PREDICTING LATER LIFE STATUS FROM FOOD HABITS IN COMMUNITIES OF ELDERLY GREEKS

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31.1   INTRODUCTION

The definition of 'health and quality of life' is not simply the absence of disease but includes personal and social well-being [1]. There is general agreement in the literature on the five areas that should be included in a total health assessment of the elderly. This has been defined as multidimensional assessment of health status, which has become synonymous with quality of life [2]. These include not only physical health, but also functional health (e.g ability to carry out activities of daily living), mental health (e.g well-being or depression), social health (e.g social activity, social networks and living arrangements) and economic situation. The literature, however, is devoid of a single index or descriptor that embraces these aspects of life. Information on physical health alone is inadequate when considering well-being and quality of life of elderly folk. For example, many of the disabling problems of older persons cannot be 'solved' or cured. However, when interviewed, older patients state frequently that their health is good in spite of the presence of these chronic conditions [2].

If quality of life is of major importance in the aged, to what extent is it influenced by nutrition or vice versa? Rosenberg and Miller [3] point to the growing evidence supporting the view that good nutritional status is an important determinant of quality of life due to its effect on the nervous system. A healthy nervous system facilitates independence by maintaining physical mobility, cognitive and visual function which allows an elderly person to be socially and

physically active.

The main purpose of this chapter is to explore the relationship between food and nutrient intake and a multidimensional index of life and health status, in the Greek samples, as a model for application to other disparate cultures. The 'Later Life Status' score was created in order to include multiple aspects of an elderly person's life. Details on the construction of the scores are given.

31.2   METHOD

31.2.1 Later Life Status (LLS)

The 'Later Life Status' (LLS) is a descriptor (score) which incorporates eight aspects of an elderly person's life, including well-being, memory, general health, medication-use, activities of daily living (ADL), exercise, social activity and social networks. Each of these aspects was indexed by summing the numeric response given to each question and in all cases, a higher score was a better score. All the scores were developed for the study except for the General Health Score which was taken from the Multi-level Assessment Instrument [4]. Judgements have not been made on the importance of various questions over others. The relative importance of one question over another may be different from culture to culture. The maximum achievable score is not uniform amongst the various indices because the number of questions for each aspect of life is not equal. Efforts were thus made to 'standardise' each score to a common denominator of 10 (i.e. each score was divided by its maximum achievable score and then multiplied by 10). The 'Later Life Status' was the sum of these 'standardised' scores derived from the eight aspects of life. Giving a final score ranging from 0 to 80. A higher score indicates better 'Later Life Status'.

Variables which contributed to each of the eight aspects of life are described as follows (refer to questionnaire for details of questions and protocol for sources when indicated):

1.   **General Health Score:**

The General Health Score is the sum of four sub-indices of the Multi-level Assessment Instrument (MAI) [4], including the assessment of 1) self rated health, 2) health behaviour, 3) health conditions and 4) a non index item. The General Health Score ranged from 33 to 74. The Self Rated Health Sub-index, derived from questions H34, H35, H36, and H37, had a value ranging from 4 to 13. The Health Behaviour Sub-index, derived from questions H38, H39, and H40, had a value ranging from 3 to 9. The Self Reported Health Conditions Sub-index was derived from a 23 item check-list of common health conditions (question H43), questions H41, H42, and H46. It ranged from 25 to 50. A Non Index Item scored 1 or 2, based upon question H47c, was added to the sum of the subindices.

2.   Self Reported Medication Use:

This index was derived from question H44, a 21 item check-list, with a score ranging from 21 to 42.

3.   Memory Score:

This index was derived from questions MA7, MA8, MA9, MA10, and WB17, with a score ranging from 0 to 5.

4.   Well-being Score:

This index was derived from questions WB11, WB12, WB13, WB14, WB15, WB16, and WB17A, with a score ranging from 0 to 7.

5.   Activities of Daily Living Score:

This index derived from questions ADL88a-n2, ADL88O, ADLP, and ADLQ, with a score ranging from 15 to 62.

6.   Exercise Score:

This index was derived from questions EX84 and EX86. Based on the answers to these questions the subject was scored by the interviewer on a scale of 1-7 (see Table 31.1).

Table 31.1. Grading of the Exercise Score: 'What exercise score would you give the subject, from 1 to 7 based on the answer to EX86?'	
1	Inactive, in bed or seated all day.
2	Inactive, seated most of the day.
3	Inactive, seated most of day with few hours of pottering.
4	Active, walks or gardens (about 1 hr) or does few hours of house work at least 3-4 times a week and on feet most of day.
5	Active, walks or gardens (about 1 hour) or few hours of housework daily and on feet most of day.
6	Active, heavy gardening or farming or plays an aerobic sport or few hours walking 3-4 times a week.
7	Very active, heavy gardening or farming or plays an aerobic sport or few hours walking daily.

7.   Social Activity Score:

This index was derived from questions DC32B and SAR92a-u (a 21 item check-list), with a score ranging from 22 to 176.

8.   Social Networks Score:

This index was derived from questions SAR93, SAR94, SAR95, SAR96, SAR97A-D, SAR98, SAR100, SAR101, and SAR102, with a score ranging from 12 to 46.

31.2.2 Composite descriptors for food and nutrient intakes

Food intake was described, as broad food groups (g/day), as calories consumed per day from each food group, as food group intake variety scores, traditional food score and as nutrients. Ten food groups were constructed from 238 food items in the food frequency questionnaire (FFQ) using the main ingredient in a food or mixed dish for grouping. The ten food groups and their food subgroups were defined as follows:

1.   Meat group - beef, lamb, chicken, turkey, game, bird, rabbit, pork, offal, and processed meat;

2.   Fish group - fish, shellfish, and fish roe dip;

3.   Dairy group - milk, cheese, cheese pie, yoghurt, custard, milk puddings, and custard pastry;

4.   Vegetable group - all vegetables, garlic, olives, including mixed dishes where vegetables are main ingredient (e.g mousaka, spinach rice casserole, eggplant and garlic/potato dip) and nuts;

5.   Legume group - all legume soups, salads and casseroles, chickpea felafel, green peas and split peas;

6.   Cereal group - bread, rice, noodles, pasta (including mixed pasta dishes like pastichio, lasagna), breakfast cereals, polenta, trahana (flour and sour milk pasta), cakes, sweet, and dry biscuits;

7.   Fruit - all fresh and dried fruit;

8.   Alcohol - beer, wine, spirits, and liqueurs;

9.   Sweets - all foods where sugar is major ingredient e.g soft drinks, juices, sugar, jam, honey, confectionery, jelly, halva (tahini paste and sugar), chocolate, and turkish delight;

10.   Fats - butter, margarine, oils, peanut butter, and tahini paste.

Nine food group intake variety scores were constructed to describe variety of foods consumed within a particular food group, from a total of 238 foods in the food frequency questionnaire. A medium serving of a food or mixed dish within a food group had to be consumed at least once a month or more to score. Alcohol and fats were collapsed into one group, 'intake variety from other foods'. The meat intake variety, scored 0 to 24, consisted of 24 foods from the meat group; the fish intake variety, scored 0 to 19, consisted of 19 foods from the fish group; the dairy intake variety, scored 0 to 30, consisted of 30 foods from the dairy group; the cereal intake variety, scored 0 to 34, consisted of 34 foods from the cereal group; the vegetable intake variety, scored 0 to 48, consisted of 48 foods from the vegetable group; the legume intake variety, scored 0 to 13, consisted of 13 foods from the legume group; the fruit intake variety, scored 0 to 33, consisted of 33 foods from the fruit group; the intake variety for sweets, scored 0 to 17, consisted of 17 foods from the sweets group; the intake variety for other foods, scored 0 to 20, consisted of 20 foods from the alcohol and fats group, including tea, coffee and water. For each of food group intake variety, the score was divided by the maximum achievable score and then multiplied by 10 to generate a common denominator. A standard total food variety score was constructed by adding together all the food group intake variety scores; the score ranged from 0 to 90.

31.2.3 Statistics

Univariate analyses were performed to examine the interrelationships between the various life factors. The percentage of variation of Later Life Status explained by the life factors, and/or food and nutrient intakes was obtained using stepwise regression analyses.

31.3   RESULTS

31.3.1 Later Life Status (LLS)

Men (ranging from 59.5 to 66.5) had a significantly greater LLS score than women (ranging from 54.5 to 62.2). This is true for all age groups in both Spata and Melbourne. Those aged 80 years and over (the older age group) scored less than those aged 70 to 79 years (the younger age group), particularly in men and amongst the Melbourne community. Melbourne women aged 70 to 79 years had a significantly greater LLS score than their counterparts in Spata, Greece (see Table 31.2).

31.3.2 Inter-correlations amongst the aspects of life

The eight aspects of life were positively inter-correlated with each other and highly significant,

except for memory (all groups), well-being and activities of daily living (Melbourne women only). Irrespective of gender and study community, all were significantly correlated with the Later Life Status (p<0.0001) (Table 31.3).

Table 31.2.   Descriptive statistics for Later Life Status (LLS).

Score	Melbourne 70 - 79	80+	Spata 70 - 79	80+
Men				
N	66	28	32	19
Mean	66.5ae	59.9be	66.1cf	59.5df
SD	6.0	7.9	8.2	7.9
Minimum	39.2	38.9	41.6	42.7
5%	55.4	47.7	50.0	42.7
25%	63.8	55.6	63.0	51.8
50%	66.9	60.9	68.2	60.2
75%	70.8	65.8	72.7	63.6
95%	74.0	70.7	75.0	76.7
Maximum	74.8	74.4	75.2	76.7
Women				
N	59	36	31	22
Mean	62.2agk	54.9bg	58.2ck	54.5d
SD	6.7	7.1	6.8	7.9
Minimum	43.3	35.7	46.8	37.8
5%	49.5	42.5	47.7	40.7
25%	58.4	50.3	53.1	51.8
50%	63.0	54.8	56.8	54.8
75%	66.7	59.9	62.8	58.3
95%	72.4	67.3	68.8	65.9
Maximum	74.0	68.1	75.1	72.7

Same superscript indicates significant differences (Wilcoxon p<0.05): a,b,c or d indicates gender differences for a given age group and centre; e,f,g or h indicates differences between the two age groups for a given gender and centre; i,j,k or l indicates differences between centres for a given age group and gender; *, a high score indicates better Later Life Status.

Table 31.3.   Pearson's correlation coefficients between the Life Factors and Later Life Status for Melbourne, by gender.

	A	B	C	D	E	F	G	H	I
Men									
A		0.60****	0.37***	0.70****	0.70****	0.74****	0.68****	0.68****	0.64****
B			0.59****	0.26**	0.55****	0.59****	0.42****	0.26**	0.27**
C				0.12	0.29**	0.32***	0.26**	0.13	0.14
D					0.38****	0.34***	0.26**	0.42****	0.45****
E						0.54****	0.37***	0.31**	0.33***
F							0.56****	0.47****	0.41****
G								0.45****	0.36***
H									0.43****

	A	B	C	D	E	F	G	H	I
Women									
A		0.63****	0.28**	0.60****	0.72****	0.75****	0.73****	0.64****	0.63****
B			0.52****	0.05	0.58****	0.52****	0.50****	0.40****	0.36***
C				0.04	0.30**	0.16	0.15	0.07	0.05
D					0.17	0.38****	0.10	0.11	0.01
E						0.41****	0.44****	0.32***	0.41****
F							0.7****	0.41****	0.35***
G								0.65***	0.47***
H									0.49****
I									

A = Later Life Status; B = General Health; C = Medication; D = Memory; E = Well-being; F = Activities of daily living; G = Exercise; H = Social activies; I = Social network

Table 31.4. **Pearson's correlation coefficients between the Life Factors and Later Life Status for Spata, by gender.**

	A	B	C	D	E	F	G	H	I
Men									
A		0.67****	0.38**	0.60****	0.85****	0.74****	0.88****	0.75****	0.59****
B			0.77****	0.26	0.50***	0.43***	0.65****	0.37**	0.33**
C				0.01	0.25	0.27*	0.37**	0.09	0.30*
D					0.56****	0.27*	0.32**	0.41**	0.17
E						0.57****	0.62****	0.54****	0.41**
F							0.57****	0.55****	0.42***
G								0.63****	0.6****
H									0.39**
I									
Women									
A		0.67****	0.38**	0.40**	0.64****	0.74****	0.79****	0.69****	0.59****
B			0.54****	0.08	0.49***	0.49****	0.5***	0.47***	0.36**
C				0.03	0.35**	0.12	0.30*	0.28*	0.15
D					0.02	0.03	0.10	0.11	0.01
E						0.3*	0.30*	0.22	0.34**
F							0.69****	0.63****	0.61****
G								0.65***	0.47***
H									0.43***
I									

A = Later Life Status; B = General Health; C = Medication; D = Memory; E = Well-being; F = Activities of daily living; G = Exercise; H = Social activies; I = Social network

31.3.3 Contribution of aspects of life to the Later Life Status

In Melbourne, more than 85% of the variation in Later Life Status was accounted for by activities of daily living (42.8% for men and 15.7% for women), well-being (5.8% for men and 43.8% for women), memory (21.3% for men and 11.3% for women) and age (16.7% for men and 21.1% for women) (Table 31.5).

Figure 31.1. The variation percentage of the Later Life Status Score explained by the life factors, controlling for age group.

Figure 12.2.2.2   The % variation of the later life status score explained by the life factors, controlling for age group

Table 31.5 **Percentage variation of Later Life Status explained by aspects of life for Melbourne (controlling for age group), by gender.**

	Parameter estimate	R x 100	P value
Men (n=94)			
Age group	-6.6	17.6	****
ADL	0.1	42.8	****
Memory	0.1	21.3	****
Exercise	0.1	6.9	****
Well-being	0.1	5.8	****
Social activies	0.1	3.2	****
Social network	0.1	1.4	****
General Health	0.1	0.6	****
Medication Use	0.1	0.2	****
Women (n=95)			
Age group	-7.3	21.1	****
Well-being	0.1	43.8	****
ADL	0.1	15.7	****
Memory	0.1	11.3	****
Social activies	0.1	4.7	****
Exercise	0.1	1.3	****
Social network	0.1	1.0	****
General Health	0.1	0.7	****
Medication Use	0.1	0.0	****

NS, not significant; * p<0.05; ** p<0.01; *** p <0.001; **** p<0.0001

In Spata, exercise alone explained more than 60% of the variation of Later Life Status for both men and women; this was followed by well-being (15.3% for men and 17.9% for women). The relative importance of age, as a determinant of Later Life Status (14.5% for men and 6% for women), was also greatly attenuated (Table 31.6 and Figure 31.1).

Table 31.6.   Percentage variation of Later Life Status explained by aspects of life for Spata (controlling for age group), by gender.

	Parameter estimate	R x 100	P value
Men (n=51)			
Age group	-6.6	14.1	**
Exercise	0.1	64.1	****
Well-being	0.1	15.3	****
ADL	0.1	2.9	****
Social activies	0.1	1.4	****
Memory	0.1	1.1	****
Medication Use	0.1	0.7	****
Social network	0.1	0.3	****
General Health	0.1	0.1	****
Women (n=53)			
Age group	-3.6	6.0	NS
Exercise	0.1	62.2	****
Well-being	0.1	17.9	****
Memory	0.1	6.2	****
ADL	0.1	5.0	****
Social activies	0.1	1.5	****
Social network	0.1	0.7	****
General Health	0.1	0.6	****
Medication Use	0.1	0.1	****

NS, not significant; * $p<0.05$; ** $p<0.01$; *** $p<0.001$; **** $p<0.0001$

31.3.4 Food group intake variety

The Later Life Status was positively associated with a greater variety derived from vegetable intake for women in both Melbourne (7%, $p<0.01$) and Spata (9%, $p<0.05$). For the men, fruit variety and variety from fish intake contributed 3.6% and 19.6% respectively of the variation of the Later Life Status; these relationships were positive ($p<0.05$, $p<0.001$ respectively).

Table 31.7. **Percentage variation of Later Life Status explained by food group intake variety scores (controlling for age group), by centre and gender.**

	Parameter estimate	R x 100	P value
Melbourne			
Men (n=94)			
Age group	-6.6	17.6	****
Fruit	1.2	3.6	*
Legume	1.0	2.0	NS
Vegetable	1.2	2.4	NS
Women (n=95)			
Age group	-7.3	21.1	****
Vegetable	1.8	7.0	**
Spata			
Men (n=51)			
Age group	-6.6	14.0	**
Fish	3.9	19.6	***
Women (n=53)			
Age group	-3.6	5.8	NS
Vegetable	2.1	9.0	*

NS, not significant; * p<0.05; ** p<0.01; *** p <0.001; **** p<0.0001

31.3.5 Absolute intake of food groups

The Later Life Status of Melbourne men was independent of food intake. For the Melbourne women, the Later Life Status was positively related to vegetable intake (p<0.0001) which explained about 10% of the variation of the Later Life Status (Table 31.8). For the Spata men, Later Life Status was positively associated with the fish intake (9%) and negatively associated with meat intake (6%). The positive associations with intakes of fat (4.7%), vegetable (4.7%) and alcohol (3.4%) were not statistically significant, although they collectively accounted for more than 12% of the variation of Later Life Status.

The Later Life Status of Spata women was positively related to the intakes of fruit and legumes which explained 12.3% and 13.7%, respectively, of the variation of the Later Life Status. The intakes of cereals (4%), meat (4%), dairy (3%) and fat (2.7%) were also important discriminants of the Later Life Status of Spata women; they were not statistically significant.

Table 31.8.   Percentage variation of Later Life Status explained by food groups (grams/day) (controlling for age group), by centre and gender.

	Parameter estimate	R x 100	P value
Melbourne			
Men (n=94)			
Age group	-6.6	17.6	****
Fruit	0.08	2.7	NS
Alcohol	0.07	2.8	NS
Women (n=95)			
Age group	-7.3	21.1	****
Vegetable	0.02	9.5	***
Spata			
Men (n=51)			
Age group	-6.6	14.0	**
Fish	0.02	9.0	*
Fat	0.2	4.7	NS
Vegetables	0.02	4.7	NS
Meat	-0.03	6.0	*
Alcohol	0.08	3.4	NS
Women (n=53)			
Age group	-3.6	5.8	NS
Fruit	0.03	12.3	**
Legumes	0.09	13.7	**
Cereals	0.01	4.0	NS
Meat	-0.03	4.0	NS
Dairy	-0.01	3.0	NS
Fat	-0.01	2.7	NS

NS, not significant; * p<0.05; ** p<0.01; *** p <0.001; **** p<0.0001

31.3.6 Calories provided by food groups

For the Melbourne men, the Later Life Status was positively associated with calories derived from the intake of fat, alcohol or fruit, but did not reach statistical significance. For the Melbourne women, the Later Life Status was positively associated with the intake of calories from vegetables which explained six per cent of the variation (p<0.001) (Table 31.9). For the Spata men, the Later Life Status was positively associated with calories derived from the intake of fat (p<0.05) and legumes (not statistically significant) which contributed to 8% and 4.2%, respectively, of the variation of the Later Life Status.

Table 31.9. **Percentage variation of Later Life Status explained by calories from food groups (controlling for energy intake and age group), by centre and gender.**

	Parameter estimate	R x 100	P value
Melbourne			
Men (n=94)			
Age group	-6.7		
Age group & energy		17.9	****
Fat	0.01	2.7	NS
Alcohol	0.01	2.0	NS
Fruit	0.02	2.7	NS
Women (n=95)			
Age group	-7.1		
Age group & energy		23.5	****
Vegetables	0.02	6.0	**
Spata			
Men (n=51)			
Age group	-5.8		
Age group & energy		20.2	**
Fat	0.02	8.0	*
Legumes	0.04	4.2	NS
Women (n=53)			
Age group	-3.6		
Age group & energy		12.0	*
Fruit	0.06	10.4	**
Legumes	0.06	11.1	**
Fat	-0.01	3.6	NS
Meat	-0.02	4.0	NS
Dairy	0.017	4.3	NS

NS, not significant; * p<0.05; ** p<0.01; *** p <0.001; **** p<0.0001

The Later Life Status of the Spata women was positively related to calories from the intake fruit and legumes (both p<0.01) which contributed to 10.2% and 11.1%, respectively, of the variation of the Later Life Status. The associations with calories from the intake of fat (negative), meat (negative) or dairy (positive) were not statistically significant, but each contributed 3.6%, 4%, and 4.3% of the variation of the Later Life Status (Table 31.9).

31.3.7 Nutrient intakes

The Later Life Status of Melbourne men was negatively associated with the intake of niacin; which explained four per cent of the variation of the Later Life Status was attributable to niacin

intake. In women, the Later Life Status was negatively associated with the intakes of cholesterol and carbohydrates; the two nutrients contributed about seven per cent of the variation of the Later Life Status in Melbourne women.

In Spata men, the Later Life Status was negatively related to the intakes of carbohydrates and zinc, and positively related to the intake of vitamin C. The intake of zinc contributed 14.3% of the variation of the Later Life Status in Spata men. A negative relationship between the Later Life Status and zinc intake was also observed in Spata women, but statistically insignificant. In Spata women, 21.3% of the variation of the Later Life Status was attributable to the intake of fibre.

Table 31.10. Percentage variation of Later Life Status explained by nutrient intake (controlling for energy intake and age group), by centre and gender.

	Parameter estimate	R x 100	P value
Melbourne			
Men (n=94)			
Age group	-6.7		
Age group & energy		17.9	****
Sodium	-0.03	3.3	NS
Magnesium	0.04	2.0	NS
Niacin	-0.4	4.0	*
Carbohydrate	-0.3	2.5	NS
Women (n=95)			
Age group	-7.1		
Age group & energy		23.5	****
Cholesterol	-0.02	3.7	*
Carbohydrate	-0.06	3.4	*
Spata			
Men (n=51)			
Age group	-5.8		
Age group & energy		20.2	***
Carbohydrate	-0.07	6.8	*
Zinc	-1.02	14.3	**
Vitamin C	0.08	6.1	*
Retinol Eq	0.003	2.5	NS
Women (n=53)			
Age group	-3.6		
Age group & energy		12.0	NS
Fibre	1.5	21.3	***
Zinc	-0.7	4.8	NS
Poly-unsaturated fat	-0.85	3.4	NS

NS, not significant; * p<0.05; ** p<0.01; *** p <0.001; **** p<0.0001

31.4   DISCUSSION

Generally, the Later Life Status of male or younger elderly were superior to their female or older counterparts. The contribution of age to the variation of Later Life Status was consistent and persistent in all dietary models where various expressions of food habits were examined (Tables 31.7-31.10). The findings suggested that the Later Life Status is a reasonable discriminator of an elderly person's life insofar as the age differences are concerned. The gender differences suggested that the Later Life Status of men is greater than women. This may be attributable to

gender differences in physical and/or social performances; both appear to be in favour of men over women. Men generally have a longer active life expectancy than women [5]. Women may live longer than men;but they are also more likely to spend the potential years of later life living alone. The fact that a high percentage of the variation of Later Life Status was accounted for by activies of daily living (ADL), exercise, well-being and memory implies that an elderly person's life is better discriminated by mobility, cognitive status and psychological status rather than the absence of disease or medication use. This observation is consistent with other studies [6-10]. Buskirk's [11] review of data on health maintenance and exercise supports the assumption that regular exercise blunts many of the physiological declines associated with ageing, improves sense of well-being and quality of life. At increased ages there is a gradual reduction in the basal metabolic rate, but no proportional reduction of the demand for essential nutrients. Physical activies has been associated with greater energy intakes and subsequently nutrient intakes and quality of life in the aged [5,12].

A high absolute intake (grams/day and kcal) of vegetables, fruit and legumes appeared to be the most important determinants of Later Life Status in Greek elderly, followed by a low intake of meat (except Melbourne elderly) and high intake of fish (spata men only). The relationship between quality of life and food intake has not been reported in other studies. In a study by Walker and Beauchene [13] on 61 elderly aged 60-94 years, physical health (measured using the Guttman Health Scale) was related to nutrients (vitamin A, ascorbic acid and fibre) predominantly found in plant foods. Nevertheless, epidemiological data indicate that a high intake of vegetables, fruit and fish are associated with reduced rates of heart disease and colonic cancer [14-16]. Legumes have also been shown to be cholesterol lowering [17] and potentially protective against cancer [18].

The effect of limited food choice on the health and nutritional status of the elderly can be serious, because consumption of a varied diet is considered the most effective way to assure adequate nutrient intake [19]. Additionally, a variety of foods are recommended in order to provide other nutrients and non-nutrients for which human requirements have been less well defined [20]. The relationship between quality of life and food variety has not been reported in other studies. It has been shown that lower total mortality is associated with a higher dietary diversity in Americans [21]. Wahlqvist et al. [22] showed that food variety is associated with less non-invasive evidence of macrovascular disease. Horwath [23] has shown that, as dietary variety increases, so the self assessment of health also increases from poor to very good in elderly Australians. Horwath also showed that social/leisure activies alone accounted for 15 per cent of the variance of the total food variety score, and 11% of the variance of the vegetable variety score. Participation in a greater variety of social activities was associated with use of a greater variety of foods, which in turn was linked with higher micro-nutrient intakes.

In the current study, vegetable variety was the most significant contributor to the variation of the Later Life Status, particularly the women in both Melbourne and Spata, where it explained up to 10% of the Later Life Status. In other words, the high vegetable intake should probably include a

variety of vegetables in order to be of benefit in later life. Visual function has been shown to be affected by antioxidants such as vitamins C and E [24], physical mobility and cognitive function by vitamins B6, B12, folate, vitamin C, riboflavin, thiamin and iron [25]. Similarly in the current study, a greater intake of vitamin C was associated with a higher Later Life Status in Spata. Meat is a good source of zinc, niacin and iron. The negative correlation of zinc intake to the Later Life Status is probably related to the negative association of meat intake to the Later Life Status (Table 31.8). Meat intake per se was not found to be negatively associated with the Later Life Status in Melbourne. However, the negative association of niacin intake to the Later Life Status may be acting as a surrogate measure for meat intake. Similarly, the importance of vitamin C and fibre in explaining the variation of the Later Life Status is probably related to the association of vegetable intake with the Later Life Status.

In summary, the results suggest that a higher plant food intake (in particular vegetables, legumes and fruit) and a lower meat intake are predictive of better Later Life Status in elderly Greeks. The higher plant food intake should probably include a variety of vegetables and fruit. In this study, efforts were made to create the Later Life Status, an index that embraces eight meaningful aspects of life, in an attempt to identify dietary predictors of an elderly person's life. The eight aspects of life, while being inter-related statistically, are considered independent resources that determine quality of life in old age [7,8]. The use of the aspects of life to describe Later Life Status requires validation, especially for elderly of other cultural or ethnic background.

31.5   SUMMARY

•   This chapter explores the relationship between food and nutrient intake and a multidimensional index of life and health status, in the Greek samples, as a model for application to other disparate cultures.

•   The 'Later Life Status' (LLS) is a descriptor (score) which incorporates eight aspects of an elderly person's life, including well-being, memory, general health, medication-use, activities of daily living (ADL), exercise, social activity and social networks. The use of the aspects of life to describe LLS requires validation, especially for elderly of disparate cultures

•   Greek men in both Spata and Melbourne had a significantly greater LLS score than women. GRK-M women aged 70-79 years had a significantly greater LLS than GRK-S women.

•   In Melbourne, >85% of the variation in LLS was accounted for by ADL (M 42.8%,F 15.7%), well-being (M 5.8%, F 43.8%), memory (M 21.3%, F 11.3%) and age (M 16.7%, F 21.1%). In Spata, exercise alone explained >60% of the variation of LLS; this was followed by well-being (M 15.3%, F 17.9%) and age (M 14.5%, F 6%).

•   LLS was positively associated with a greater vegetable variety for women in both GRK-M (7%, p<0.01) and GRK-S (9%, p<0.05). For the men, fruit and fish variety contributed 3.6% and 19.6% respectively of the variation of the LLS.

•   LLS of GRK-M men was independent of food intake. For GRK-M women, the LLS was positively related to vegetable intake (p<0.0001) which explained about 10% of the variation of LLS.

•   For GRK-S men, LLS was positively associated with fish intake (9%) and negatively associated with meat intake (6%). The positive associations with intakes of fat (4.7%), vegetable (4.7%) and alcohol (3.4%) were not significant. LLS of GRK-S women was positively related to the intakes of fruit and legumes which explained 12.3% and 13.7% respectively of the variation of the LLS; the intakes of cereals (4%), meat (4%), dairy (3%) and fat (2.7%) were also important discriminants of LLS, but were not significant.

•   A greater intake of vitamin C was associated with better LLS in GRK-S.

•   In conclusion, an elderly person's life appears to be better discriminated by mobility, cognitive and psychological status rather than the absence of disease or medication use. A high absolute intake of vegetables, fruit and legumes appeared to be the most important determinants of LLS in Greek elderly, followed by a low intake of meat (except GRK-M

elderly) and high intake of fish (GRK-S men only). The high vegetable intake should probably include a variety of vegetables in order to be of benefit in later life.

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31.7 Legend to Figure

Figure 31.1   The variation percentage of the Later Life Status Score explained by the life factors, controlling for age group.

CHAPTER 31

PREDICTING LATER LIFE STATUS FROM FOOD HABITS IN COMMUNITIES OF ELDERLY GREEKS

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