At breakfast there was a choice of white or brown bread, the option of fruit juice, porridge and cereal. For lunch, the first course was characterised by 'home-made' soup or fruit juice. Main courses comprised sandwiches, meats, fish and vegetarian meals with carbohydrates as accompaniment. There were five choices of main course and a potato dish was offered every day; with creamed potato the most frequent option. 'Milky' puddings and ice cream were available for dessert at lunch time. For the evening meal, fruit juice or soup were offered, however this time, dried soup powder was used. There were five choices of main course, including a vegetarian option, followed by dessert, which could be a trifle/mousse/ice cream or cheese and biscuits.

Data were collected from patients in the Orthopaedic wards for both systems of delivery. These wards were identified with the help of medical staff as the most suitable in that patients are more likely to stay longer, their medical condition would not interfere with food consumption, they are capable of independent judgement, and are highly critical, as evidenced by past surveys conducted by the food service manager. Demographic patient details are given in more detail in Table 1. It was concluded that

research findings would have implications for the rest of the hospital as these patients are the most difficult to satisfy. Wards selected were also last to receive their meals being either at the end of the 'belt run' for the plated system or the final ward for trolley service delivery. Therefore the research setting constituted the worst case scenario for food acceptability and satisfaction.

The consistency of the sample was ensured as the wards chosen were for elective surgery, implying that the patient profile generally remains static and the medical conditions are similar. Food service staff and menu choice were identical for both plate and trolley system of delivery and therefore any change observed would be due to the factor of food service system.

A consumer opinion card, adapted from Cardello (1982), concentrating on the quality indicators of core foods was used to measure patient satisfaction and compare the two systems of delivery, plate and trolley. The critical aspect of quality assessment of foods is often subjective, however by using contemporary psychophysical (sensory) and psychometric (opinion survey) measures, these subjective variables can be measured objectively (Cardello *et al,* 1984).

The opinion card as presented at Figure 1, was developed at the U.S. Army Natick Research and Development Laboratories to assess patient and staff acceptance for food items served at military hospitals. The reliability and validity of the card has been previously evaluated and has been shown to be superior to other forms with similar formats (Cardello, 1982).

Insert Figure 1 here

The survey instrument consisted of five, 7-point rating scales, three questions were coded 7=very positive to 1=very negative and two questions coded as a 'just about right' scale. Space for open ended comments was also given. Five attributes of the food

were rated; temperature, texture, flavour, portion size, as well as the respondent's overall opinion of the food. To prevent respondent pattern response, categories were inverted for some questions. These were then coded appropriately for data analysis. The core foods selected were carrots, broccoli, minced beef dish, a poached fish dish, creamed potatoes and a cold pudding. These items were chosen as they appeared on both the plate and trolley system menu and therefore enabled a direct comparison between the two food service systems.

The opinion card was distributed (n=180) by the researcher on the wards during meal times for both systems of delivery. Patients were asked to complete the cards once they had received their trays while consuming their meal. The responses were then collected for analysis which used non-parametric statistics as normal distribution was not confirmed. Comparison between service style and food attribute was tested using the Mann-Whitney U Test.

Binary logistic regression analysis was used to build a model which would predict food service style on the basis of the food attributes measured. Further investigation used multinomial logistic regression to predict opinion for the assessment of each food attribute within food service style. The theoretical distinction between the two is that the former produces predictions at the individual case level while the latter internally aggregates cases to form subpopulations and is therefore, more general.

i. Binary Logistic Regression

This analysis can be used when an outcome is to be predicted based on values of a set of predictor variables. It is suited to models where the dependent variable is dichotomous or binary i.e. food service and is the preferred analytical technique when compared to linear regression and discriminant analysis, as the set of independent variables may be categorical, continuous, discrete, or a mix (28).

Logistic regression coefficients can be used to estimate odds ratios for each of the independent variables in the model.

Temperature and portion size were defined as categorical, as the scale used was a 'just about right' scale while flavour and texture items were defined as ordinal. Optimising the model was not pursued as the object of the analysis was to ascertain which of the variables was most influential in making the classification of food service style. The model was therefore estimated using a block entry of variables.

ii. Multinomial Logistic Regression

This type of analysis can be used when subjects are classified based on values of a set of predictor variables. In multinomial logistic regression the dependent variable should be categorical and larger than binary. Quality attributes were used for the selected core foods as predictor variables in a model classifying response in terms of a category opinion scale. A satisfied response was defined as either 'good' or 'very good', for example the top end of the opinion scale (29). Again the model was not optimised as the purpose of the analysis was to gain an insight into the variables which were most influential towards satisfaction.

Results

Results of the consumer opinion/satisfaction card (n= 180) are summarised in Table 2. A significant difference in the rating of temperature for the minced beef, poached fish and potato dish was shown. Further analysis revealed that patients thought these dishes were significantly hotter served by the trolley system. However, it was observed that the vegetables; carrots and broccoli, were spread out in the gastronome pan on the bulk trolley, dissipating heat, mirroring the situation found on a plate. Temperature, therefore, of these items demonstrated no significant difference between the two food

service systems. Flavour of the vegetables and fish dish together with texture for all foods however, were significantly enhanced by the bulk trolley system of food delivery. There was a significant difference ($p \leq 0.05$) in satisfaction with portion size for broccoli and potato. Overall patients' opinion showed that the broccoli, creamed potato, and fish dish benefited by choice at the point of consumption. Satisfaction with cold desserts such as trifles was found not to be dependent on the delivery system.

Binary Logistic Regression Analysis

Table 3 shows the summary statistics of binary logistic regression for the model of food service calculated before the procedure terminated. This procedure initially classifies all cases to the plate service (plate=0). As the model progresses and terminates, some cases are reassigned to the trolley service (trolley=1) and a predicted probability of membership to a food service system is achieved. The overall 'goodness of fit' of the model was assessed using the Hosmer and Lemeshow test, and was found not to be significant ($p=0.2$), showing that the model reasonably fitted the data. The Nagelkerke R-squared statistic indicates that the model, as fitted, explains 20.6 % of the variability and classification improved by 15%. The conclusions that can be drawn, therefore, are only a tentative indication of strength of relationship. The results of the logistic regression analysis indicate that there was a significant influence between the two independent variables, portion size and texture and the dependent variable, food service style. This suggests that the texture of food is influential in assigning a case to the trolley system of delivery, whereas the attribute portion size is related to the plate system. A diagrammatic representation is presented in Figure 1.

Multinomial Logistic Regression Analysis

Multinomial logistic regression was used to predict opinion using the quality attributes of selected core foods. The categorical variables, temperature and portion size, were recoded from a 'just about right' scale into an ordinal scale (level 1-4) and then

multinomial logistic regression analysis conducted on both serving systems, plate and trolley. For the plate system of delivery the Nagelkerke R-squared value (0.72) demonstrated that 72% of the variance was explained by the model and classification improved by 29%. Results are presented in Table 4. For the trolley system of delivery the Nagelkerke R-squared value (0.71) demonstrated that 71% of the variance was explained by the model and classification improved by 24%. Results are presented in Table 5.

When overall satisfaction is considered in a continuous way for both styles of food service, it is predicted by the attributes of temperature and texture. As satisfaction groups are created (bad opinion, slightly bad, neutral, slightly good and good) it can be seen that for the plate system of delivery the attribute flavour could be important too. Results are rather contradictory for the trolley system of delivery. The literature suggests that in reality there may be little substantive difference between someone who is very satisfied and someone who is somewhat satisfied (20).

Discussion

The consideration of patient's expectations and perceptions should have particular significance in shaping the objectives of any food service operation. Patient meal satisfaction has been previously studied (30) but discussion centred on menu changes rather than improving the food quality of the dishes already offered and service style. Other research (31) has addressed issues such as the physical environment of the hospital meal and its perceived importance, however to date a model has not been proposed, predicting patient satisfaction with the quality of food as served. Taking an overview and using the three different analytical approaches to data analysis (Mann-Whitney U, Binary Logistic Regression and Multinomial Regression), it is reasonable to assert that, temperature and overall flavour attributes were not significantly different between the two styles of food service, conversely portion size and texture of food are

different. However, consumer satisfaction is dependent on temperature and texture attributes. Portion size was not found to influence satisfaction and therefore the attribute 'texture' appears to be the main dimension in this research which relates patient satisfaction with food service and the trolley system of delivery. Expectations were matched by the trolley service of delivery and hence a corresponding level of satisfaction was achieved. Results obtained from the consumer opinion card show that the bulk trolley method of food distribution enables all foods to have a better texture, and for some foods (potato, poached fish and minced beef) temperature, and for other foods (broccoli, carrots, and poached fish) flavour than the plate system of delivery, where flavour is associated with bad opinion or dissatisfaction. An indicative model of the factors involved in consumer satisfaction with two food service systems is presented in Figure 2.

Unfortunately hospital food service has an image problem, before even tasting any food patients generally expect poor quality (32); this has been described as 'institutionalised stereotyping' (11). Food quality attributes have been demonstrated in this study to have a critical effect on patient satisfaction. While confirming previous results (19-22), attributes of significance (temperature and texture) have been established by comparing two systems of delivery. Strong preferences have been shown for the appropriate temperature of food and this can influence acceptance (33-34). Texture is a sensory characteristic which has also been shown to influence satisfaction (35) and is susceptible in institutional food (36). Sensory characteristics have been identified in the literature as being important to hospital patients when judging food quality (14-15). This research confirms patient satisfaction is enhanced by choice at the point of consumption; however, portion size was not the controlling dimension. Temperature and texture were the most important attributes which determine patient satisfaction with

food, therefore defining the focus for hospital food service managers. The first step to better hospital food is quality. Food served with appropriate sensory properties would tempt jaded appetites and encourage self recovery and as summarised by one patient.

'…what we need is basic care, the food that we want, it should be hot, it should be well presented and well cooked. If we don't eat we will be in hospital for longer and all we want to do is go home'

Acknowledgements

Permission was sought and granted by the NHS Trust Research Ethics Committee to conduct this research.

Data confidentiality:

Although subjects were identified by sex, ward, bay and bed number, this was done purely as a means of identifying patients in order to eliminate the likelihood of data being transposed. A unique number was used for data analysis

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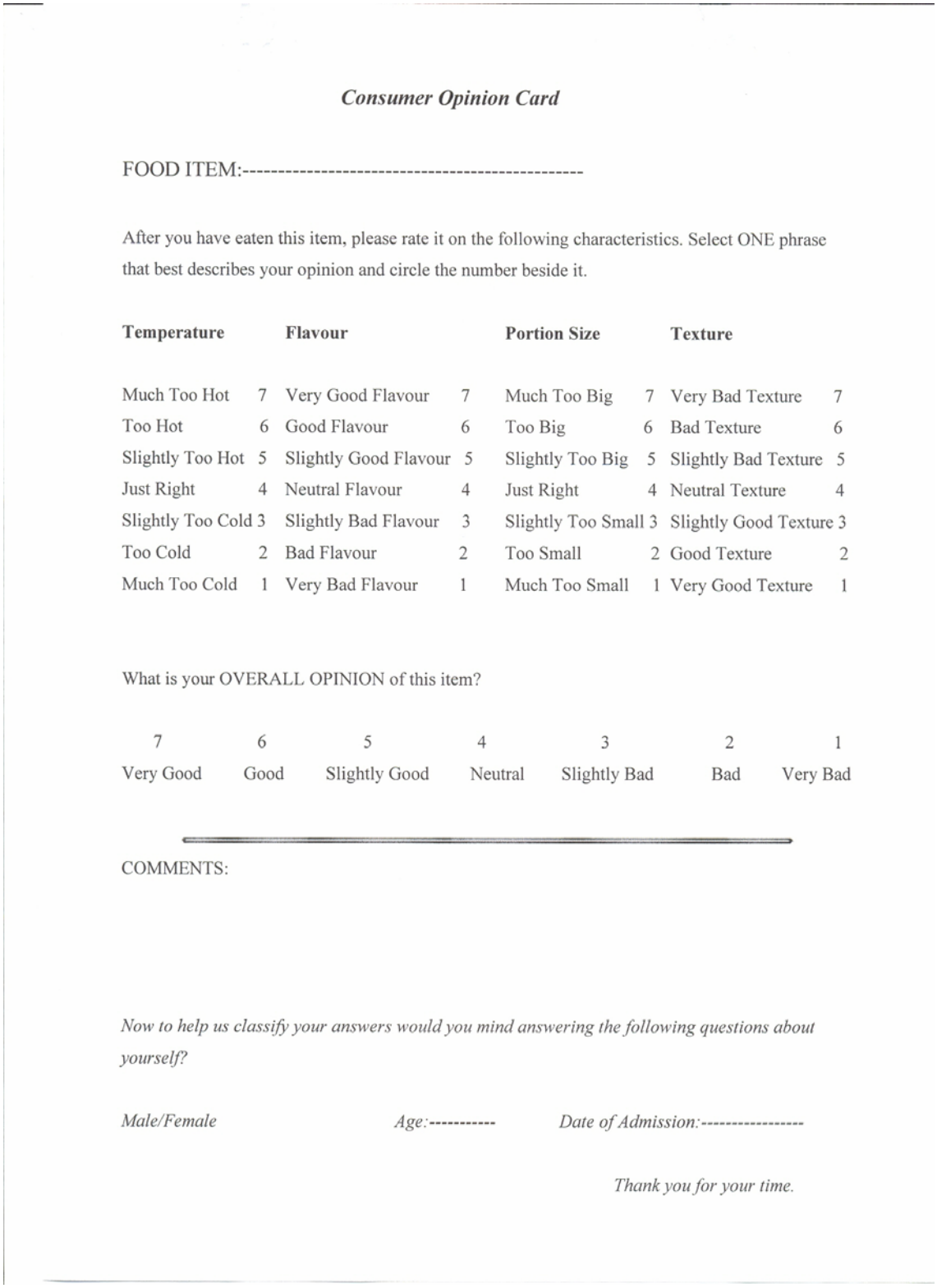
Table 1:

The demographic characteristics of patients (n=180)

Characteristic	Plate system of delivery	Trolley system of delivery
Sex	%	%
Female	59.0	59.0

Male	41.0	41.0
Age		
20-29	3.7	3.6
30-39	4.7	2.6
40-49	4.3	5.9
50-59	10.9	16.5
60-69	22.8	26.1
70-79	39.7	30.4
80-89	13.9	14.9
Length of stay		
1 day	10.7	16.2
1-3 days	17.9	15.2
1 week	23.6	9.2
More than 1 week	47.8	59.4

Figure 1



Consumer Opinion Card

FOOD ITEM:----------

After you have eaten this item, please rate it on the following characteristics. Select ONE phrase that best describes your opinion and circle the number beside it.

Temperature		**Flavour**		**Portion Size**		**Texture**	
Much Too Hot	7	Very Good Flavour	7	Much Too Big	7	Very Bad Texture	7
Too Hot	6	Good Flavour	6	Too Big	6	Bad Texture	6
Slightly Too Hot	5	Slightly Good Flavour	5	Slightly Too Big	5	Slightly Bad Texture	5
Just Right	4	Neutral Flavour	4	Just Right	4	Neutral Texture	4
Slightly Too Cold	3	Slightly Bad Flavour	3	Slightly Too Small	3	Slightly Good Texture	3
Too Cold	2	Bad Flavour	2	Too Small	2	Good Texture	2
Much Too Cold	1	Very Bad Flavour	1	Much Too Small	1	Very Good Texture	1

What is your OVERALL OPINION of this item?

7	6	5	4	3	2	1
Very Good	Good	Slightly Good	Neutral	Slightly Bad	Bad	Very Bad

COMMENTS:

Now to help us classify your answers would you mind answering the following questions about yourself?

Male/Female *Age:----------* *Date of Admission:----------*

Thank you for your time.

Table 2 Comparison of core foods (hot) by food service system (n=180)

	Broccoli		Carrots		Potato		Poached Fish		Minced Beef	
Attributes	**U***	**p**	**U***	**p**	**U***	**p**	**U***	**p**	**U***	**p**
Temperature	372	0.286	363	0.056	374	0.007	264	0.001	188	<0.0005
Flavour	109	<0.0005	205	<0.0005	416	0.072	213	0.001	355	0.302
Portion Size	121	<0.0005	480	1.00	445	0.015	420	0.734	344	0.154
Texture	292	0.023	250	0.001	291	0.001	234	0.002	228	0.002
Overall Opinion/ Satisfaction	219	0.001	356	0.065	356	0.011	211	0.001	325	0.131

*U is the Mann-Whitney statistic

Table 3 **Summary of statistics of Binary Logistic Regression for food service model**

Variables	B	S.E.	Wald	df	p	Exp(B)
Temp			5.59	4	0.23	
Temp(1)	-20.93	21983.5	0.00	1	1.00	0.00
Temp(2)	-0.95	1.34	0.51	1	0.48	0.39
Temp(3)	0.25	1.26	0.40	1	0.84	1.28
Temp(4)	0.30	1.25	0.06	1	0.81	1.35
Flavour	0.01	0.14	0.01	1	0.96	1.00
Size			24.07	5	<0.0005	
Size(1)	-3.30	1.70	3.78	1	0.05	0.04
Size(2)	-3.90	1.12	12.13	1	<0.0005	0.02
Size(3)	-3.54	0.93	14.51	1	<0.0005	0.03
Size(4)	-2.28	0.87	6.85	1	0.01	0.10
Size(5)	-1.98	0.95	4.36	1	0.04	0.14
Texture	0.41	0.13	10.39	1	0.001	1.51
Constant	0.42	1.52	0.08	1	0.78	1.52

Where B=log-likelihood if term is removed from model (raw coefficient), S.E=standard error of B, Wald=statistic answering question which parameters are not necessary in the model, i.e. the model is not significantly degraded by deletion of this parameter, df=degrees of freedom, $p \leq 0.05$ significance to 95%, Exp(B)=coefficient or the multiplier of a variable category that determines the probability that a case is assigned to plate (0) or trolley (1) service style.

Table 4 **Summary of statistics of Multinomial Logistic Regression for plate food service model and satisfaction**

OPINION[a]		B	Std. Error	Wald	df	Sig.	Exp(B)
2.00	Intercept	39.860	7.175	30.865	1	.000	
	TEMP	-2.879	1.008	8.157	1	.004	.056
	FLAVOUR	-4.362	.995	19.216	1	.000	.013
	SIZE	-1.511	1.210	1.559	1	.212	.221
	TEXTURE	-2.746	.829	10.965	1	.001	.064
3.00	Intercept	35.371	6.258	31.947	1	.000	
	TEMP	-2.313	.889	6.761	1	.009	.099
	FLAVOUR	-3.050	.707	18.600	1	.000	.047
	SIZE	-1.608	.919	3.061	1	.080	.200
	TEXTURE	-2.586	.656	15.564	1	.000	.075
4.00	Intercept	24.061	4.218	32.542	1	.000	
	TEMP	-1.876	.691	7.374	1	.007	.153
	FLAVOUR	-1.977	.428	21.310	1	.000	.139
	SIZE	-.343	.608	.319	1	.572	.709
	TEXTURE	-1.469	.365	16.194	1	.000	.230
5.00	Intercept	18.592	3.956	22.087	1	.000	
	TEMP	-1.915	.674	8.085	1	.004	.147
	FLAVOUR	-1.504	.392	14.715	1	.000	.222
	SIZE	.327	.590	.307	1	.579	1.387
	TEXTURE	-1.127	.339	11.069	1	.001	.324
6.00	Intercept	13.735	3.481	15.565	1	.000	
	TEMP	-1.839	.652	7.970	1	.005	.159
	FLAVOUR	-.656	.353	3.452	1	.063	.519
	SIZE	-.027	.463	.003	1	.954	.973
	TEXTURE	-.656	.303	4.695	1	.030	.519

a The reference category is: 7.00.

Where opinion 7 = very good, 6 = good, 5 = slightly good, 4 = neutral, 3 = slightly bad, 2 = bad and 1= very bad

Where B=log-likelihood if term is removed from model (raw coefficient), S.E=standard error of B, Wald=statistic answering question which parameters are not necessary in the model, i.e. the model is not significantly degraded by deletion of this parameter, df=degrees of freedom, $p \leq 0.05$ significance to 95%, Exp(B)=coefficient or the multiplier of a variable category that determines the probability of that category (above 1 increases the probability and less than 1 deceases the probability).

Table 5 **Summary of statistics of Multinomial Logistic Regression for trolley food service model and satisfaction**

OPINION[a]		B	Std. Error	Wald	df	Sig.	Exp(B)
2.00	Intercept	50.836	8.578	35.121	1	.000	
	TEMP	-7.976	1.639	23.671	1	.000	.000
	FLAVOUR	-.545	1.041	.274	1	.601	.580
	SIZE	-2.591	1.435	3.260	1	.071	.075
	TEXTURE	-2.778	1.138	5.959	1	.015	.062
3.00	Intercept	40.207	7.079	32.258	1	.000	
	TEMP	-4.899	1.104	19.682	1	.000	.007
	FLAVOUR	-2.680	.774	11.986	1	.001	.069
	SIZE	-1.422	1.101	1.669	1	.196	.241
	TEXTURE	-.908	.698	1.689	1	.194	.404
4.00	Intercept	33.312	6.627	25.270	1	.000	
	TEMP	-3.613	.976	13.699	1	.000	.027
	FLAVOUR	-2.962	.676	19.175	1	.000	.052
	SIZE	-.419	1.067	.154	1	.694	.658
	TEXTURE	-.743	.546	1.852	1	.174	.476
5.00	Intercept	15.592	5.423	8.266	1	.004	
	TEMP	-.833	.836	.993	1	.319	.435
	FLAVOUR	-1.483	.409	13.184	1	.000	.227
	SIZE	-.256	.640	.159	1	.690	.774
	TEXTURE	-.539	.376	2.061	1	.151	.583
6.00	Intercept	12.111	4.516	7.194	1	.007	
	TEMP	-1.576	.700	5.068	1	.024	.207
	FLAVOUR	-.455	.358	1.620	1	.203	.634
	SIZE	.329	.544	.365	1	.546	1.389
	TEXTURE	-.722	.330	4.783	1	.029	.486

a The reference category is: 7.00.

Where opinion 7 = very good, 6 = good, 5 = slightly good, 4 = neutral, 3 = slightly bad, 2 = bad and 1= very bad

Where B=log-likelihood if term is removed from model (raw coefficient), S.E=standard error of B, Wald=statistic answering question which parameters are not necessary in the model, i.e. the model is not significantly degraded by deletion of this parameter, df=degrees of freedom, $p \leq 0.05$ significance to 95%, Exp(B)=coefficient or the multiplier of a category that increases probability of that category (above 1 increases the probability and less than 1 deceases the probability).

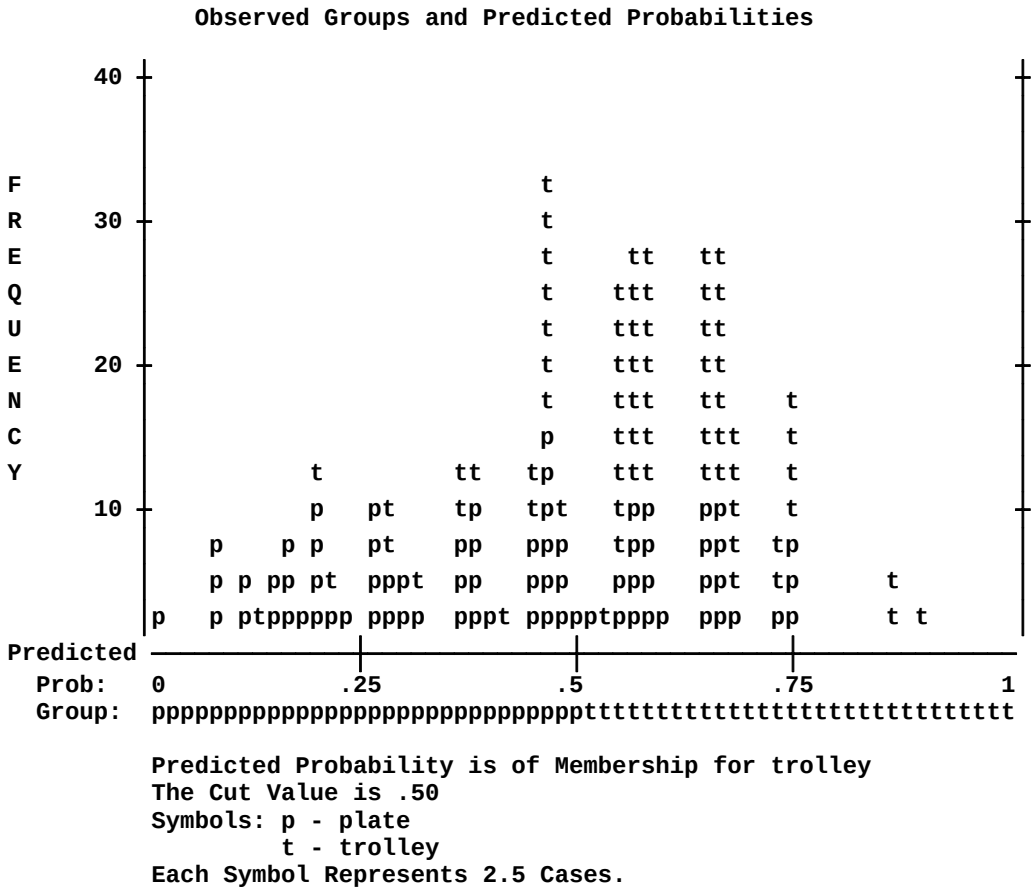


Figure 1 A diagrammatic representation of food service system by Binary Logistic Regression Analysis

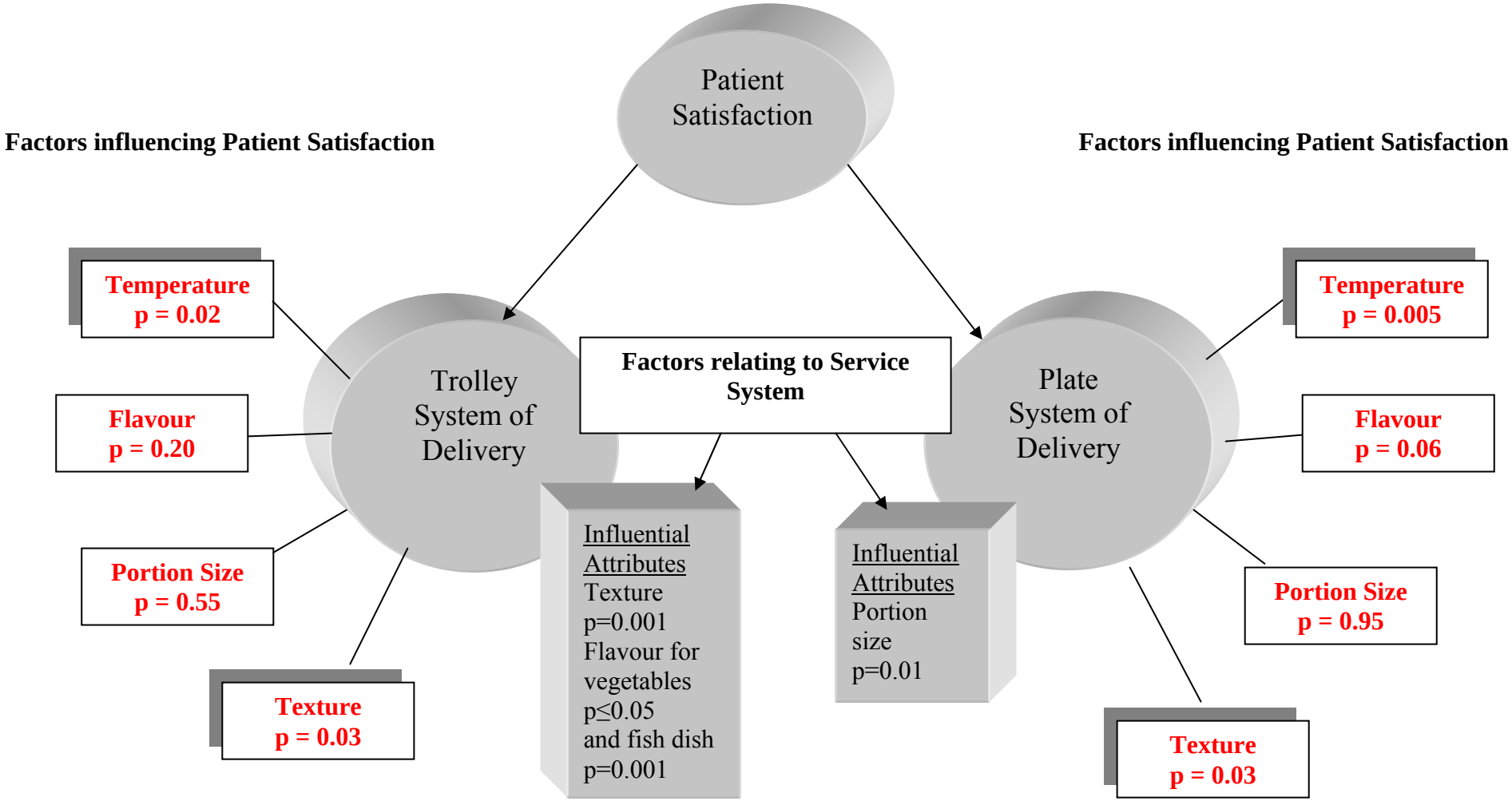


Figure 2 **An indicative model of patient satisfaction with two food service systems**

(Significance of terms within the model are shown and influential terms are shadowed)