Food supplement use in the community dwelling population aged 50 and over in the Republic of Ireland.

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Abstract

OBJECTIVE:
Use of food supplements in the developed world is increasing in all age groups. With older age, the prevalence of multimorbidity and pharmacotherapy increases. Aim was to explore the prevalence of food supplement use among population aged≥50 years in Ireland and to identify factors associated with food supplement use.

DESIGN AND SETTING:
Cross-sectional analysis of food supplements and medicines reported during in-home interviews by 8081 community dwelling participants aged≥50 years included in the first wave of the Irish Longitudinal Study on Ageing.

RESULTS:
The prevalence of regular use of food supplements was 16.6% (95% confidence interval (CI) 15.5-17.7%) and 14.1% (95% CI 13.2-15.1%) reported taking food supplements and medicines concomitantly. Associate factors for supplement use were being female (odds ratio (OR) 2.65; 95% CI 2.30-3.06), retired (OR 1.49; 95% CI 1.23-1.79), a non-smoker (OR 1.47; 1.21-1.77), having third level or higher education (OR 1.32; 95% CI 1.10-1.57) and living alone (OR 1.37; 1.07-1.76). Possession of private health insurance (OR 1.61; 95% CI 1.23-2.19), reporting three or more chronic conditions (OR 2.56; 95% CI 2.01-3.27) and polypharmacy were also associated factors (OR 2.35; 95% CI 1.85-2.98).

CONCLUSIONS:
Food supplement use is significant among the elderly in Ireland and increases with age. Its use is associated with having chronic conditions and taking (multiple) medicines, so further study is needed to assess the appropriateness and risks associated with food supplement use and to examine further the factors influencing their differential use by men and women.

Keywords: Correlates; Elderly; Food supplements; Ireland; Prevalence

Introduction

In Ireland, the proportion of adults aged over the age of 65 has remained unchanged at around 11% for the past 40 years but this figure is projected to increase to 14% by 2021, with the greatest increase expected in those over 80 years of age.[1]

Use of food supplements is increasing in many countries in past decades but varies significantly between countries and even between populations in the same country.[2–6] Reports showed that food supplements were taken regularly by 17–71% participants, depending on the population studied.[2–6] A 2001 survey in the Republic of Ireland and Northern Ireland found that 23% of population aged 18–64 years regularly used at least one food supplement.[7]

Certain food supplements may be recommended by practitioners and are available through publicly funded health schemes as they may benefit patients with chronic diseases even in an otherwise well-nourished population.[8,9] Furthermore, despite epidemics of obesity (BMI $\geq$ 30) in older adults,[10] increasing age may be independently associated with poor nutritional status in high- and middle-income countries.[11] In that case, supplemental nutrition intake clearly is beneficial.[12] Patient's reasons for their use include dissatisfaction with conventional medicines, a common belief that they are safer and a desire for personal control over one's health.[13] People also connect their use with a healthier life style[14,15] despite recent concerns that use of some food supplements may be associated with increased total mortality risk.[16]

With older age the prevalence of multimorbidity increases and in parallel, pharmacotherapy. The likelihood of polypharmacy (taking five or more medicines concomitantly) increases and is estimated to occur in 19–66% of the elderly.[5,14]

The already diminished physiological reserve associated with ageing can be further depleted by acute or chronic disease states and by the effects of the drugs used to treat them. With more medications taken concomitantly, the risk of interactions and adverse effects is increased[17] Furthermore, taking food supplements and (prescription) medicines concomitantly could also increase the risk of adverse interactions[17,18] although reports of adverse effects are scarce.[19] Herbal food supplements pose particular risks and some drug–herbal combinations predispose to serious clinical consequences.[20–22]

Only a fraction of food supplement users tell their health care practitioners what they are taking[15,23] thus both inadvertently withholding relevant health information and exacerbating the potential risks of adverse reactions and interactions.

Thus, the objectives of this study were to explore the prevalence of food supplement use among the population aged 50 years and more in the Republic of Ireland and to identify factors associated with food supplements use.

Methods

Study design and population

The Irish Longitudinal Study on Ageing (TILDA) is a validated national prospective cohort study led by Trinity College Dublin to provide systematically collected data that describes the social (social network, home-care), economic (income, employment, life standard) and health status (physical and mental health, medicine and food supplement use, need of health services and its utilisation) of older Irish adults and try to identify the factors that influence healthy ageing. More details about the study cohort profile were published elsewhere.[24]

Medicine and supplement use data were collected during the in-home interviews performed by trained interviewers using Computer-Aided Personal Interview software (Quancept SPSS). Inclusion criteria for participation in this study were being aged 50 years and over and being resident in the Republic of Ireland. Institutionalized people were excluded from recruitment. Participants were selected by means of a three-stage process of RANSAM sampling procedure[24] using the sampling frame of Irish Geodirectory, an up-to-date listing and mapping of all residential addresses in the Republic of Ireland. Firstly all addresses in the country were clustered using proportionate stratification by socio-economic status, age structure and geographical location; second step was selection of a systematic random sample of addresses of fixed size within each cluster and in last step random list of residents who were $\geq$50 years of age was made. Of the 10,128 households randomly chosen, 6282 were eligible households, where at least one resident was $\geq$50 years and agreed to participate (response rate 62.0%). The sample was designed to give each household in the country an equal probability of selection and, since all members aged $\geq$ 50 years in each household were eligible, each person aged $\geq$ 50 years also had an equal probability of selection.

A total of 8175 people participated in in-home interviews aged 50 years and over. In 94 cases data on medicine and food supplement use were not collected (participants did not want to give or did not know the details about the medicines/food supplements use during the interview). The analysis is completed on the 8081 participants with collected medication/food supplement data which corresponds to a participation rate of 98.9%.

This study was approved by the research ethics committee of Trinity College Dublin, and subjects were required to sign an informed consent document prior to participation. All experimental procedures adhered to the tenets of the Declaration of Helsinki.

Medication data collection

For this analysis we used data from the first cross-sectional wave of TILDA that took place from October 2009 to February 2011. The in-home inventory of medicines and food supplement was conducted by asking the question *''Now I would like to record all medications that you take on a regular basis, like every day or every week. This will include prescription and non-prescription medications, over-the-counter medicines, vitamins, and herbal and alternative medicines.''* Up to 20 items were recorded per participants. No information about dose, frequency, quantity or prescription status was obtained. Medication data was coded using the ATC (Anatomical Therapeutic Chemical) classification system.[25]

In the current analyses, a food supplement is defined according to the Directive 2002/46/EC of the European Parliament and of the Council, of 10 June 2002: '''Food supplements' means foodstuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities''.[26]

Medication and food supplement use was compared across genders and age groups (50–64, 65–74 and 75 years and more). The prevalence of food supplement and medicine use were weighted to adjust for the non-respondents and the survey design to provide national estimates.

Statistical analysis

Descriptive statistics were used to illustrate differences in the prevalence of medicine and food supplement use. Prevalences were presented as percentages including 95% confidence intervals (CI).

Group differences were assessed by Pearson's chi-square test and associations between different variables and food supplement use was assessed by logistic regression. Adjusted and unadjusted odds ratios (OR) were presented: the adjusted model includes variables previously found to be associated with the use of food supplements[2,3,6,15,23,27]. Two-sided significance tests were used throughout and p-value < 0.05 considered statistically significant.

All analyses were performed using SPSS 18 (SPSS for Windows Release 18.0).

Results

Table 1 shows the characteristics of the respondents: in total 54% were women and 57.4% were aged 50–64 years, 26.4% aged 65–74 years and 16.2% aged 75 and over.

The health status of respondents declined with age as the proportion reporting three or more chronic conditions increased rapidly from 16.8% in those aged 50–64 years to 45.8% in those aged 75 years and over. Women also having a significantly higher prevalence of chronic conditions than men in all three age groups.

Types of food supplement reported

Among the 2094 food supplements reported were 40 different preparations assigned an ATC code and a further 94 for which an ATC code was not available. However, only two of these were used by more than 1% of the respondents, namely evening primrose oil (2.8%) and garlic (1.1%). The most prevalent food supplements with their assigned ATC code were calcium with or without vitamin D (ATC A12; 31.4%), omega-3-tryglycerides (ATC C10AX06; 18.2%), glucosamine (ATC M01AX05; 13.3%), vitamin B – single or combinations (ATC A11D, A11E, B03B; 8.7%), multivitamins with minerals (ATC A11A, A11B; 8.4%), iron (ATC B03A; 4.9%), vitamin C (ATC A11GA01; 2.6%), vitamin D and analogues (ATC A11CC; 1.4%).

The ten most frequently reported food supplements accounted for 93% of all reported supplements.

Prevalence of reported food supplement and medicine use

Overall, 21,456 medicines and food supplements were recorded (Table 2) with nine times more medicines than food supplements (19,362 versus 2094) and while only 30.8% (95% CI 29.6–32.0%) of respondents reported not taking any medicine, the converse was found with food supplements, as a substantial majority (83.4%; 95% CI 82.3–84.5%) reported not taking them.

Women used over twice as many food supplements as men with 22.9% (95% CI 21.4–24.5%) versus 9.7% (95% CI 8.6–10.8) respectively and women were substantially more frequent users of food supplements in all age groups. In line with the prevalence of chronic conditions, the prevalence of regular food supplement use increased with increasing age from only 13.5% (95% CI 12.3–14.8%) in those aged 50–64 years to 23.9% (95% CI 21.4–26.6%) in those aged 75 years and more. The mean number of reported food supplements per respondent in the whole cohort ($n = 8081$) was 0.25 (standard deviation (SD) 0.64), which is almost one-tenth the mean number of reported medicines (2.35; SD 2.55). However, when non-users were excluded, the reported use either of a food supplement (1.41; SD 0.84: $n = 1404$) or a medicine (3.41; SD 2.41: $n = 5572$), were different only by a factor of 2. Overall 14.1% (95% CI 13.2–15.1%) respondents reported taking both food supplements and medicines at same time with the prevalence for women being consistently around 10% greater than in men in each age group.

Factors associated with food supplement use

The association of selected sociodemographic characteristics (age, gender, location of household, education, marital status, household composition, employment, wealth (using yearly household income as a proxy) and health insurance), health status (self-rated health and having self-reported chronic conditions), health behaviours (smoking) and medicine taking to the use of food supplements is summarised in Table 3.

Unadjusted logistic regression analysis for variables in Table 3 suggested that all the listed variables were associated with food supplement use. However after adjustment, the sociodemographic variables of gender, education, composition of household, employment status and wealth (using yearly household income as a proxy) appeared to be strongly associated with food supplement use together with private health insurance.

Also, variables that define health status or behaviour, self-reported chronic conditions, medicines taken concurrently and current smoking status, were found to be contributing factors. Women are almost three times more likely (OR = 2.65, $p < 0.001$) to be using food supplements than men in the population aged 50 years or over regardless of whether the food supplement was prescribed or obtained otherwise (e.g. in a pharmacy/health shop). People living in

Table 1 Demographic and health characteristics of the TILDA respondents ($n = 8081$).

	Age at interview (years)								
	50–64			65–74			75 and more		
	Male ($n = 2064$)	Female ($n = 2571$)	Subtotal	Male ($n = 1052$)	Female ($n = 1085$)	Subtotal	Male ($n = 590$)	Female ($n = 719$)	Subtotal
Location of household									
Dublin city/county	21.9%	24.1%	23.1%	24.4%	24.8%	24.6%	24.6%	24.5%	24.5%
Another town/city	28.2%	28.2%	28.2%	29.2%	29.1%	29.2%	27.8%	27.9%	27.8%
A rural area	49.9%	47.8%	48.7%	46.4%	46.1%	46.2%	47.6%	47.6%	47.6%
Highest education achieved									
None/primary	22.6%	18.5%	20.3%	42.5%	37.4%	39.9%	53.7%	48.0%	50.6%
Secondary	46.6%	44.7%	45.5%	31.6%	35.7%	33.7%	25.3%	35.8%	31.1%
Third/higher	30.9%	36.8%	34.1%	25.9%	26.9%	26.4%	21.0%	16.2%	18.4%
Marital status									
Married	78.8%	75.1%	76.8%	73.9%	61.3%	67.5%	60.8%	32.4%	45.2%
Never married	11.3%	7.5%	9.2%	11.4%	7.2%	9.3%	14.2%	9.7%	11.8%
Separated/divorced	7.1%	10.8%	9.1%	5.0%	5.3%	5.1%	1.5%	0.7%	1.1%
Widowed	2.8%	6.5%	4.9%	9.7%	26.3%	18.1%	23.4%	57.2%	41.9%
Composition of household									
Living alone	15.5%	14.0%	14.6%	21.8%	29.5%	25.7%	31.7%	51.2%	42.4%
Living with spouse	31.2%	34.3%	32.9%	58.7%	51.6%	55.1%	52.2%	28.2%	39.0%
Living with others[a]	53.3%	51.8%	52.5%	19.6%	18.9%	19.2%	16.1%	20.6%	18.6%
Employment status									
Employed	63.6%	49.4%	55.7%	15.6%	8.7%	12.1%	10.7%	1.5%	5.7%
Retired	13.9%	12.1%	12.9%	82.1%	54.7%	68.2%	87.6%	58.8%	71.8%
Other[b]	22.5%	38.5%	31.4%	2.3%	36.6%	19.7%	1.7%	39.6%	22.5%
Yearly household income									
0–10,000 EUR	10.4%	9.6%	9.9%	9.4%	12.5%	11.0%	12.9%	13.1%	13.0%
10,001–20,000 EUR	16.3%	16.0%	16.2%	25.7%	28.5%	27.1%	27.3%	40.2%	34.4%
20,001–40,000 EUR	30.4%	32.3%	31.4%	36.1%	37.2%	36.7%	37.8%	28.4%	32.6%
40,001–70,000 EUR	26.3%	21.0%	23.3%	18.0%	9.8%	13.8%	9.7%	4.3%	6.7%
70,001 EUR and over	11.7%	10.9%	11.2%	4.5%	2.6%	3.5%	3.9%	1.0%	2.3%
Missing	4.9%	10.3%	7.9%	6.4%	9.4%	7.9%	8.5%	13.1%	11.0%
Number of reported chronic conditions									
None	31.8%	27.3%	29.3%	19.3%	11.6%	15.4%	12.7%	8.2%	10.2%
1	32.6%	31.7%	32.1%	25.5%	22.3%	23.9%	21.9%	18.1%	19.8%
2	20.5%	22.8%	21.8%	24.2%	26.8%	25.5%	27.3%	21.6%	24.1%
3 or more	15.1%	18.1%	16.8%	31.0%	39.3%	35.2%	38.1%	52.2%	45.8%

[a] Other relatives or unrelated people.
[b] ''Self-employed (including farming)'', ''unemployed'', ''permanently sick or disabled'', ''looking after home or family'', ''in education or training''.

Table 2 The weighted prevalence of food supplement and medicine use.[a]

	Gender/age (years)	50–64	95% CI (%)	65–74	95% CI (%)	≥75	95% CI (%)	Total for gender	95% CI (%)	Total for observed population	95% CI (%)
Taking at least one food supplement											
	Male	6.9%	(5.8, 8.3)	11.40%	(9.5, 13.7)	18.0%	(14.8, 21.6)	9.7%	(8.6, 10.8)	16.6%	(15.5, 17.7)
	Female	20.1%	(18.4, 22.1)	25.20%	(22.5, 28.2)	28.0%	(24.5, 31.8)	22.9%	(21.4, 24.5)		
Number of reported food supplements											
None	Male	93.1%	(91.7, 94.2)	88.6%	(86.3, 90.5)	82.0%	(78.4, 85.2)	90.3%	(89.2, 91.4)	83.4%	(82.3, 84.5)
	Female	79.9%	(77.9, 81.6)	74.8%	(71.8, 77.5)	72.0%	(68.2, 75.5)	77.1%	(75.5, 78.6)		
1 or 2	Male	6.3%	(5.2, 7.5)	10.8%	(9.0, 13.0)	17.5%	(14.4, 21.1)	9.1%	(8.1, 10.2)	15.2%	(14.3, 16.2)
	Female	18.0%	(16.4, 19.7)	23.4%	(20.8, 26.2)	26.3%	(22.9, 29.9)	20.9%	(19.5, 22.4)		
3 or more	Male	0.7%	(0.4, 1.2)	0.6%	(0.3, 1.4)	0.5%	(0.1, 1.5)	0.6%	(0.4, 1.0)	1.3%	(1.1, 1.7)
	Female	2.2%	(1.6, 2.9)	1.8%	(1.1, 2.9)	1.7%	(1.0, 3.2)	2.0%	(1.6, 2.6)		
Taking at least one medicine											
	Male	53.2%	(51.1, 55.3)	78.6%	(75.9, 81.0)	87.8%	(84.7, 90.3)	64.4%	(62.8, 66.0)	69.2%	(68.0, 70.4)
	Female	62.7%	(60.7, 64.7)	84.3%	(81.9, 86.5)	91.6%	(89.3, 93.5)	73.6%	(72.2, 75.1)		
Number of reported medicines											
None	Male	46.8%	(44.7, 48.9)	21.4%	(19.0, 24.1)	12.2%	(9.7, 15.3)	35.6%	(34.0, 37.2)	30.8%	(29.6, 32.0)
	Female	37.3%	(35.3, 39.3)	15.7%	(13.5, 18.1)	8.4%	(6.5, 10.7)	26.4%	(24.9, 27.8)		
1 or 2	Male	30.0%	(28.1, 32.0)	29.4%	(26.6, 32.4)	22.7%	(19.4, 26.5)	28.8%	(27.3, 30.3)	30.4%	(29.3, 31.5)
	Female	34.3%	(32.4, 36.2)	33.0%	(30.1, 36.0)	23.7%	(20.7, 27.0)	31.8%	(30.5, 33.3)		
3 or 4	Male	13.7%	(12.3, 15.3)	22.7%	(20.2, 25.4)	26.6%	(23.2, 30.3)	17.8%	(16.6, 19.1)	20.2%	(19.3, 21.2)
	Female	17.7%	(16.2, 19.4)	25.8%	(23.0, 28.4)	31.6%	(28.2, 35.2)	22.4%	(21.1, 23.8)		
5 or more	Male	9.4%	(8.2, 10.8)	26.4%	(23.7, 29.3)	38.5%	(34.6, 42.5)	17.8%	(16.6, 19.1)	18.6%	(17.7, 19.6)
	Female	10.70%	(9.5, 12.0)	25.6%	(23.0, 28.4)	36.4%	(32.6, 40.3)	19.4%	(18.1, 20.7)		
Taking both medicines and food supplements concomitantly											
	Male	5.3%	(4.3, 6.4)	10.1%	(8.3, 12.2)	17.2%	(14.1, 20.7)	8.2%	(7.3, 9.3)	14.1%	(13.2, 15.1)
	Female	15.3%	(13.8, 16.8)	23.2%	(20.5, 26.1)	27.2%	(23.8, 30.9)	19.5%	(18.2, 21.0)		

[a] Percentage is weighted adjusting to non-respondents and survey design to provide the national estimates.

Table 3 Factors associated with food supplement use.

Variables	Unadjusted OR (95% CI)	p	Adjusted OR (95% CI)	p
Age (years)				
50–64	1		1	
65–74	1.38 (1.21, 1.58)	<0.001	0.95 (0.80, 1.13)	0.530
≥75	1.83 (1.57, 2.13)	<0.001	1.10 (0.89, 1.37)	0.384
Sex				
Male	1		1	
Female	2.72 (2.39, 3.09)	<0.001	2.65 (2.30, 3.06)	<0.001
Location of household				
Dublin city/county	1		1	
Another town/city	0.82 (0.70, 0.96)	0.015	0.84 (0.71, 0.99)	0.039
Rural area	0.79 (0.69, 0.91)	0.001	0.88 (0.75, 1.02)	0.089
Highest education achieved				
Primary/none	1		1	
Secondary	0.99 (0.86, 1.15)	0.944	1.12 (0.96, 1.31)	0.151
Third/higher	1.21 (1.05, 1.40)	0.010	1.32 (1.10, 1.57)	0.003
Marital status				
Married	1		1	
Never married	1.00 (0.81, 1.22)	0.963	0.83 (0.62, 1.12)	0.227
Separated/divorced	1.10 (0.87, 1.38)	0.433	0.94 (0.70, 1.27)	0.703
Widowed	1.60 (1.38, 1.87)	<0.001	0.85 (0.66, 1.09)	0.207
Composition of household				
Not living alone	1		1	
Living alone	1.37 (1.20, 1.56)	<0.001	1.37 (1.07, 1.76)	0.013
Employment status				
Employed	1		1	
Retired	1.95 (1.69, 2.24)	<0.001	1.49 (1.23, 1.79)	<0.001
Other	1.86 (1.60, 2.17)	<0.001	1.27 (1.06, 1.52)	0.010
Yearly total household income				
0–10,000 EUR	1		1	
10,001–20,000 EUR	1.58 (1.26, 1.99)	<0.001	1.52 (1.20, 1.94)	0.001
20,001–40,000 EUR	1.49 (1.20, 1.86)	<0.001	1.64 (1.29, 2.09)	<0.001
40,001–70,000 EUR	1.23 (0.97, 1.57)	0.089	1.57 (1.19, 2.08)	0.001
70,001 EUR and over	1.09 (0.81, 1.47)	0.573	1.30 (0.92, 1.83)	0.139
Missing	1.81 (1.38, 2.37)	<0.001	1.64 (1.23, 2.19)	0.001
Medical cost cover (health insurance)				
Not covered	1		1	
Private medical insurance	2.12 (1.64, 2.73)	<0.001	1.61 (1.23, 2.10)	0.001
Medical card[a]	2.38 (1.86, 3.06)	<0.001	1.24 (0.94, 1.63)	0.134
Self-rated health				
Excellent/very good	1		1	
Good	1.13 (0.99, 1.29)	0.079	0.94 (0.81, 1.08)	0.369
Fair/poor	1.53 (1.31, 1.79)	<0.001	1.07 (0.89, 1.28)	0.491
Number of reported chronic conditions				
None	1		1	
1	2.03 (1.65, 2.50)	<0.001	1.60 (1.28, 2.00)	<0.001
2	2.85 (2.32, 3.52)	<0.001	1.92 (1.52, 2.43)	<0.001
3 or more	4.67 (3.83, 5.69)	<0.001	2.56 (2.01, 3.27)	<0.001
Smoking				
Currently smoker	1		1	
Ex-smoker	1.13 (0.99, 1.28)	0.064	1.06 (0.93, 1.22)	0.362
Non-smoker	1.68 (1.41, 2.00)	<0.001	1.47 (1.21, 1.77)	<0.001

Table 3 (*Continued*)

Variables	Unadjusted OR (95% CI)	p	Adjusted OR (95% CI)	p
Number of medicines taken				
None	1		1	
1 or 2	2.20 (1.85, 2.61)	<0.001	1.56 (1.29, 1.89)	<0.001
3 or 4	2.62 (2.18, 3.14)	<0.001	1.58 (1.26, 1.97)	<0.001
5 or more	4.04 (3.38, 4.83)	<0.001	2.35 (1.85, 2.98)	<0.001

CI, confidence interval.
[a] Medical card is most inclusive public health insurance available in Ireland.

the capital (Dublin) were more frequent users of food supplements (OR = 1.19, $p < 0.05$) than people living in any other city or town. In addition non-smokers were one and a half times more likely to be users of food supplements (OR = 1.47, $p < 0.001$) compared to smokers. Age and marital status were not associated with food supplement use after adjusting for the other health and demographic variables.

Respondents who did not provide data on medicine and food supplement use ($n = 94$) were more likely to be older, less educated, and to live alone ($p < 0.05$).

Discussion

This study provides a nationally representative estimate of food supplement use among people aged 50 years and over. The overall prevalence in the population aged 50 years and more was 16.6% but in women it was nearly 2.5 times higher than in men. With increasing age, supplement use increased progressively, but the greatest disparity between the genders was greatest in the youngest 50—64 age group. Similar results with reference to gender and age have been reported in Canadian study,[6] although in others studies the prevalence of food supplement use decreased with age, but even in these studies performed in Australia, New Zealand, USA and Sweden women consistently were more frequent users than men.[2,3,15,27] In addition the European Prospective Investigation into Cancer (EPIC) study[4] assessed use in the previous 24 h and drew similar conclusions although direct comparison between the studies because of the different study design is not possible.

Although supplement use is significant in our cohort, it is much less substantial than medicines use and the disparity in medicines use between men and women was much less than that in supplement use. Use of both a supplement and a medicine occurred in around 1 in 7 and was associated with multimorbidity and/or polypharmacy, which is in line with other studies.[5,6,23]

In contrast with results of EPIC study where nearly every fifth respondent (18.3%) reported multiple supplements use, in our cohort fewer than 1 in 50 recorded as taking 3 or more supplements. However, polypharmacy in our cohort was almost 15 times more common. An increased number of medications taken concomitantly and an increased number of medication classes have been found to be major determinants of prescription medicine nonadherence.[28] However, the impact food supplements have on adherence among those receiving polypharmacy remains to be determined.

After adjusting for confounding variables, eight factors were predictive of supplement use; in common with many other studies, being female was the strongest predictive factor for supplement use at any age. Retirement was a factor in contrast to age which was not, but both the number of reported chronic conditions and of medicines taken were moderately significant factors, probably because of increased likelihood of need and of being prescribed a supplement. The relationship between income and health insurance was similarly complex; the highest annual household income group was not associated with supplement use but possessing private medical insurance was. This complex relationship may partly explain why while was concordance with findings in Australia and New Zealand.[2,3] this was not the case in Canada[6] where (higher) social status was associated with food supplement use. In the US 2002 National Health Interview Survey[15] both factors; income and private insurance were associated with higher food supplement use. Access to free health service utilisation in Ireland is targeted at those with low incomes and those over 70 years of age. Over half the TILDA cohort was in the 55—64 age group and were employed while over a third were in the highest income group. The results show the combination of influences in these two disparate sub-groups. However, it is notable that as in other countries, higher education is positively associated with supplement use,[2,3,6,15] whereas current smoking is the only negative factor. This could be interpreted as illustrating the association of higher levels of education influencing greater health seeking behaviours and conversely, the avoidance of potentially healthy behaviour associated with smoking. This interpretation is supported by the avoidance of food supplements by active smokers.

The most common types of supplements used are linked to bone health (calcium ± vitamin D) and joint symptoms (glucosamine) and to cardiovascular disease (omega-3 triglycerides) with B vitamins and multivitamin, multimineral combinations were taken by 1 person in 12 or more, whereas all other supplement types were taken by fewer than 1 in 20. Vitamin and mineral supplements were more frequently used than other non-vitamin products which is similar to the pattern seen in many other countries, including the UK,[4] US[5] and Australia[2] although supplement use is much higher (49%) in the US.[5] However, the use of herbal preparations alone was insignificant in this cohort which contrasts with patterns of use in the US.[5,15] It may be that the ease of access to, and the extent of promotion of, herbal supplements in the US facilitates this usage.

The supplements analysed in our study are found in both prescription and non-prescription products, but it was not possible confidently to distinguish one from the other in the data that was gathered. Food supplements are frequently prescribed in Ireland: in 2010 just over 2.5 million (M) prescriptions (3.6% of all prescriptions prescribed on public schemes covering around 80% of citizens that year) were for food supplements.[29] Of the supplements most frequently reported in this study, calcium (alone or in combination with D vitamin) (1.2 M), glucosamine (0.4 M) and omega-3-triglycerides (0.2 M) were frequently prescribed along with those less frequently reported, iron (0.3 M) and evening primrose oil (0.003 M) the principal exception being folic acid (0.4 M) which is not often used alone in these age groups.[29] The data in this study indicates the contribution of prescribing to calcium supplement use, since those entitled to free use of health services were 56% (OR = 1.56, 95% CI 1.32—1.84) more likely to report a calcium supplement compared to those covered with another insurance scheme or those without any coverage.

The TILDA study does not address nutrition nor people's attitudes to medicines and medical care and so it is difficult to speculate on the reasons for the selection and use of supplements in this population. Whether the use of these supplements is related to perceived clinical need or to what extent they contribute to the appropriate intake of dietary constituents will require further analysis. Similar studies of supplement use[5,18] have additionally described cases of potentially unsafe supplement-medicine combinations being used and the term 'dietary supplement polypharmacy' has been proposed indicating the need to raise awareness of the scale and scope of potential problems.[30] However, although the likelihood of certain interactions which are potentially more serious is limited in our study since herbal usage is so low and products containing *Ginkgo biloba* or St. John's wort are available in Ireland only on prescription, they need to be investigated so that the risks and benefits of supplement use can be quantified.

The strengths of this study were the validated national random sample and the high response rate. Almost two thirds of the initially selected eligible households agreed to participate and 98.9% of those provided medication data in the in-home interview which make this study both representative and robust. Furthermore, medicine data was collected by in-home interview which is more reliable than the self-report recall method.[31]

The main limitations of our study were that data on dose and dose regimen, and the way they were obtained (e.g. prescribed or purchased), were not recorded.

Conclusion

Food supplement use in the Irish population aged over 50 years is substantial and increases with age. Use is higher in women than in men and occurs both in those whose health service use is paid by the state and those who pay most of their own costs. The positive association between education level and use and the negative association between current smoking status and non-use implies that those most at risk of ill-health use supplements least. The elderly should be encouraged by healthcare providers to discuss their food supplement use with their medical practitioner or pharmacist to optimise the potential benefits and reduce the potential risks from interactions, a factor that has yet to be explored. This is particularly important for those reporting polypharmacy and multimorbidity in particular. Health care professionals should target males and smokers to assess their need for supplements.

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None.

Conflicts of interest

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Authors contributions

Mr. Peklar and all co-authors take responsibility for the integrity of the data and the accuracy of the data analysis. Mr. Peklar: analysis, design, interpretation, writing and manuscript preparation. Dr. Henman: analysis, design, interpretation, and manuscript preparation. Ms. Richardson: analysis, manuscript preparation, drafting. Dr. Kos: design, interpretation, and manuscript preparation. Professor Kenny: study design, interpretation and manuscript preparation.

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