

# Determinants of foodservice satisfaction for patients in geriatrics/rehabilitation and residents in residential aged care

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## Abstract

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**Background** Poor satisfaction with institutional food is a significant moderator of food intake in geriatrics/rehabilitation and residential aged care.

**Purpose** To quantify the relationship between foodservice satisfaction, foodservice characteristics, demographic and contextual variables in geriatrics/rehabilitation and residential aged care.

**Methods** The Resident Foodservice Satisfaction Questionnaire was administered to 103 patients of 2 geriatrics/rehabilitation units and 210 residents of nine residential aged care facilities in Brisbane, Australia. Ordered probit regression analysis measured the association of age, gender, ethnicity and appetite, timing and amount of meal choice, menu selectivity, menu cycle, production system, meal delivery system and therapeutic diets with foodservice satisfaction.

**Results** Patient and resident appetite ( $P < 0.01$ ), the amount and timing of meal choice ( $P < 0.01$ ), self-rated health ( $P < 0.01$ ), accommodation style ( $P < 0.05$ ) and age ( $P < 0.10$ ) significantly moderated foodservice satisfaction. High protein/high energy therapeutic diets ( $P < 0.01$ ), foodservice production ( $P < 0.01$ ) and delivery systems ( $P > 0.01$ ) were significant moderators for those with 'fair' self-rated health.

**Conclusions** Patient and resident characteristics and structural and systems-related foodservice variables were more important for influencing foodservice satisfaction than characteristics of food quality. The results suggest modifications to current menu planning and foodservice delivery methods: reducing the time-lapse between meal choice and consumption, augmenting the number of meals at which choice is offered, and revising food production and delivery systems.

It is important that residents in poorer health who are a high risk of under-nutrition are provided with sufficient high protein/high energy therapeutic diets. Diets that restrict macro- and micro-nutrients should be minimized for all patients and residents.

## Introduction

A gradual decline in food intake occurs throughout the lifespan, because of reduced requirements to achieve energy balance. This results from reduced physical activity and resting energy expenditure, loss of lean body mass and gain in body fat associated with ageing.<sup>1,2</sup> Other physiological changes associated with ageing include alterations in taste, smell, mental and physical health and can cause detrimental modifications of eating habits, leading to under-nutrition.<sup>3</sup> Under-nutrition predisposes people to a greater risk of chronic disease,<sup>4</sup> and if undernourishment persists in the long-term, weight loss, muscle wastage, lethargy, compromised immunity, poor wound healing, pressure sores<sup>5</sup> and symptoms of specific nutrient deficiencies may ensue, indicating malnutrition.<sup>6</sup>

This condition is particularly a problem in long-term care institutions, for example, geriatrics/rehabilitation hospitals and in higher-dependency (high care, nursing homes) residential aged care,<sup>7</sup> as the patients and residents are almost totally reliant on the foodservice for nourishment. Furthermore, this group has higher protein/energy/fat requirements compared to well older adults living in the community or in hostel/independent living accommodation, to manage frailty, weight loss, muscle loss, cognitive and functional decline. Public health messages and dietary guidelines that may be relevant to the general population are hence inapplicable to this group. International literature examining the prevalence of malnutrition in the nursing home and long-term care sector indicates that between 30 and 65% of residents are malnourished, highlighting the increased risk of the condition in elderly people.<sup>8–10</sup>

It is important to highlight the difference between modifiable and non-modifiable causes of malnutrition. The non-modifiable causes

include: illness or disease and refusal of nutrition support.<sup>1,4,11</sup> Modifiable sources include: lack of staff awareness, insufficient therapeutic diets, appetite-impairing drugs (e.g. cardiovascular drugs and diuretics), lack of eating assistance/meal aids, poor dining environment, inadequate nutrition support, poor dentition and poor dysphagia recognition and/or treatment. A related conclusion from research into plate waste and dietary prescription in long-term care is that overly restrictive diets reduce the palatability of meals, leading to reduced food intake,<sup>12–14</sup> while liberalized diets promote greater food choice, increase enjoyment from eating, enhance quality of life and do not lead to poorer clinical outcomes.<sup>13</sup>

Another consideration is that autonomy and control over one's environment is deemed to be valued in the long-term care sector, particularly in residential aged care.<sup>15,16</sup> Food is recognized as providing an opportunity for residents to maintain a small level of personal control over their own choices, especially because control of 'big picture' choices may be perceived to be lost on admission to residential aged care.<sup>17</sup> Disparities between patient/resident expectations and the actual food provided can cause meals to be returned, uneaten.<sup>18</sup> Improvements and/or modifications to food services, the menu, staffing, the psychosocial and physical dining environment may influence the modifiable antecedents to malnutrition. Understanding patient/resident satisfaction with, and expectations of, food services in this setting can aid in the development of improved patient and resident-focused foodservices and thereby help to reduce the incidence and/or progression of malnutrition. The analysis of foodservice satisfaction data from the long-term care setting presented in this paper is the first step, in Australia, towards this and extends the work already completed in the acute care sector.<sup>19</sup>

The aim of this study was to conduct a comprehensive analysis of the factors affecting resident satisfaction in the long-term care setting and demonstrate the value of a detailed foodservice satisfaction instrument for quality management. The purpose of this paper is to present a regression model with an analysis of the marginal effects, which shows the relative importance of a range of foodservice characteristics at the margins of satisfaction, for example, the most significant influences on achieving 'very good', in contrast to 'very poor' results. The relevance of findings to strengthening the involvement of patients and residents in influencing their care and the development of foodservice policy will be considered.

## Methods

### Study design

A cross-sectional survey using the Resident Foodservice Satisfaction Questionnaire was completed.<sup>20</sup> The full version of the survey contains 37 foodservice statements rated on a five-point Likert scale from 'always' to 'never' and an overall rating from 'very good' to 'very poor'. Responses were scored from 1 to 5, with one representing the least positive response and five representing the most positive response. Demographic and contextual items on age, gender, ethnicity (country of birth and first language), length of stay, timing of meal choice, appetite, self-rated health, diet type and timing of instrument completion were included to test whether different patient and resident groups had different levels of foodservice satisfaction. A widely accepted screening test for cognitive function, the Clock Drawing Task,<sup>21</sup> was administered with the foodservice satisfaction survey as a quick, simple method to screen for cognitive ability in study participants. The test measures visual-constructive abilities, abstract conceptualization, numerical and verbal memory and is predictive of cognitive decline.<sup>22</sup> Mini Mental State Examination (MMSE)-type questions were utilized for respondents who could not complete the clock test because of visual

impairment, difficulty writing, illness or other unknown reasons and included: (i) name on the consent form (orientation to person), (ii) the hospital ward or hostel they were living in (orientation to place), (iii) the date (orientation to time) and (iv) the time of day that the survey was completed (orientation to time).<sup>23</sup>

The foodservice satisfaction questionnaire statements are associated with four underlying constructs: 'meal quality and enjoyment'; 'autonomy'; 'staff consideration' and 'hunger and food quantity' and 19 independent items.<sup>20</sup> A previous study has demonstrated the internal reliability of the factors, as measured by assessments of Cronbach's alpha and lists descriptive statistics on the contextual and demographic variables.<sup>20</sup>

### Participants and study setting

A convenience sample of residents and patients was recruited from nine residential aged care facilities and two hospital-based geriatrics/rehabilitation units in South East Queensland, Australia, respectively, during 2003–04.<sup>20</sup> Owing to the ethical requirements that no data were to be collected from patients or residents without their verbal or written consent, the demographic characteristics of non-respondents could not be obtained to establish whether they differed systematically from respondents. Differences between respondents and non-respondents were certainly plausible, as the majority of non-respondents in both the aged care and hospital settings declined because of illness or frailty rather than an unequivocal refusal to participate. A summary of facility and foodservice system characteristics is presented in Table 1.

### Statistical analysis

Data analysis was completed using SPSS version 11.5.1 (2003; SPSS Inc., Chicago, IL, USA). Median values for demographic and contextual characteristics (age, length of stay, years lived in Australia, clock drawing test score) were compared for hospital patients and aged care residents using Mann–Whitney tests. Chi-square tests

**Table 1** Summary of foodservice systems at study facilities

Facility	<i>n</i> (beds)	Sample size available for analysis from each facility	Food production / distribution system	Menu cycle	Menu selectivity	Number of days between meal ordering and consumption	<i>n</i> (choices per meal)	Mean overall foodservice satisfaction rating <sup>1,2</sup>	Client feedback mechanism
Hospital 1	30 geriatric / rehabilitation 942 beds total	60	Cook freeze / decentralized	Weekly	Semi selective	1	2 + sandwiches (lunch and dinner)	4.67	Survey
Hospital 2	78 geriatric / rehabilitation 825 beds total	43	Cook fresh / decentralized	Weekly	Semi selective	1	2 + sandwiches (lunch and dinner)	4.57	Survey
RAC1	45 low care	10	Cook fresh and frozen / decentralized	5-weekly	Limited selective	1	Dinner (3)	4.10	Resident meetings
RAC2	75 low care; 13 high care	9	Cook fresh / decentralized	Monthly	Semi selective	1	Lunch (2); dinner (3)	3.75	Suggestion boxes; resident meetings
RAC3	39 low care	13	Cook fresh / decentralized	Monthly	Limited selective	1	Dinner (3)	4.30	Comments book
RAC4	60 low care	28	Cook fresh / decentralized	Monthly	Limited selective	1	Dinner (3)	5.00	Compliment / complaint forms; suggestions box
RAC5	290 low care	75	Cook fresh / centralized	Monthly	Fully selective	More than 3	5 – lunch and dinner and extensive breakfast choice	4.07	Monthly resident meetings; surveys
RAC6	53 low care; 2 high care	11	Cook fresh and frozen / centralized	Monthly	Semi selective	2	Lunch (3) and dinner (3)	3.70	Survey
RAC7	92 low care; 55 high care	17	Cook fresh / decentralized	Monthly	Limited selective	1	Dinner (2)	3.71	Comments book; comments / complaints form; food review committee with resident representatives
RAC8	31 low care; 24 high care	25	Cook chill / centralized	Monthly	Semi selective	12	Lunch (2); dinner (3)	3.80	Resident meetings
RAC9	30 low care; 12 high care	22	Cook fresh / decentralized	Monthly	Semi selective	1	Lunch (2); dinner (3)	4.10	Suggestion box

RAC, residential aged care.

<sup>1</sup>Mean rather than median values were used to summarize data in this case, as they enabled more meaningful distinctions between results.<sup>2</sup>1, very poor; 5, very good.

(Fisher's exact test) were used to compare the proportions within categorical variables (gender, language, diet type, timing of meal choice and appetite) between the hospitals and residential aged care facilities. Chi-square tests (Fisher's exact test) were used to measure perceived differences in foodservice characteristics between residential aged care facilities and hospitals. Statistical significance was assessed at the 5% level.

Overall foodservice satisfaction is treated as a latent variable with an ordinal indicator, derived from a five-point Likert scale. Ordered probit regression analysis was used to investigate the impact of the demographic and foodservice variables on the probability of attaining different levels of overall foodservice satisfaction. Dichotomous dummy variables were created to measure the effect of each level of the categorical independent variables on overall foodservice satisfaction. The list of dummy variables and their corresponding referent categories are provided in Table 2.

Principal components representing groups of foodservice variables were included in the regression analyses as a result of the high level of multicollinearity in the dataset. Results were saved as regression coefficients. The component score coefficient matrix generated as part of the principal components analysis expressed each principal component as a linear combination of the original variables and presented individual variable weights.<sup>24</sup> The principal components regression methodology allowed the independent importance of the foodservice characteristics to overall foodservice satisfaction to be estimated. All regression analyses were performed using the NLOGIT program within LIMDEP (version 8.0; Econometric Software Inc., Plainview, NY, USA), and the econometric approach was 'general-to-specific' modelling.<sup>25</sup> Variables with coefficients that were statistically significant at the 5% level with *t*-statistics > 2.0 were retained in the final model. Variables were not deleted if they were considered theoretically important, based on conclusions from published research. For example, in the model representing 'fair' self-rated health (*n* = 71), items with larger marginal effects including 'age 65–74 years'

(*Pr* = -0.196) and 'first language – English' (*Pr* = -0.383) were not statistically significant. They were retained in the model because of the size of their regression coefficients and the reported importance of ethnicity and age in relation to health care foodservice satisfaction in the published literature.<sup>26,27</sup>

The likelihood ratio statistic (chi-square and degrees of freedom) was used to assess model goodness-of-fit. The predictive ability of the models was examined using the tables of actual and predicted proportions.

## Results

### Sample characteristics

The residential aged care sample was significantly older than the hospital sample (*P* < 0.01), with a longer length of stay (*P* < 0.01). Clock drawing test scores did not differ significantly between the groups, and 93.7% of respondents obtained scores from 7 to 10. The remaining 6.4% of respondents were able to complete the MMSE-type questions successfully and were therefore considered to be cognitively capable of answering the foodservice satisfaction questions reliably. A higher proportion of aged care residents were on 'normal' diets than hospital patients (*P* < 0.01). There were more residents on fibre-modified diets in aged care (*P* < 0.01), and on higher energy and protein prescriptions in hospital (*P* < 0.01). In 2003–04, the average length of stay was around 32 months in 'high care' facilities and 23 months in 'low care' hostels.<sup>28</sup> The average length of stay of 30 months obtained in this study was higher than the 'low care' facility average and may be explained by 12 (4%) of the sample residing in Independent Living units. Residents from these areas had better functional status than those in 'low care' facilities.

Residents in aged care indicated that they chose their meals significantly earlier (up to 3 days prior to consumption) than those in hospital (*P* < 0.01), where meals were primarily chosen 1 day before, or on the day of consumption. Significantly, more hospital patients (86%) required assistance to complete the survey

**Table 2** Dummy variable definitions for categorical explanatory variables

Variable	Dummy variable definition
<b>Age</b>	
<i>Less than 65 years</i>	DVLESS65: 1 = <i>age less than 65 years</i> ; 0 = <i>other</i>
65–74 years	DV65_74Y: 1 = age 65–74 years; 0 = other
75–84 years	DV75_84Y: 1 = age 75–84 years; 0 = other
85–94 years	DV85_94Y: 1 = age 85–94 years; 0 = other
95 years or more	DV95Y: 1 = age 95 years or more; 0 = other
<b>Gender</b>	
<i>Male</i>	DVMALE: 1 = <i>male</i> ; 0 = <i>other</i>
<i>Female</i>	DVFEM: 1 = <i>female</i> ; 0 = other
<b>Country of birth</b>	
<i>Country A (Australia, UK, NZ, USA, Canada, South Africa)</i>	DVCOUNT0: 1 = <i>Country A</i> ; 0 = <i>other</i>
Country B (Western and Eastern Europe)	DVCOUNT1: 1 = Country B; 0 = other
Country C (Asia/India)	DVCOUNT2: 1 = Country C; 0 = other
<b>First language</b>	
Non-English	DVLANG0: 1 = <i>Non-English</i> ; 0 = <i>other</i>
English	DVLANG: 1 = English; 0 = other
<b>Timing of meal choice</b>	
<i>No choice</i>	DVCHNO: 1 = <i>no choice</i> ; 0 = <i>other</i>
3 or more days prior to meal	DVCH3B4: 1 = choice 3 days before; 0 = other
2 or more days prior to meal	DVCH2B4: 1 = choice 2 days before; 0 = other
Yesterday	DVCHYES: 1 = choice yesterday; 0 = other
Today	DVCHTOD: 1 = choice today; 0 = other
Just before I eat	DVCH0B4: 1 = choice 0 days before; 0 = other
At the start of the week	DVCHWK: 1 = choice at start of week; 0 = other
<b>Appetite</b>	
<i>Worse than normal</i>	DVAPWOR: 1 = <i>worse than normal</i> ; 0 = <i>other</i>
Normal	DVAPNORM: 1 = normal; 0 = other
Better than normal	DVAPBET: 1 = better than normal; 0 = other
<b>Self-rated health</b>	
<i>Poor</i>	DVHPOOR: 1 = <i>poor health</i> ; 0 = <i>other</i>
Fair	DVHFAIR: 1 = fair health; 0 = other
Good	DVHGOOD: 1 = good health; 0 = other
Very good	DVHVGGOOD: 1 = very good health; 0 = other
Excellent	DVEXCEL: 1 = excellent health; 0 = other
<b>Diet type</b>	
<i>Normal</i>	DVNORM: 1 = <i>normal</i> ; 0 = <i>other</i>
Fat or carbohydrate modified	DVCHOFAT: 1 = fat or carbohydrate modified; 0 = other
Texture modified soft	DVTMS: 1 = texture modified soft; 0 = other
Fibre modified	DVFIBRE: 1 = fibre modified; 0 = other
Energy and protein increased	DVKJPRO: 1 = energy and protein increased; 0 = other
Pureed	DVPUREED: 1 = pureed; 0 = other
Reduced/low salt	DVSALT: 1 = reduced/low salt; 0 = other
Fluid restricted	DVFLUID: 1 = fluid restricted; 0 = other
Other special diets	DVOTHER: 1 = other diets/combinations; 0 = other
Not sure	DVNOTSUR: 1 = not sure; 0 = other
<b>Type of menu</b>	
<i>Limited-selective<sup>1</sup></i>	DVMENU1: 1 = <i>limited-selective</i> ; 0 = <i>other</i>
Semi selective	DVMENU2: 1 = semi selective; 0 = other
Almost fully selective	DVMENU3: 1 = almost fully selective; 0 = other
<b>Menu cycle length</b>	
<i>Weekly</i>	DVWEEK: 1 = <i>weekly</i> ; 0 = <i>other</i>
Monthly	DVMONTH: 1 = monthly; 0 = other

**Table 2** (continued)

Variable	Dummy variable definition
5-weekly	DV5WEEK: 1 = 5-weekly; 0 = other
Cooking method	
<i>Off-site – cook freeze</i>	<i>DVOFFST: 1 = offsite; 0 = other</i>
Onsite cook fresh/frozen	DVFREFRO: 1 = fresh/frozen; 0 = other
Onsite cook fresh	DVFRESH: 1 = fresh; 0 = other
Onsite cook chill	DVCCHILL: 1 = cook chill; 0 = other
Meal delivery system	
<i>Centralized plating</i>	<i>DVCENT: 1 = centralized; 0 = other</i>
Decentralized plating	DVDCENT: 1 = decentralized; 0 = other
Meal choice	
<i>Lunch only</i>	<i>DVCHLUN: 1 = choice at lunch; 0 = other</i>
Dinner only	DVCHDIN: 1 = choice at dinner; 0 = other
Lunch and dinner	DVLUNDIN: 1 = choice at lunch and dinner; 0 = other
Number of lunch choices (main meal)	
<i>None</i>	<i>DVLUNO: 1 = no choice at lunch; 0 = other</i>
Two	DVLUN2: 1 = 2 choices at lunch; 0 = other
Three	DVLUN3: 1 = 3 choices at lunch; 0 = other
Five	DVLUN5: 1 = 5 choices at lunch; 0 = other
Number of dinner choices (main meal)	
<i>Two</i>	<i>DVDIN2: 1 = 2 choices at lunch; 0 = other</i>
Three	DVDIN3: 1 = 3 choices at dinner; 0 = other
Five	DVDIN5: 1 = 5 choices at dinner; 0 = other
Type of consent	<i>DVVERB: 1 = verbal consent; 0 = other</i> DVVWRIT: 1 = written consent; 0 = other
Location of dining	<i>DVROOM: 1 = eat in own room; 0 = other</i> DVDINRM: 1 = eat in dining room; 0 = other
Accommodation	<i>DVOTHLIV: 1 = other accommodation;</i> 0 = independent living
Assistance to complete survey	<i>DVNASSI: 1 = no assistance; 0 = other</i> DVIYASSI: 1 = assistance; 0 = other
Time of survey completion	<i>DVMORN: 1 = survey completed in the morning; 0 = other</i> DVLUNCH: 1 = survey completed at lunch time; 0 = other DVAFTERN: 1 = survey completed during the afternoon; 0 = other DVEVENG: 1 = survey completed during the evening; 0 = other
Season of survey completion	<i>DVWINTER: 1 = survey completed in winter; 0 = other</i> DVSUMM: 1 = survey completed in summer; 0 = other DVAUTUM: 1 = survey completed in autumn; 0 = other
Residential aged care or hospital client	<i>HOSPITAL: 1 = hospital client; 0 = other</i> AGED: 1 = aged care resident; 0 = other

<sup>1</sup>Referent categories in italics.

than aged care residents (52%) ( $P < 0.01$ ). Both of these trends are investigated further in the regression analyses.

### Regression analysis

The regression model contained nine statistically significant foodservice and patient/resident characteristics, shown in Table 3. In the interests of parsimony, only those marginal effects relat-

ing to the probability of obtaining an overall satisfaction rating of five, that is 'very good', are included.

The foodservice variables with the highest weightings within the significant principal components (obtained from the component score coefficient matrix) are shown in Table 4. These variables represent the most important foodservice characteristics, which were included in the final model.

**Table 3** Parsimonious model of foodservice satisfaction in longer-stay care ( $n = 229$ )

Variable	Coefficient	SE	<i>t</i> -statistic	Marginal effect <sup>1</sup>	SE
Appetite – better than normal	1.140 <sup>2</sup>	0.292	3.902	0.421 <sup>2</sup>	0.049
Appetite – normal	0.569 <sup>2</sup>	0.198	2.874	0.214 <sup>2</sup>	0.033
Choice of meal at the point of service	0.514 <sup>3</sup>	0.253	2.032	0.203 <sup>2</sup>	0.042
Self-rated health – very good	0.494 <sup>3</sup>	0.219	2.259	0.195 <sup>2</sup>	0.041
Non-independent living accommodation	0.535 <sup>3</sup>	0.268	1.995	0.194 <sup>2</sup>	0.031
Self-rated health – good	0.350 <sup>3</sup>	0.174	2.017	0.137 <sup>2</sup>	0.040
Age 75–84 years	0.300 <sup>4</sup>	0.163	1.840	0.118 <sup>2</sup>	0.040
Foodservice Principal 7	0.230 <sup>2</sup>	0.078	2.945	0.090 <sup>2</sup>	0.030
Foodservice Principal 6	–0.162 <sup>3</sup>	0.078	–2.076	–0.064 <sup>3</sup>	0.031
Constant ( $\mu_1$ )	1.099 <sup>2</sup>	0.312	3.529	NA	0.00 <sup>5</sup>
$\mu_2$	0.635 <sup>2</sup>	0.136	4.682	NA	0.00 <sup>5</sup>
$\mu_3$	1.739 <sup>2</sup>	0.095	18.244	NA	0.00 <sup>5</sup>
$\mu_4$	2.704 <sup>2</sup>	0.104	25.958	NA	0.00 <sup>5</sup>
$\chi^2$ foodservice satisfaction (9 d.f.)	46.49 <sup>2</sup>	NA	NA	NA	NA
Measures of model fit					
Log-L	–256.91	NA	NA	NA	NA
Restricted Log-L	–280.15	NA	NA	NA	NA
LRI	0.083	NA	NA	NA	NA
Predicted proportion (overall satisfaction score)	0 (1)	0 (2)	9 (3)	18 (4)	81 (5)
Actual proportion (overall satisfaction score)	3 (1)	8 (2)	46 (3)	73 (4)	99 (5)
Per cent prediction (predicted/actual proportion)	0	0	20	25	82

LRI, Likelihood Ratio Index.

<sup>1</sup>Refers to the marginal effect of the variable on the probability of obtaining an overall foodservice satisfaction score of 5, 'very good' and is interpreted as a percentage.

<sup>2</sup>Statistically significant at the 1% level.

<sup>3</sup>Statistically significant at the 5% level.

<sup>4</sup>Statistically significant at the 10% level.

<sup>5</sup>Constant is a fixed parameter.

The results in Table 3 show that people with better-than-normal appetites were the most likely to record a 'very good' rating (42.1%) for the foodservice. Indeed, this group was approximately twice as likely as individuals with 'normal appetites' to register a 'very good' response (21.4%) on this item.

'Not living in independent living accommodation' and 'very good self-rated health' both were associated with a higher probability (approximately 19% each) of recording 'very good' overall foodservice satisfaction ratings. Choice of meals at the point of service (compared to the referent category, 'no choice') had a similar influence on the probability that patients and residents recorded a 'very good' overall satisfaction (approximately 20%).

Compared to patients and residents aged <65 years, 75- to 84-year-olds were approximately 12% more likely to register 'very good' overall satisfaction ratings. The predictive accuracy of the model according to the table of predicted proportions was high: the 'very good' overall satisfaction category, which served as the primary category for interpretation of the marginal effects, was correctly predicted in 82% of cases.

#### Stratum-specific models

Results of the marginal effects analysis for the original regression model indicated 'fair' self-rated health had a negative effect on overall foodservice satisfaction. It was considered

**Table 4** Foodservice items contributing the highest weights to each principal component

Principal component	Characteristics represented by highest-weighted foodservice items (coefficient 0.1 or more)
Principal 6	Quantity of food received Hunger immediately after meals Hunger between meals Choice of meal size Chewing problems Swallowing problems Vegetables – too crisp Option to suggest timing of meals Access to food/snacks Meals have excellent and distinct flavours Adequacy of dining aids
Principal 7	Staff respect Staff politeness Consultation about food preferences Crockery/cutlery presentation Suitability of meal times Adequacy of knives Adequacy of dining aids

important to further investigate factors influencing foodservice satisfaction for patients and residents with 'fair' self-rated health, as people in poorer health are at a higher risk of poor food intake, under-nutrition and ultimately, malnutrition. Ninety-eight individuals were in this group, providing a respectable sample size for subgroup analysis. The results are presented in Table 5.

The model for 'fair' self-rated health contained the largest number of variables of all models estimated, thus produced the highest Likelihood Ratio Index (LRI) (0.37). Furthermore, the predictive ability of the model (50–68%) was good. As with the preceding analyses, appetite was an influential variable and the marginal effect for people with 'better than normal' appetites, for whom the probability of recording a 'very good' overall foodservice satisfaction rating was 71%. This result emphasizes the importance of promoting appetite for patients and residents in poorer health. The influence of 'normal' appetite on 'very good' overall satisfaction ratings was similar (approximately 21%) to that of the complete final model.

Aspects of choice timing and the amount of choice provided (i.e. at the midday and evening meal) were also important. Choice on the day of the meal produced a higher marginal probability of patients and residents rating 'very good' for overall foodservice satisfaction (77.4%;  $P < 0.01$ ) than the other choice timing options in the model. Surprisingly, choices on the day before the meal were associated with a lower probability and statistical significance (around 47%;  $P < 0.05$ ) of a 'very good' satisfaction rating than choices 3 days before the meal (73.5%;  $P < 0.01$ ).

Results indicated that patients and residents on higher energy and protein diets were approximately 79% more likely to rate their overall foodservice satisfaction as 'very good' ( $P < 0.01$ ), in contrast to the negative effect on satisfaction of patients and residents being on carbohydrate or fat modified diets ( $Pr = -0.171$ ). Foodservice production system characteristics were also associated with systematic differences in overall satisfaction. The cook chill system resulted in the highest probability of patients and residents rating overall satisfaction as 'very good' ( $Pr = 0.987$ ;  $P < 0.01$ ); however, in this model, it was closely followed by a combination of fresh and frozen foods ( $Pr = 0.889$ ;  $P < 0.01$ ) and cook fresh ( $Pr = 0.694$ ;  $P < 0.01$ ). Compared to the cook freeze system, though, all other foodservice systems obtained high probabilities of 'very good' overall satisfaction ratings.

## Discussion

This work represents a novel approach to measuring foodservice satisfaction that has the potential for significant impact on the geriatrics/rehabilitation and residential aged care sector. No previous studies have utilized such a detailed, reliable foodservice satisfaction instrument, with adjustment of analyses for structural and foodservice system-related characteristics. The majority of published research on service quality in long-term care facilities has not measured resident opinions of food services in detail.<sup>29–37</sup> Four international studies have

**Table 5** Ordered probit model of foodservice satisfaction in longer-stay care for clients with 'fair' self-rated health ( $n = 71$ )

Variable	Coefficient	SE	<i>t</i> -statistic	Marginal effect <sup>1</sup>	SE
Foodservice system – cook chill	9.276 <sup>2</sup>	1.834	5.059	0.987 <sup>2</sup>	0.030
Foodservice system – fresh/frozen	3.189 <sup>2</sup>	0.829	3.848	0.889 <sup>2</sup>	0.064
Diet type – high energy/high protein	2.484 <sup>2</sup>	0.786	3.161	0.786 <sup>2</sup>	0.113
Choice on the day of the meal	2.440 <sup>2</sup>	0.670	3.640	0.774 <sup>2</sup>	0.105
Choice 3 days prior to the meal	2.410 <sup>3</sup>	1.172	2.055	0.735 <sup>2</sup>	0.135
Appetite – better than normal	2.150 <sup>2</sup>	0.611	3.517	0.711 <sup>2</sup>	0.123
Decentralized delivery system	4.296 <sup>2</sup>	1.269	3.386	0.695 <sup>2</sup>	0.233
Foodservice system – cook fresh	3.125 <sup>2</sup>	0.682	4.584	0.694 <sup>2</sup>	0.223
Choice one day prior to the meal	1.813 <sup>2</sup>	0.490	3.697	0.468 <sup>3</sup>	0.218
Choice at midday and evening meal	3.470 <sup>2</sup>	0.828	4.192	0.389	0.255
First language – English	-1.177 <sup>3</sup>	0.594	-1.981	-0.383	0.277
Non-independent living accommodation	4.547 <sup>2</sup>	1.070	4.250	0.269	0.220
Appetite – normal	1.047 <sup>2</sup>	0.363	2.886	0.213	0.161
Age 65–74 years	-2.466 <sup>2</sup>	0.665	-3.710	-0.196	0.250
Survey completion immediately prior to or after lunch	-2.427 <sup>2</sup>	0.704	-3.445	-0.186	0.242
Diet type – carbohydrate or fat modified	-2.658 <sup>2</sup>	0.949	-2.801	-0.171	0.230
Foodservice Principal 7	0.510 <sup>2</sup>	0.171	2.991	0.116	0.125
Foodservice Principal 10	-0.289 <sup>4</sup>	0.177	-1.630	-0.065	0.079
Constant ( $\mu$ 1)	-10.326 <sup>2</sup>	2.465	-4.190	0.00 <sup>5</sup>	0.00 <sup>5</sup>
$\mu$ 2	0.823 <sup>3</sup>	0.321	2.573	0.00 <sup>5</sup>	0.00 <sup>5</sup>
$\mu$ 3	2.918 <sup>2</sup>	0.229	12.761	0.00 <sup>5</sup>	0.00 <sup>5</sup>
$\mu$ 4	4.534 <sup>2</sup>	0.265	17.097	0.00 <sup>5</sup>	0.00 <sup>5</sup>
$\chi^2$ foodservice satisfaction (18 d.f.)	61.38	NA	NA	NA	NA
Measures of model fit					
Log-L	-62.12	NA	NA	NA	NA
Restricted Log-L	-92.81	NA	NA	NA	NA
LRI	0.37	NA	NA	NA	NA
Predicted proportion (overall satisfaction score)	1 (1)	0 (2)	15 (3)	18 (4)	9 (5)
Actual proportion (overall satisfaction score)	2 (1)	3 (2)	22 (3)	27 (4)	17 (5)
Per cent prediction (predicted/actual proportion)	50	0	68	67	53

LRI, Likelihood Ratio Index.

<sup>1</sup>Refers to the marginal effect of the variable on the probability of obtaining an overall foodservice satisfaction score of 5, 'very good' and is interpreted as a percentage.

<sup>2</sup>Statistically significant at the 1% level.

<sup>3</sup>Statistically significant at the 5% level.

<sup>4</sup>Statistically significant at the 10% level.

<sup>5</sup>Constant is a fixed parameter.

investigated foodservice satisfaction;<sup>38–41</sup> however, they do not consider it in the context of the foodservice system or the complexity of resident characteristics. One study examined the association of foodservice characteristics with the risk of malnutrition<sup>42</sup> and noted significant associations between tray vs. bulk meal delivery systems, a lack of assistance to open containers and move dishes, time lapses between choice and consumption and therapeutic diets; however, it did not adjust for variations in residents' age, appetite, self-rated health, the production system, or specific therapeutic diets.

Appetite is clearly linked to the enjoyment and consumption of foods,<sup>43</sup> and appetite was found to have an important effect on overall foodservice satisfaction in this study. Therefore, menus should focus on promoting appetite by maximizing flavours and aromas and minimizing nutrient restrictions and texture modifications that almost always limit the provision of flavoursome foods, for example, crumbed fish and/or chips; egg and/or cheese-based dishes; gravy; sauces; creamy desserts.<sup>20</sup> Despite the statistical variance explained by the 'food quality and enjoyment', 'hunger and food quantity',

'autonomy' and 'staff consideration' factors of the Resident Foodservice Satisfaction Questionnaire,<sup>20</sup> the magnitude of influence of items representing these factors in the general ordered probit regression model (Principals 6 and 7, see Table 4) was outweighed by the effects of age, appetite, self-rated health, the timing of meal choice and accommodation style. The negative association of the variables in Principal 6 (including food quality, choice, food quantity) with overall foodservice satisfaction was related to lower levels of satisfaction with these service attributes and suggests the need for improvements to some or all of the elements of Principal 6. In contrast, the component variables of Principal 7 (including staff respect, meal service quality) lead to a 9% greater probability of rating overall satisfaction as 'very good'. This was attributed to a higher existing level of resident satisfaction with these characteristics.

No previous foodservice satisfaction studies measuring patients' or residents' self-rated health were identified, but the results here seem reflect the findings reported in the general health care satisfaction literature inasmuch as self-rated health significantly influences satisfaction with services.<sup>44,45</sup> The lower likelihood of satisfaction from residents of independent living accommodation may be attributed to their consumption of fewer meals served at the facility, as the majority prepared all of their meals. Alternatively, better levels of functional status (when compared with hostel residents) may have coincided with higher expectations for service delivery that were disparate with service outcomes. It has been identified that older people, in general, are becoming more focussed towards maximizing their independence, quality of life and personal autonomy<sup>46</sup> and that expectations of aged care services are changing towards those that provide greater personal control over care.<sup>47</sup> Whatever the case, the small number of respondents from independent living ( $n = 12$ ) compared with non-independent living ( $n = 201$ ) precluded interpretation of this effect with certainty; however, it provided a novel hypothesis for investigation in future research.

Results for the 'fair' self-rated health model showing the negative impact of carbohydrate/fat restrictions to the likelihood of rating 'very good' for overall satisfaction ( $-17\%$ ,  $P < 0.01$ ) in contrast to the positive association for patients and residents on high protein/high energy diets ( $79\%$ ,  $P < 0.01$ ) support conclusions in published literature that restrictive diets in residential aged care are inappropriate and reduce quality of life.<sup>12,13</sup> Furthermore, choice on the day of consumption had the most positive effect ( $77\%$ ,  $P < 0.01$ ), when compared with choice the day before ( $47\%$ ,  $P < 0.05$ ).

Interestingly, choice 3 days prior to the meal ( $74\%$ ,  $P < 0.01$ ) was better than choice 1 day before the meal. Higher levels of foodservice satisfaction in the acute care setting have previously been associated with a short time between meal choice and consumption, because of the positive effect on patient perceptions of personal control, appetite, order accuracy, staff service courtesy and increased interaction with staff service employees.<sup>18,48-50</sup> However, one study conducted in the long-term care setting reported that patients and residents with cognitive impairment who had their meals chosen for them  $> 6$  days prior to the meal had lower rates of malnutrition than those who had their meals chosen  $< 6$  days prior to the meal.<sup>42</sup> It was suggested this was because of the people taking more care to consider the residents' preferences in selecting the meals with the longer time-frame. This may also be a plausible explanation for the results obtained in this study; however, there were uneven proportions of results for each category of choice. For example, of the 71 cases included in the current analysis of those reporting 'fair' self-rated health, 22.5% were for 'choice 3 days prior to the meal'; 11.3% were for 'choice on the day of the meal' and 40.8% were for 'choice 1 day prior to the meal', thus those with the lowest and second lowest percentage of responses appeared to be the most significant, potentially explaining the unexpected result for 'choice 3 days prior to the meal'. The results indicated that the timing of choice has a significant influence on foodservice satisfaction, but to better quantify the association, future research with more balanced sample

sizes per category would be required. The strongest conclusion regarding choice timing may be established from the final model, where choice at the point of meal service resulted in a 20% increased probability of patients and residents rating overall satisfaction as 'very good'. In the original estimation, 12.2% of the sample was in this category.

The more positive rating of the cook fresh/frozen system (89%,  $P < 0.01$ ) compared with the cook fresh system (69%,  $P < 0.01$ ) was the incorporation of pre-frozen fish and chips, pies and pastries on the menu. This may account for the slight discrepancy between ratings, as several residents noted that they looked forward to these types of 'comfort' meals. This has particular implications for patients and residents with 'fair' self-rated health, as it may indicate that they have a preference for these foods.

A unique finding from this study was the result for decentralized foodservice delivery, wherein meals were plated at the point of service rather than in a central kitchen. This delivery system resulted in a 69.5% increased likelihood of patients and residents rating overall satisfaction as 'very good' ( $P < 0.01$ ). This reinforces the evidence in the current literature, which indicates that decentralized meal service results in improved food quality and temperature because of reduced food handling,<sup>51</sup> the creation of a more 'home-like' atmosphere because of the individualized portioning of meals for residents in the dining room rather than the main kitchen<sup>6</sup> and a more natural, domestic environment.<sup>52</sup> As some of the residential aged care facilities, particularly larger facilities, were operating a centrally plated tray system, this may be a productive area in which to consider foodservice system changes. As those in poorer health are at a greater risk of poor food intake and malnutrition, targeted foodservice and nutrition interventions should be considered for this group.

### Limitations

Although the new Resident Foodservice Satisfaction instrument and methods of analysis may be largely generalizable, the results of their

application are likely to be context-specific, particularly as the sample was a convenience sample. Notably, the relative marginal importance of each foodservice characteristic is likely to depend on its level. Similarly, consumer preferences may vary across settings (e.g. across institutions and across countries). It was emphasized throughout the regression analysis that non-statistically significant variables were not deleted from the models if they were considered to be theoretically fundamental or practically important based on published literature (e.g. items that are pertinent to food quality).<sup>49,53,54</sup> This was because it is possible that items may have a small statistical significance level (e.g. because of insufficient variation in the dataset) based on the magnitude of their regression coefficient, but be of considerable practical significance.

In different settings or, indeed, in the same settings over time, those attributes that affect overall satisfaction in a statistically and practically significant way are likely to vary. However, the extensive development of the survey and analysis methodology should have ensured the results obtained were reliable and valid for the sample studied. Further research is required to establish the influence of including samples more representative of patients and residents with lesser cognitive and physical capability and people from non-English speaking backgrounds.

### Conclusions

This study utilized a novel foodservice satisfaction questionnaire to investigate factors that influence patient and resident satisfaction in geriatrics/rehabilitation and residential aged care. The results differ from those of foodservice research conducted in both the acute and long-stay settings, where aspects of food quality and meal service quality were reported to dominate satisfaction with food services.<sup>52,54-56</sup> This occurred as a detailed consideration of patient, resident and foodservice system characteristics of the kind conducted here has not previously been attempted.

The analysis revealed that appetite, self-rated health and age were substantial moderators of patient and resident foodservice satisfaction. Structural and system-related aspects of the foodservice were more important than those characteristics related specifically to food quality and temperature that have been shown to be important in previous foodservice satisfaction studies in the acute care setting.<sup>19</sup> Food quality and temperature may, of course, themselves be markers of (and proxies for) the quality of foodservice delivery systems.<sup>51</sup> The association of restrictive therapeutic diets with lower levels of overall foodservice satisfaction supports the hypothesis that these diets lead to poor quality of life and clinical outcomes, while the positive association with high protein/high energy diets supports dietary liberalization efforts.<sup>57</sup> The higher levels of satisfaction associated with menus including pre-frozen fish and chips, pies and pastries (cook fresh/freeze) compared with cook fresh alone further support the need for the inclusion of such comfort foods on menus in these settings.

The significance of institutionalized delays between meal choice and meal consumption has direct aged care policy implications. Considering the negative impact of choosing meals far in advance of meal times, and the association of this with poor food intake in the published literature,<sup>18</sup> the fact that 22.7% of the entire sample selected their meals at least 3 days prior to eating raises concerns.

These results also emphasize that patient and resident preferences for service timing and delivery are also influential. Small, simple changes to the organization and management of food services may markedly improve patient and resident satisfaction levels and perhaps do so without additional cost. The positive economic implications of improving food consumption and patient and resident health status, the minimization of modifiable risks of malnutrition and reduction in food wastage associated with these types of foodservice delivery changes are deserving of further consideration and are of increasing importance as the population ages.

The increasing level of frailty within the residential aged care and geriatrics/rehabilitation population associated with population ageing provides a challenge for quality improvement efforts, including satisfaction surveys. The satisfaction questionnaire described in this study can be utilized with patients and residents of varying sensory and cognitive abilities using pre-designed protocols.<sup>20</sup> It is important that patient and resident satisfaction with food services is continually monitored using carefully designed tools such as the Resident Foodservice Satisfaction Questionnaire, to monitor changes in patient and resident opinions and preferences over time and to ensure issues are identified quickly for rectification. The opportunity to express opinions over food services provides an important avenue for residents and patients to maintain a small level of involvement and personal control over their long-term care, particularly when control of 'big picture' decisions may be lost, or perceived to be lost. Regular monitoring, reporting and responding to resident and patient satisfaction with food services is an essential method for preventing and treating poor food intake and under-nutrition in long-term care settings. There needs to be a strong partnership between medicine, nursing, dietetics, other allied health and food services for the best possible experiences and health outcomes for residents and patients.

## References

- 1 Kinney JM. Nutritional frailty, sarcopenia and falls in the elderly. *Current Opinion in Clinical Nutrition and Metabolic Care*, 2004; **7**: 15–20.
- 2 Morley J. Decreased food intake with aging. *Journal of Gerontology A: Biological Sciences, Medical Sciences*, 2001; **56A**: 81–88.
- 3 Keller H. Malnutrition in institutionalized elderly: how and why? *Journal of the American Geriatrics Society*, 1993; **41**: 1212–1218.
- 4 Reilly J. Understanding chronic malnutrition in childhood and old age: role of energy balance research. *Proceedings of the Nutrition Society*, 2002; **61**: 321–327.
- 5 Bergstrom N, Braden B. A prospective study of pressure sore risk among institutionalised elderly. *Journal of the American Geriatrics Society*, 1992; **50**: 747–758.

- 6 Shatenstein B, Ferland G. Absence of nutritional or clinical consequences of decentralized bulk food portioning in elderly nursing home residents with dementia in Montreal. *Journal of the American Dietetic Association*, 2000; **100**: 1354–1360.
- 7 Thomas DR, Ashmen W, Morley JE, Evans WJ. Nutritional management in long-term care: development of a clinical guideline. *Journal of Gerontology A: Biological Sciences, Medical Sciences*, 2000; **55**: M725–M734.
- 8 Azad N, Murphy J, Amos S, Toppan J. Nutrition survey in an elderly population following admission to a tertiary care hospital. *Canadian Medical Association*, 1999; **161**: 511–515.
- 9 Kyle UG, Unger P, Mensi N, Genton L, Pichard C. Nutrition status in patients younger and older than 60 y at hospital admission: a controlled population study in 995 subjects. *Nutrition*, 2002; **18**: 463–469.
- 10 Stratton RJ, Green CJ, Elia M. *Disease related Malnutrition: An Evidence-Based Approach to Treatment*. Wallingford: CABI Publishing, 2003.
- 11 Abbasi AA, Rudman D. Undernutrition in nursing homes: prevalence, consequences, causes and prevention. *Nutrition Reviews*, 1994; **52**: 113–122.
- 12 Buckler DA, Kelber ST, Goodwin JS. The use of dietary restrictions in malnourished nursing home patients. *Journal of the American Geriatrics Society*, 1994; **42**: 1100–1102.
- 13 Dorner B, Niedert KC, Welch PK. Liberalized diets for older adults in long-term care – position of ADA. *Journal of the American Dietetic Association*, 2002; **102**: 1316–1323.
- 14 Nichols PJ, Porter C, Hammond L, Arjmandi BH. Food intake may be determined by plate waste in a retirement living center. *Journal of the American Dietetic Association*, 2002; **102**: 1142–1144.
- 15 Kane RA, Caplan AL, Urv-Wong EK, Freeman IC, Arokar MA, Finch M. Everyday matters in the lives of nursing home residents: wish for and perception of choice and control. *Journal of the American Geriatrics Society*, 1997; **45**: 1086–1093.
- 16 Agich GJ. Actual autonomy and long-term care decision making. In: McCullough LB, Wilson NL (eds) *Long-Term Care Decisions: Ethical and Conceptual Dimensions*. Baltimore, MD: John Hopkins University Press, 1995: 113–136.
- 17 Ball MM, Whittington FJ, Perkins MM *et al.* Quality of life in assisted living facilities: viewpoints of residents. *The Journal of Applied Gerontology*, 2000; **19**: 304–325.
- 18 Burke A. *Hungry in Hospital*. London: Association of Community Health Councils for England and Wales, 1997.
- 19 Wright ORL, Connelly LB, Capra S. Consumer evaluation of hospital foodservice quality: an empirical investigation. *International Journal of Health Care Quality Assurance*, 2006; **19**: 181–194.
- 20 Wright ORL, Capra S, Connelly L. Foodservice satisfaction domains in geriatrics, rehabilitation and aged care. *Journal of Nutrition, Health and Aging*, 2010; **14**: 775–780.
- 21 Manos PJ, Wu R. The ten point clock test: a quick screen and grading method for cognitive impairment in medical and surgical patients. *International Journal of Geriatric Psychiatry*, 1994; **24**: 229–244.
- 22 Ferrucci L, Cecchi F, Guralnik JM *et al.* Does the clock drawing test predict cognitive decline in older persons independent of the mini-mental state examination? *Journal of the American Geriatrics Society*, 1996; **44**: 1326–1331.
- 23 Agrell B, Dehlin O. The clock-drawing test. *Age and Ageing*, 1998; **27**: 399–403.
- 24 Norman GR, Streiner DL. *Biostatistics: The Bare Essentials*, 2nd edn. ON, Canada: B.C. Decker Inc., 2000.
- 25 Pagan A. Three econometric methodologies: a critical appraisal. In: Oxley L, Roberts CJ (eds) *Surveys in Econometrics*. Oxford: Blackwell, 1995: 9–29.
- 26 Clark PA, Kaldenberg DO, Drain M, Wolosin RJ. Elderly inpatients' priorities for acute care service quality. *International Journal of Health Care Quality Assurance*, 2004; **17**: 92–104.
- 27 Shahar S, Chee KY, Chik W. Food intakes and preferences of hospitalised geriatric patients. 2002. Available at: Biomed Central Geriatrics <http://www.biomedcentral.com/1471-2318/2/3>, accessed 21 June 2003.
- 28 Aged and Community Services Australia. 2005. Available at: [http://www.agedcare.org.au/factsheets/factsheet2\\_residentialagedcare.htm](http://www.agedcare.org.au/factsheets/factsheet2_residentialagedcare.htm), cited 23 March 2005.
- 29 Davis MA, Sebastian JG, Tschetter J. Measuring quality of nursing home service: residents' perspective. *Psychological Reports*, 1997; **81**: 531–542.
- 30 Kleinsorge IK, Koenig HF. The silent customers: measuring customer satisfaction in nursing homes. *Journal of Health Care Marketing*, 1991; **11**: 2–29.
- 31 Huber R, Netting FE, Kautz JR III. Differences in types of complaints and how they were resolved by local long-term care ombudsmen operating in/not in area agencies on aging. *Journal of Applied Gerontology*, 1996; **15**: 87–101.
- 32 Chou SC, Boldy DP, Lee AH. Resident satisfaction and its components in residential aged care. *The Gerontologist*, 2002; **42**: 188–198.
- 33 Becker BW, Kaldenberg DO. Factors influencing the recommendation of nursing homes. *Marketing Health Services*, 2000; **20**: 22–28.
- 34 Raynes N. Involving residents in quality specification. *Aging and Society*, 1998; **18**: 65–78.

- 35 Rantz MJ, Mehr DR, Petroski GF *et al.* Initial field testing of an instrument to measure: observable indicators of nursing home care quality. *Journal Of Nursing Care Quality*, 2000; **14**: 1–12.
- 36 Norton PG, van Maris B, Soberman L, Murray M. Satisfaction of residents and families in long-term care: I. Construction and application of an instrument. *Quality Management in Health Care*, 1996; **4**: 38–46.
- 37 Zinn JS, Lavizzo-Mourey RJ, Taylor L. Measuring satisfaction with care in the nursing home setting: the nursing home resident satisfaction scale. *Journal of Applied Gerontology*, 1993; **12**: 452–465.
- 38 Crogan NL, Evans B, Velasquez D. Measuring nursing home resident satisfaction with food and food service: initial testing of the FoodEx-LTC. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 2004; **59**: M370–M377.
- 39 Marken D. Enhancing the dining experience in long-term care: dining with dignity program. *Journal of Nutrition for the Elderly*, 2004; **23**: 99–109.
- 40 Rikkert MGMO, Rigaud A-S. Malnutrition research: high time to change the menu. *Age and Ageing*, 2003; **32**: 241–243.
- 41 Lengyel CO, Smith JT, Whiting SJ, Zello GA. A questionnaire to examine food service satisfaction of elderly residents in long-term care facilities. *Journal of Nutrition for the Elderly*, 2004; **24**: 5–18.
- 42 Carrier N, West GE, Ouellet D. Cognitively impaired residents' risk of malnutrition is influenced by food-service factors in long-term care. *Journal of Nutrition in Gerontology and Geriatrics*, 2007; **25**: 73–87.
- 43 Schiffman SS. Perception of taste and smell in elderly persons. *CRC Critical Reviews in Food Science and Nutrition*, 1993; **33**: 17–26.
- 44 Bauld L, Chesterman J, Judge K. Measuring satisfaction with social care amongst older service users: issues from the literature. *Health and Social Care in the Community*, 2000; **8**: 316–324.
- 45 Judge K, Solomon M. Public Opinion and the National Health Service: patterns and perspectives in consumer satisfaction. *Journal of Social Policy*, 1993; **22**: 299–327.
- 46 Hogan W. Review of Pricing Arrangements in Residential Aged Care: the context of the review. Canberra, ACT: Commonwealth of Australia, 2003. Report No.: Background Paper No. 1.
- 47 Hall J, Stevens D. *Residential Care – Vision 2020 Main Findings*. Adelaide: Aged Care and Housing Group Inc., 1999.
- 48 Folio D, O'Sullivan-Maillet J, Tougher-Decker R. The spoken menu concept of patient foodservice delivery systems increases overall patient satisfaction, therapeutic and tray accuracy, and is cost neutral for food and labor. *Journal of the American Dietetic Association*, 2002; **102**: 546–548.
- 49 Williams R, Virtue K, Adkins A. Room service improves patient food intake and satisfaction with hospital food. *Journal of Paediatric Oncology Nursing*, 1998; **15**: 183–189.
- 50 Dougherty DA. The advantages of the spoken menu. *Hospital Food and Nutrition Focus*, 1993; **9**: 3–4.
- 51 Remsburg RE. Impact of a buffet-style dining program on weight and biochemical indicators of nutritional status in nursing home residents – a pilot study. *Journal of the American Dietetic Association*, 2001; **101**: 1460–1463.
- 52 O'Hara PA, Harper DW, Kangas M, Dubeau J, Borsutzk C, Lemire N. Taste, temperature and presentation predict satisfaction with foodservices in a Canadian continuing-care hospital. *Journal of the American Dietetic Association*, 1997; **97**: 401–405.
- 53 Lau C, Gregoire MB. Quality ratings of a hospital foodservice department by inpatients and postdischarge patients. *Journal of the American Dietetic Association*, 1998; **98**: 1303–1307.
- 54 Dube L, Trudeau E, Belanger MC. Determining the complexity of patient satisfaction with food services. *Journal of the American Dietetic Association*, 1994; **94**: 394–398.
- 55 Gregoire MB. Quality of patient meal service in hospitals: Delivery of meals by dietary employees vs delivery by nursing employees. *Journal of the American Dietetic Association*, 1994; **94**: 1129–1134.
- 56 Wright ORL, Capra S, Aliakbari J. A comparison of two measures of hospital foodservice satisfaction. *Australian Health Review*, 2003; **26**: 70–75.
- 57 Niedert KC. Position of the American Dietetic Association: liberalization of the diet prescription improves quality of life for older adults in long-term care. *Journal of the American Dietetic Association*, 2005; **105**: 1955–1965.