O'Sullivan, Therese Anne and Bremner, Alexandra and Cedaro, Pieta and O'Neill, Sheila and Lyons-Wall, Philippa (2009) ***Glycaemic index and glycaemic load intake patterns in older Australian women.*** Nutrition and Dietetics, 66(3). pp. 138-144.

Abstract

Aims: Dietary glycemic index (GI) and glycemic load (GL) have been associated with risk of chronic diseases, yet limited research exists on patterns of consumption in Australia. Our aims were to investigate glycemic carbohydrate in a population of older women, identify major contributing food sources, and determine low, moderate and high ranges.

Methods: Subjects were 459 Brisbane women aged 42-81 years participating in the Longitudinal Assessment of Ageing in Women. Diet history interviews were used to assess usual diet and results were analysed into energy and macronutrients using the FoodWorks dietary analysis program combined with a customised GI database.

Results: Mean±SD dietary GI was 55.6±4.4% and mean dietary GL was 115±25. A low GI in this population was ≤52.0, corresponding to the lowest quintile of dietary GI, and a low GL was ≤95. GI showed a quadratic relationship with age (P=0.01), with a slight decrease observed in women aged in their 60's relative to younger or older women. GL decreased linearly with age (P<0.001). Bread was the main contributor to carbohydrate and dietary GL (17.1% and 20.8%, respectively), followed by fruit (15.5% and 14.2%), and dairy for carbohydrate (9.0%) or breakfast cereals for GL (8.9%).

Conclusions: In this population, dietary GL decreased with increasing age, however this was likely to be a result of higher energy intakes in younger women. Focus on careful selection of lower GI items within bread and breakfast cereal food groups would be an effective strategy for decreasing dietary GL in this population of older women.

Introduction

Consumption of a diet low in glycemic index (GI) and glycemic load (GL) has been associated with decreased risk of obesity[1] and chronic diseases, including Type 2 diabetes, heart disease, ovarian cancer and gallbladder disease[2]. Some studies have not observed a reduction in disease risk[3,4], although these studies did not use tools specifically validated to assess GI and GL. The Dietitians Association of Australia has supported the use of GI in making food choices[5] and consumer awareness of the GI concept has increased three-fold from 28% in 2002 to 84% in 2006[6].

GI values for individual foods and beverages have been classified as low (≤55%), moderate (56-69%) or high (≥70%) to guide the Australian public in choosing a low glycemic diet[7]. Although these guidelines have been in the public domain for a number of years, limited research exists on consumption patterns within the Australian population to determine what constitutes low, moderate or high ranges of dietary GI and GL.

Our aims were to: investigate GI and GL consumption in a population of older Australian women; examine the major contributing food sources; and identify low, moderate and high ranges in this population.

Methods

Subjects

A total of 511 women participated in the Longitudinal Assessment of Ageing in Women (LAW), an age-stratified, multidisciplinary study conducted at Royal Brisbane and Women's Hospital. Women were randomly selected from the electoral roll (details published previously[8]). Data for the current study were collected during year three of LAW. Study procedures were approved by the Human Research Ethics Committees of Queensland

University of Technology and Royal Women's Hospital. Subjects gave informed written consent.

Assessment of dietary intake

Usual intake was assessed by a dietitian during a standardised diet history interview[9,10]. Subjects described the amount and type of foods and drinks consumed in a typical month within the previous six months. Details were obtained on the pattern of food intake throughout the day with a special focus on carbohydrate-contributing items, including brand names and preparation methods. Food models and measuring displays were used to assist in determination of usual serve sizes. Data were analysed into energy and macronutrient intakes using the FoodWorks dietary analysis program (Professional Version 4.00, Xyris Software, Brisbane) with the Australian Food and Nutrient Database, combined with a customised GI database comprising published GI values[11,12]. Where appropriate, values were imputed from similar foods when the specific brand was not available and GI values for mixed foods and recipes were estimated from constituents; for example, the GI for trifle was based on a weighted GI calculation of the carbohydrate-containing ingredients: sponge, jelly and custard.

Subjects identified as under-reporters of total energy (ratio of reported energy intake to estimated energy expenditure of <0.76) were excluded from the study[13,14]. For a subject to qualify for a GI and GL score, at least 85% of their carbohydrate intake was required to be allocated a GI value. Dietary GL was calculated as the product of the GI and carbohydrate content for each food, summed for all foods eaten during the day. Dietary GI was calculated as the product of the GI and carbohydrate content for each food, summed for all foods eaten during the day and divided by the total daily carbohydrate intake[15]. The dietary GI is therefore the weighted mean GI, proportional to the amount of the available carbohydrate contributed by each food.

The contribution of a food group to carbohydrate intake was calculated by summing the carbohydrate for each food group and dividing by the total carbohydrate intake for the LAW women. The contribution of a food group to dietary GL was calculated by summing the GL for each food group and dividing by overall dietary GL. The contribution of a food group to dietary GI was calculated by multiplying the percentage of the group's contribution to carbohydrate intake by the average GI of the food group, and dividing by the sum of this product from all food groups.

Statistical analysis

Means, SD, medians, interquartile ranges, tertiles and quintiles were used to describe intakes. Dietary GL was also examined as GL per megajoule of energy to account for energy intake. Linear regression was used to analyse changes in dietary GI and GL for each year of age, with models tested for quadratic terms (age-squared) and checked using residual plots. The Statistical Package for Social Sciences (SPSS) for Windows Graduate Student Version 14.0 was used for analyses.

Results

Subjects

Of the 511 subjects who commenced the LAW study in year one, 470 subjects completed a diet history for this study in year three (response rate 92%). Reasons for non-completion were: unable to attend appointment (n=24), illness (n=13), declined to participate (n=2), and death (n=2). Of the subjects who completed the diet history, 11 were identified as under-reporters, resulting in a total of 459 for inclusion in dietary analysis. Of these subjects, 90 did not meet the criterion of ≥85% of carbohydrate consumed allocated GI values. The remaining

369 subjects were used for GI and GL analyses. Characteristics of this group did not differ significantly from those of the 142 subjects who were not included in the analysis (**Table 1**).

Nutrient intakes, dietary GI and GL

Nutrient intakes are shown in **Table 2**. Mean energy intake was 8.5 MJ, with 46.0% derived from carbohydrate, 18.1% from protein, 32.6% from fat and 3.3% from alcohol; mean dietary GI was 55.6 and dietary GL was 115. GL showed an inverse linear relationship with age; for each one-year increase in age, there was an average decrease of 0.4 in GL ($P<0.001$) (**Table 3**, **Figure 1**). There was no significant difference in GL per megajoule with age. GI showed a quadratic relationship with age ($P=0.01$); values were slightly lower in women aged 60-69 years compared to younger or older women.

Foods contributing to glycemic carbohydrate

Overall, 89.7% of the total carbohydrate intake was able to be allocated a GI value. Food groups that contributed over 5% to total carbohydrate intake were breads, particularly white, grain and wholemeal; fruit, particularly bananas and apples; dairy products, particularly milk and yoghurt; breakfast cereals; potato; and rice (**Table 4**). Food groups that contributed over 5% to total dietary GL were bread products, particularly white, grain and wholemeal; fruit, particularly bananas and apples; breakfast cereals, particularly oats/porridge, Sanitarium Weet-Bix™ and muesli; potato; rice; and dairy products (**Table 4**). The contribution of these food groups to the weighted dietary GI is the same as their contribution to dietary GL, since the GL, by definition, is equal to the GI weighted for the carbohydrate content of the items.

Ranges of dietary GI and GL

When examined in tertiles, low dietary GI was ≤53.7, medium was 53.8-57.4, and high was ≥57.5; low dietary GL was ≤103, medium was 104–126 and high was ≥127. Cut-points for quintiles were (lowest to highest) 52.0, 54.6, 56.7 and 59.3 for GI and 95, 108, 119 and 134 for GL. If the GI ranges suggested for individual foods[11] were extrapolated to dietary values, 44.2% of subjects were within the low range (≤55%), 55.0% were within the moderate range (56-69%) and 0.8% were within the high range (≥70%).

Discussion

Comparison of diet with other studies

This study examined patterns of glycemic carbohydrate in an age-stratified group of older Brisbane women. Although not representative of the general population, which has proportionately fewer women in the older age groups[16], dietary intakes observed in LAW women were similar to those reported for adult Australian women in the National Nutrition Survey[17], with 46.9% of energy derived from carbohydrate, 17.2% from protein, 32.5% from fat and 2.6% from alcohol. Mean values in the LAW study of 56 for GI and 115 for GL were within the range of values cited in previous studies of 49 to 64 for GI and 96 to150 for GL, although comparisons with other studies are made with caution due to differences in dietary assessment. In these studies, average dietary GL was higher (136) in a male population[18], intermediate (GL:128-134) in mixed male and female populations[19-21] and lower (GL: 96-116) in female populations[22-26], with the notable exception in a group of Japanese women (GL:150)[27].

In the LAW population, GL decreased linearly with age, with values about 15% higher in younger compared to older women (**Figure 1**). This difference was not significant when adjusted for the higher energy intake in younger women, using the GL per megajoule measure (**Table 3**). Higher mean GL values, previously reported in older men[18] and mixed male and female populations[19-21], are also likely to be a consequence of higher overall energy intake in male subjects. GI showed a small but significant quadratic relationship with age, decreasing to a plateau for women in their 60's and increasing for women over 70 years of age. The increase in the older women could be explained by an increasing preference for relatively high GI, low fibre items, or by a cohort effect due to cultural changes in food consumption patterns with time; these possibilities were not explored in this study. In previous research, GI has tended to be lower (GI: 49-57) in studies that employed food frequency questionnaires[19,20,22-25] compared with other studies using different methods of dietary assessment (GI: 56-64) such as 24-hour recalls [26,28], diet records [27,29,30]or diet histories[18], although the reason for this trend is not clear.

Foods contributing to glycemic carbohydrate

Differences in glycemic carbohydrate reported in previous studies of older women may be partially attributed to cultural differences in food consumption patterns. In a group of Japanese women, Amano et al[27] reported that the largest contributor to carbohydrate intake was white rice, which has a relatively high GI[12] and may explain the observed high dietary GI and GL. In a group of American women, with GI and GL values similar to those we found in the LAW study, Liu et al[25] reported that cooked potato (7.7%), cold breakfast cereal (6.5%) and white bread (5.2%) were the highest contributors to dietary GL. Although food categories differed somewhat, this pattern was similar to the LAW study, in which potato contributed 8.3% and breakfast cereals, excluding cooked oats to allow comparison, contributed 7.3% to GL. White bread (9.8%) and fruit, especially bananas (5.2%), made higher contributions to GL in the LAW women than the American women. In **Table 4**, we reported the major food groups in the LAW study women, contributing to carbohydrate and dietary GL. Contributions to dietary GI were not listed, as conceptually, the contribution of a food group to the dietary GL is equivalent to its contribution to the weighted dietary GI (that is, weighted by the percent contribution to total carbohydrate intake), expressed as a percentage of the final dietary GI.

Optimal ranges of dietary GI and GL

Currently there are no evidence-based guidelines for optimal dietary GI or GL, although a low GI for an individual food or beverage is classified as ≤55[11]. If this criterion is extrapolated to dietary values, 44.2% of LAW subjects would report consuming a low GI diet; 55.0% a moderate GI diet; and less than 1% a high GI diet of ≥70[11]. Of five previous studies of dietary GI in older women, four have reported an average GI of less than 55[22-25], and one study reported a moderate GI of 64[27]. Based on these data and results of the current study, it is questionable whether a cut-off for an average GI of ≤55 would be appropriate for defining a low GI diet. Our results suggest that a low dietary GI, corresponding to the lowest quintile in the LAW population, would be ≤52.0, while a low dietary GL would be less than ≤95. In practice, a low GL can mean a diet rich in low GI carbohydrates and vegetables, or a diet low in carbohydrates and high in fat and protein. GL can also vary according to energy intake, giving rise to age and gender-related differences. It is therefore more logical to focus on the choice of lower GI alternatives within high carbohydrate food groups, rather than attempt to define a single GL criterion for men and women of all ages.

A review of glycemic index values[31] reports that most varieties of legumes, pasta, fruits and dairy products are classified as low GI foods, with a GI of 55 or less. Foods such as breads, fruit, breakfast cereals and dairy products were the major contributors to glycemic carbohydrate in the LAW study (**Table 4**). Of these groups, breads and breakfast cereals span a wider range of GI values, while values for fruit and dairy are lower and more uniform[12]. Our study suggests that a focus on careful selection of lower GI items, especially within bread and breakfast cereal groups would be an effective strategy for decreasing GI and GL in this population of older women. Alternatively, the GL could be reduced by consumption of smaller portions of the higher carbohydrate foods. However reducing overall carbohydrate could have implications for achieving the acceptable macronutrient distribution range (AMDR) of 45-65% of energy intake from carbohydrate, recommended by the National Health and Medical Research Council[32], as the mean percentage of energy from carbohydrate in the LAW study was at the lower end of this range (46%). While the AMDR for carbohydrate is designed to achieve micronutrient sufficiency and reduce risk of long-term chronic diseases, qualitative aspects of carbohydrate, including dietary GI and dietary fibre, are also important.

A strength of our study was the diet history assessment, with detailed information on serve sizes and food types allowing relatively precise characterisation of dietary GI and GL. Use of a customised GI database allowed 90% of the total carbohydrate intake to be allocated a GI value, with over 95% allocated for the six most important food groups (**Table 4**). Inaccurate estimates of dietary GI and GL may have occurred due to the inability to allocate GI values to some items; for example, within the cake, muffin and scones group (57% allocated), and the vegetables other than potato group (60% allocated), together contributing just under 9% of total carbohydrate. However, this limitation was minimised at the individual level by setting the subject inclusion criterion of ≥85% of carbohydrate allocated a GI value, to ensure that the score would be representative of the individual's overall diet.

To our knowledge, this study is the first to examine age-related differences in a population of older women and to note a decreasing GL with increasing age. This is a likely consequence of higher energy intake in younger women rather than qualitative differences in carbohydrate, although small age-related trends existed in GI and could have contributed. The major sources of both GI and GL were breads and fruit, followed by dairy for GI and breakfast cereals for GL. Focus on choice of low GI alternatives within these groups, in particular the breads and breakfast cereals, would be a feasible way to lower glycemic carbohydrate in this population.

References

1. Thomas D, Elliott E, Baur L. Low glycaemic index or low glycaemic load diets for overweight and obesity. *Cochrane Database Syst Rev*. 2007; (3):Art.No.:CD005105.DOI:10.1002/14651858.CD005105.pub2.

2. Barclay AW, Petocz P, McMillan-Price J*, et al.* Glycemic index, glycemic load, and chronic disease risk- a meta-analysis of observational studies. *Am J Clin Nutr*. 2008; 87(3):627-637.

3. Meyer K, Kushi L, Jacobs DJ, Slavin J, Sellers T, Folson A. Carbohydrates, dietary fiber, and incident type 2 diabetes in older women. *Am J Clin Nutr*. 2000; 71:921-30.

4. Lau C, Færch K, Glümer C*, et al.* Dietary glycemic index, glycemic load, fiber, simple sugars, and insulin resistance: The Inter99 study. *Diabetes Care*. 2005; 28(6):1397-1403.

5. Dietitians Association of Australia. Glycemic Index [Internet site]. 2002 [updated 30/6/03]. Available from: http://www.daa.asn.au/public/smart_eating/nutrition/nutrition.asp?alpha=G&id=66.

6. Glycemic Index Ltd. Glycemic Index Symbol Program [Report]. University of Sydney; 2006 [updated April 2006]. Available from: http://www.gisymbol.com.au/pages/index.asp.

7. Vaughan L. Dietary guidelines for the management of diabetes. *Nurs Stand*. 2005; 19(44):56-64.

8. Khoo SK, Franzcog, O'Neill S, Travers C, Oldenburg B, the LAW Study Group. Age-related changes relevant to health in women: design, recruitment, and retention strategies for the Longitudinal Assessment of Women (LAW) study. *J Womens Health*. 2008; 17(1):135-146.

9. Tapsell LC, Brenninger V, Barnard J. Applying conversation analysis to foster accurate reporting in the diet history interview. *J Am Diet Assoc*. 2000; 100(7):818-824.

10. Cameron M, Van Staveren W, editors. Manual on Methodology for Food Consumption Studies. New York: Oxford University Press; 1988.

11. University of Sydney. Home of the Glycemic Index - GI Database [Internet site]. Sydney: The University of Sydney; 2007 [updated 2004-2007]. Available from: http://www.glycemicindex.com/.

12. Foster-Powell K, Holt S, Brand-Miller J. International table of glycemic index and glycemic load values: 2002. *Am J Clin Nutr*. 2002; 76:5-56.

13. Black AE. The sensitivity and specificity of the Goldberg cut-off for EI: BMR for identifying diet reports of poor validity. *Euro J Clin Nutr*. 2000; 54(5):395-404.

14. Goldberg G, Black A, Jebb S*, et al.* Critical evaluation of energy intake data using fundamental principles of energy physiology: Derivation of cut-off limits to identify under-reporting. *Euro J Clin Nutr*. 1991; 45:569-581.

15. Jenkins DJ, Wolever TM, Taylor RH*, et al.* Glycemic index of foods: a physiological basis for carbohydrate exchange. *Am J Clin Nutr*. 1981; 34(3):362-366.

16. Department of Families; Housing; Community Services and Indigenous Affairs. Women in Australia 2004: Chapter 1. Population Characteristics. Australian Government Office for Women; 2004 [updated 5/11/08]. Available from: http://www.ofw.facs.gov.au/publications/wia/contents.html.

17. McLennan W, Podger A. *National Nutrition Survey: Nutrient Intakes and Physical Measurements, Australia, 1995*. Canberra: Australian Bureau of Statistics, Commonwealth Department of Health and Aged Care, Commonwealth of Australia; 1998.

18. van Dam RM, Visscher AWJ, Feskens EJM, Verhoef P, Kromhout D. Dietary glycemic index in relation to metabolic risk factors and incidence of coronary heart disease: The Zutphen Elderly Study. *Euro J Clin Nutr*. 2000; 54(9):726-731.

19. Barclay AW, Brand-Miller JC, Mitchell P. Macronutrient intake, glycaemic index and glycaemic load of older Australian subjects with and without diabetes: baseline data from the Blue Mountains Eye Study. *Br J Nutr*. 2006; 96(1):117-123.

20. Liese A, Schulz M, Fang F*, et al.* Dietary glycemic index and glycemic load, carbohydrate and fiber intake, and measures of insulin sensitivity, secretion, and adiposity in the Insulin Resistance Atherosclerosis Study. *Diabetes Care*. 2005; 28(12):2832-2838.

21. Du H, van der A DL, van Bakel MME*, et al.* Glycemic index and glycemic load in relation to food and nutrient intake and metabolic risk factors in a Dutch population. *Am J Clin Nutr*. 2008; 87(3):655-661.

22. Liu S, Manson JE, Stampfer MJ*, et al.* Dietary glycemic load assessed by food-frequency questionnaire in relation to plasma high-density-lipoprotein cholesterol and fasting plasma triacylglycerols in postmenopausal women. *Am J Clin Nutr*. 2001; 73(3):560-566.

23. Giles GG, Simpson JA, English DR*, et al.* Dietary carbohydrate, fibre, glycaemic index, glycaemic load and the risk of postmenopausal breast cancer. *Int J Cancer*. 2006; 118(7):1843-1847.

24. Oh K, Hu FB, Cho E*, et al.* Carbohydrate intake, glycemic index, glycemic load, and dietary fiber in relation to risk of stroke in women. *Am J Epidemiol*. 2005; 161(2):161-169.

25. Liu S, Manson JE, Buring JE, Stampfer MJ, Willett WC, Ridker P. Relation between a diet with a high glycemic load and plasma concentrations of high-sensitivity C-reactive protein in middle-aged women. *Am J Clin Nutr*. 2002; 75(3):492-498.

26. Davis MS, Miller CK, Mitchell DC. More favorable dietary patterns are associated with lower glycemic load in older adults. *J Am Diet Assoc*. 2004; 104(12):1828-1835.

27. Amano Y, Kawakubo K, Lee JS, Tang AC, Sugiyama M, Mori K. Correlation between dietary glycemic index and cardiovascular disease risk factors among Japanese women. *Euro J Clin Nutr*. 2004; 58(11):1472-78.

28. Brekke HK, Jansson P-A, Mansson J-E, Lenner RA. Lifestyle changes can be achieved through counseling and follow-up in first-degree relatives of patients with type 2 diabetes. *J Am Diet Assoc*. 2003; 103(7):835-43.

29. Buyken AE, Toeller M, Heitkamp G, *et al.* Glycemic index in the diet of European outpatients with type 1 diabetes: relations to glycated hemoglobin and serum lipids. *Am J Clin Nutr*. 2001; 73(3):574-581.

30. Wolever T, Nguyen P, Chiasson J, *et al.* Determinants of diet glycemic index calculated retrospectively from diet records of 342 individuals with non-insulin-dependent diabetes mellitus. *Am J Clin Nutr*. 1994; 59(6):1265-1269.

31. Atkinson FS, Foster-Powell K, Brand-Miller JC. International Tables of Glycemic Index and Glycemic Load Values: 2008. *Diabetes Care*. 2008; 31(12):2281-2283.

32. National Health and Medical Research Council. *Nutrient Reference Values for Australia and New Zealand Including Recommended Dietary Intakes*. Canberra: Department of Health and Ageing, Commonwealth of Australia; 2006.

Table 1. Characteristics of women in the Longitudinal Assessment of Ageing in Women (n=511)

Characteristic	Included in dietary GI and GL analysis (n=369)	Not included in dietary GI and GL analysis (n=142)	P value[1]
Age (years)	61.6	60.3	0.274
Activity level (valid %)[2]			
Active (walk or other activity ≥2/week)	65.2	65.8	
Sedentary (walk or other activity <2/week)	34.8	34.2	0.912
Missing (n)	10	22	
Menopausal and hormone therapy (HT) status (valid %)[2]			
Premenopausal	12.7	14.8	
Using HT >12 months	44.1	34.4	
Peri or postmenopausal, and using HT <12 months	43.2	50.8	0.162
Missing (n)	8	14	
Smoking status (valid %)[2]			
Non-smoker	54.6	52.7	
Ex-smoker	36.1	38.2	
Current smoker	9.2	9.1	0.915
Missing (n)	1	11	
Anthropometry (mean±SD)			
BMI (kg/m^2)	26.8±5.1	27.8±5.6	0.084
Waist to hip ratio	0.81±0.1	0.80 ± 0.1	0.527

[1]P-value from t-test or chi-square test of characteristic equality in the two groups

[2]Valid % expresses the proportion of women with this characteristic when missing values are removed

Table 2. Nutrient intakes for women participating in the Longitudinal Assessment of Ageing in Women

	Mean±SD	Median	Interquartile range
Energy (MJ)[1]	8.47±1.31	8.40	7.56-9.40
Carbohydrate (g)[1]	225±49	225	193-256
Protein (g)[1]	87.8±16.0	87.1	76.4-96.7
Fat (g)[1]	73.7±20.0	71.7	59.9-84.5
Alcohol (g)[1]	9.69±13.51	2.99	0.00-14.91
Dietary GI[2]	55.6±4.4	55.6	52.6-58.4
Dietary GL[2]	115±25	113	98-130
Dietary GL/MJ[2]	13.7±2.3	13.7	11.9-15.2

[1]n=459

[2]n=369

Table 3. Differences in GI and GL with age[1] in women participating in the Longitudinal Assessment of Ageing in Women (n=369)

	Change per one year increase in age	95% CI	P value
Carbohydrate (g)	-0.682	-1.133, -0.231	0.003
Energy (MJ)	-0.040	-0.052, -0.028	<0.001
Dietary GI[2]	-0.718 (age) +	-1.269, -0.167	0.011
	0.006 (age-squared)	0.001, 0.010	0.015
Dietary GL	-0.406	-0.653, -0.159	0.001
Dietary GL/MJ	0.017	-0.005, 0.040	0.133

[1]Determined using linear regression, age-squared included in model when significant

[2]Age-squared was significant in model

Table 4. Percentage contribution of food groups to carbohydrate and GL in the Longitudinal Assessment of Ageing in Women, and the percentage of carbohydrate allocated a GI value for each food group.

Food group	% Contribution to carbohydrate	% Contribution to dietary GL	% Carbohydrate allocated a GI value
Bread products	17.1[1]	20.8[3]	96.5
Fruit	15.5[2]	14.2[4]	96.7
Dairy products	9.0	5.8	94.5
Breakfast cereals	7.5	8.9[5]	96.1
Potato	5.8	8.3	99.7
Rice	5.3	7.3	99.8
Vegetables other than potato	4.7	2.8	56.9
Cakes, muffins, scones	4.1	3.0	60.1
Pasta	4.0	3.7	97.5
Sweet biscuits	3.2	4.0	98.4
Juice	3.2	2.8	92.6
Crackers	2.3	3.2	94.7
Spreads	2.2	2.1	93.1
Milk, sugar in tea and coffee	1.8	1.6	95.3
Chocolate	1.6	1.4	98.9
Soft drinks	1.6	1.8	91.0
Confectionery	1.5	1.4	67.7
Added sugars	1.4	1.8	99.7
Legumes, nuts, seeds	1.3	0.8	70.8
Condiments, sauces	1.2	0.5	37.0

Ice cream, ice confection	1.1	1.1	94.5
Tomato, tomato products	1.0	0.4	47.8
Cordial	0.7	0.8	94.4
Pastry products	0.6	0.3	51.2
Alcoholic beverages	0.5	<0.1	2.6
Pizzas	0.4	0.4	91.3
Meat and egg products[6]	0.3	0.1	37.1
Desserts[7]	0.3	0.2	64.5
Snack foods, crisps	0.3	0.2	54.2
Nutritional supplements[8]	0.2	0.1	65.6
Flour[9]	0.2	<0.1	<0.1
Other cereals	0.1	0.1	73.6
TOTAL	**100%**	**100%**	**89.7%**

[1]includes white (7.2%), grain (3.8%), wholemeal (3.4%) breads; [2]includes bananas (4.7%), apples (3.3%); [3]includes white (9.8%), grain (3.5%), wholemeal (4.7%); [4]includes bananas (5.2%), apples (2.6%); [5]includes oats/porridge (1.6%), Sanitarium Weet-Bix™ (regular) (1.6%), muesli (1.4%); [6]includes sausages, fish, meats in sauce, crumbed meats; [7]includes jelly, pudding, trifle, pavlova; [8]includes Sustagen, Ensure, Ultra Slim, protein powders; [9]flour listed separately in recipes.

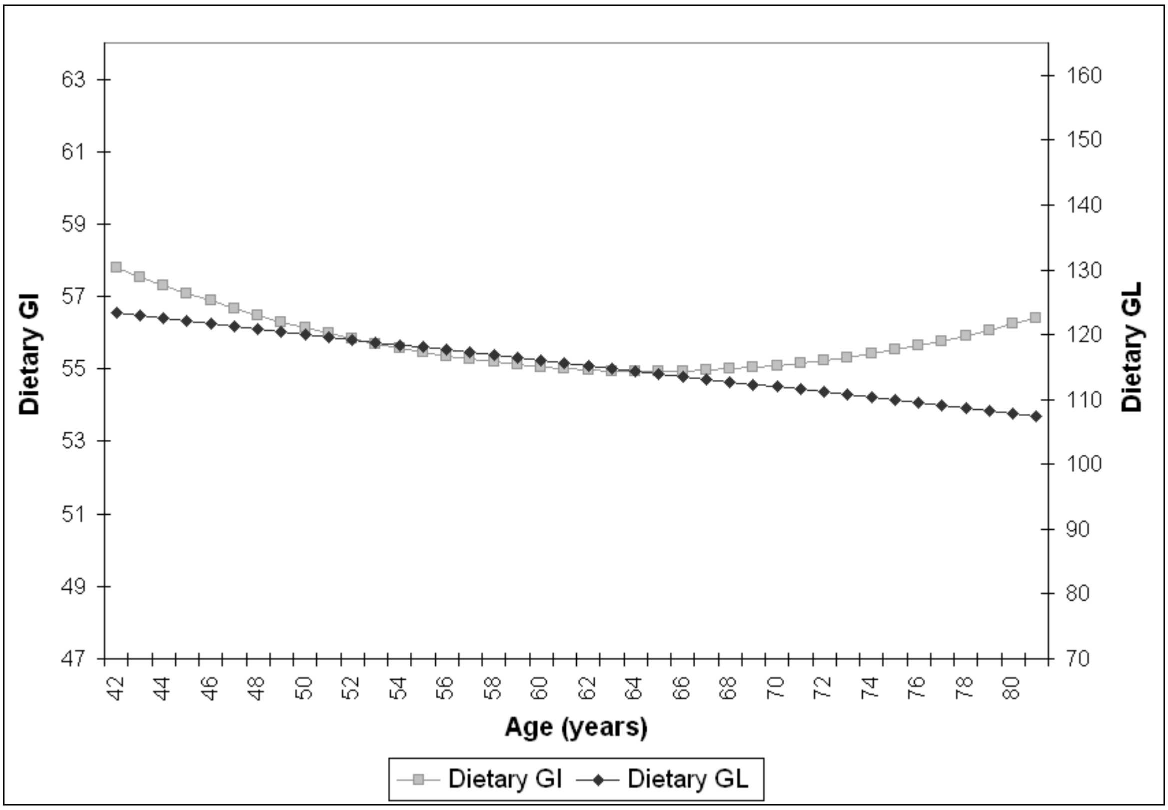

Figure 1. Changes in dietary GI and GL for each year of age for women participating in the Longitudinal Assessment of Ageing in Women (n=369); GL ($P<0.001$), GI ($P=0.013$)

Scale represents middle 95% range of GI and GL

Linear regression equations: expected dietary GI per year= $78.16 - 0.7181\times age + 0.005555\times age^2$; expected dietary GL per year= $140.4 - 0.4062\times age$