Consumption pattern, Attitudes and Nutrition Knowledge on Soft Drinks Among Belgian Adults

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Abstract

Health problems have been increasing as a result of excessive soft drink consumption in western countries. Increased sweet taste preference, advanced technology and reasonably cheap prices of soft drinks are contributing factors for this increased consumption. Yet to our understanding it is not well established what are Belgian adults' nutrition knowledge and attitude towards soft drink consumption. This study aimed at assessing Belgian consumers' attitude, consumption pattern and nutrition knowledge on soft drinks. A cross-sectional online survey was carried out among Belgian adults through an existing consumer panel for adults during the period of February to March 2012. A total of 507 subjects aged between 17-85 years were involved in this study. A comprehensive structured questionnaire was developed for data collection. Data analysis involved descriptive statistics (frequency distribution), data reduction (Cronbach's alpha test, factor analysis), data segmentation (cluster analysis) and bivariate statistics (correlations, chi-square tests, independent t-tests, Kruskal Wallis, Mann-Whitney and one factor ANOVA). Results revealed that, general consumption of soft drinks among Belgian adults was low, on average to around once a week, except some individuals (23%) were found to be heavy consumers of soft drinks. Age, BMI and occupation were found to associate with consumption of soft drinks in this study (P<0.05). Objective nutrition knowledge score was higher in heavy light soft drink consumers and in adults (31-50 years and 17-30 years) (P<0.05). Subjective nutrition knowledge did not associate with many variables. A more positive attitude towards soft drinks consumption was found in heavy users of both light and regular soft drinks, also in obese people and young adults (17-30 years) compared to other groups (all P-values <0.05). Provision of adequate information especially informative policy measures about soft drinks will be useful in raising awareness, changing attitudes and increasing nutrition knowledge of adult's soft drink consumers.

Key words: Consumption, Attitudes, Nutrition Knowledge, Soft drinks, Users

Background information

Diet-related diseases such as cardiovascular diseases, obesity, type II diabetes and cancer are now diagnosed across the world and have a significant effect on public health. One of the critical components in the shift of diets is the increased intake of soft drinks and sugary fruit drinks (Popkin and Nielsen, 2003). High consumption of sugar sweetened beverages, especially carbonated soft drinks, increases the risk of overweight, obesity (Malik *et al.,* 2006), heart diseases as well as tooth decay (Roos and Donly, 2002). They contain high amounts of energy due to high sugar contents in the form of fluid which often do not give satiety in the same way as solid foods do (Brownell et al., 2009; Elfhag *et al.,* 2007; Malik *et al.,* 2006). In the United States of America, one third of the adults are obese which is linked to the consumption of sugar sweetened beverages (Bleich *et al.,* 2009). It was estimated that on average, the intake of carbonated beverages in Europe was around one can per day which is equivalent to 355 mls or 12 ounces (Renwick and Nordmann, 2007) and the total volume of consumption in Western and Eastern Europe rose by 12.7% and 23% respectively in 2007 (Hawkes, 2010).

Soft drinks are among the popular products today (Lazim and Hasliza, 2011). Their consumption and popularity has been increasing steadily due to increased strong preference to palatable sweet taste, at a reasonably low price (Sartor *et al.,* 2011). In addition the presence of advanced production technologies contribute to this popularity (Lazim and Hasliza, 2011). General food consumption behaviour is influenced by consumers' attitudes towards food and nutrition (Pieniak *et al.,* 2010). Consumer attitudes can be explained as one's general evaluation of a certain product or brand based on his/her assessment of specific characteristics of the product (Dube *et al.,* 2003). Nutrition knowledge is expected to have an impact on understanding and using of nutrition information and decision making in general (Grunert *et al.,* 2012). Subjective and objective knowledge lies in the fact that people do not perceive accurately how much or how little they know (House *et al.,* 2004). Fitzgerald *et al.* (2008) and Pieniak *et al.* (2010) argued that sufficient levels of knowledge, both subjective and objective are required for people to use reliable information to positively influence their healthier foods choices.

The present study examined if consumers have nutrition knowledge about soft drinks and their attitude towards consumption of regular or light/ low calorie sugar sweetened drinks. The study also aimed at finding relations between the consumption of soft drinks and demographic characteristics such as gender, Body Mass Index (BMI), education, income, family composition and occupation.

Methods
A cross-sectional study was conducted among Belgian adults by using a quantitative consumer survey during the period of February to March 2012. Participants were selected through an existing panel of Belgian adults. Data on soft drink consumption, consumers' attitude towards (light, regular) soft drinks and their nutrition knowledge were collected.

Study population
A total of 507 individuals completed the present study, while 31 individuals (6%) were dropped out due to incomplete information.

The final sample included 209 males and 293 females between the ages of 17 and 85 years with an average age of 43.4 ± 15.4 years and 5 individuals did not indicate their sex. Three age categories were defined. The first group comprised of young adults ranging from 17-30 years. The second group of middle aged adults ranges from 31-50 years and the last group was composed of adults above 50 years. Young adults (17-30 years) as defined by Hattersley *et al.* (2009), is a group which is in the life stage of increased self reliance and autonomy. Many young people are moving away from their homes and parents, thus become more independent on food and beverage choices as well as purchase decisions (Hattersley *et al.,* 2009). Middle aged adults mostly are full dependent working group (employed or self employed) and to some extent they are parents whose life styles including food habits have potential impact on their children (Verzeletti *et al.*, 2009). The study sample is more biased to old age above 50 years, however gender balance was quite representative based on the total sample (Table 1). Three levels of education were categorized, these included; low level (those with primary or unfinished lower secondary education and general secondary education). The second category was medium level (those with special secondary education, technical secondary education and art secondary education). The third category was high education (those with high school education and beyond university). Occupation levels were defined in four categories. The first category was paid work (included full-time paid work and part-time paid work), the second category was retired people and third was people working full time in higher education. The last category was people who are unemployed (included job seekers and non job seekers). Four groups of BMI status were also identified; underweight, normal weight, overweight and obese individuals. Financial situation was classified into 'not well' (means those with low income) , 'modest' (means those with average income) and 'well' (means those with high income) stata.

Measures
Data collection was conducted by means of an online survey method. This method has the following advantages: low costs, fast responses

Table 1: Description of the final sample in percentages (n=507)

Gender	Male	41.2
	Female	57.8
Age (years)	17-30 years	27.0
	31-50 years	33.3
	above 50 years	39.1
Education level	low	12.9
	medium	12.5
	high	74.5
Occupation	paid work	70.8
	retired	13.7
	full-time university	10.3
	unemployed	5.2
BMI status	underweight	3.0
	normal	52.0
	overweight	28.0
	obese	15.0
Income	not well off	5.1
	modest	20.2
	well off	74.7
Children < 14 years in H/H	no	88.2
	yes	11.7

from participants and guarantees data of optimal quality (Verbeke *et al.,* 2008). A comprehensive structured questionnaire was developed (based on study objectives) as a tool for data collection. The questionnaire was self completed and included questions related to soft drinks consumption patterns, attitudes and nutrition knowledge as well as personal characteristics of the respondents such as socio-demographics.

Questions on consumption patterns
Participants were asked about their frequencies of consumption of regular and light soft drinks on a 7-point scale ranging from never to several times a day. Based on these consumption frequencies of regular and light soft drinks a cluster analysis was performed to identify groups of participants with similar consumption pattern. It has the two steps: (1) Hierarchical

clustering with Ward's method (for calculating means of all variables) and squared Euclidean (for calculating distance from each mean). It means hierarchical clustering requires distance or similarity matrix between all pairs of cases (2) K-Means cluster analysis with initial cluster centres that resulted from the hierarchical procedure was followed. In K-means (where K is the number of clusters) cases/consumers were assigned to their respective clusters depending on closeness to the cluster mean. Cluster means were re-computed again using cases assigned to clusters, the cases were reclassified repeatedly based on new sets of means until all cases were assigned to their permanent clusters. From this cluster analysis five segments or groups of consumers were identified and profiled, these are: non-users (n=50), low users (n=209), medium users (n=79), heavy light users (n=83) and heavy regular users (n=83).

Questions on subjective nutrition knowledge
Questions assessing consumers' subjective nutrition knowledge on soft drinks were examined, such as their own understanding, their own rating and evaluation regarding soft drinks. The following items were used to measure subjective knowledge as adapted from Pieniak (2008), which was also consistent with Pieniak *et al.* (2010). (i) 'My friends consider me as an expert in the health aspects of soft drinks', (ii) 'I have a lot of knowledge about how to evaluate the quality of soft drinks', (iii) 'I know which soft drinks are good for me'. These items were then checked for internal reliability (Cronbach's alpha) and a value of 0.839 was obtained denoting good internal consistency, hence a single construct 'subjective knowledge' was computed.

Questions on objective nutrition knowledge
Objective knowledge was measured with 20 statements focusing on the nutritional composition of soft drinks (such as sugar, calories, acidity, and caffeine) and their health impacts (e.g. overweight/obesity, dental erosion, diabetes). In these statements they had to indicate if they are true or false which gave them 20 score points (adapted from Spillmann *et al.,* 2011).

Questions on attitudes towards consumption of soft drinks

Participants were required to indicate based on 7-point scale to which extent they either agree or disagree on various items of regular and light soft drinks. For example regular and light soft drinks are; healthy, nutritious, pleasant, cheap, satisfactory, refreshing, body hydration, taste, easily available, and feelings experienced when drinking. All items under attitude questions were reliable with Cronbach's alpha >0.6. Cronbach's alpha is used to measure internal consistency for similar items. Therefore two new variables were computed under attitude, indicating that the items measured were the same, these included; Attitude towards regular soft drinks with Cronbach's alpha value of 0.847 and attitude towards light soft drinks with Cronbach's alpha value of 0.892.

Questions on personal characteristics

This included aspects like gender, age, education, occupation, income and household composition, as well as BMI (weight and height). Apart from gender which is categorical by nature most of the personal characteristics were defined into various categories. Associations between these personal characteristics and consumption, attitude, and knowledge on soft drinks were determined. The original questionnaire was developed in English and was then translated into Dutch (a language convenient to participants).

Data analysis

Descriptive statistics such as frequency distributions, percentages, means and standard deviations, were used to describe sample characteristics such as age, gender, BMI status, education and occupation levels. Dependent variables such as age and BMI were introduced as categorical variables so as to make comparison between groups. Independent variables like knowledge, attitude and consumption patterns are considered as continuous variables. Data were analyzed by computer software program Statistical Package for Social Science (SPSS) version 20.

For two categorical variables (dependent and independent) such as gender and groups of soft drink users, a cross tabulation was used to verify/assess their association through Pearson's chi-square test. Correlation was used to assess association between two continuous (interval scaled) variables such as subjective nutrition knowledge and attitude towards consumption of soft drinks. The correlation was significant at 0.05 levels. One way Anova F-test was used to verify whether more than two categories have different mean values on an interval scaled variable. Bonferroni post hoc analysis was used to detect differences within groups.

One-Sample Kolmogorov-Smirnov Test, QQ-Plots and histograms were used to check whether the data were normally distributed or not. For normally distributed data (P-value >0.05) parametric tests (independent-samples t-tests for two categorical variables and one-way Anova F-test for more than two categories) were selected for analysis. For data which were not normally distributed (P<0.05) non- parametric tests (Kruskal Wallis and Mann- Whitney) were used. Levene's test was used to test the assumption of equality of variances among groups. Normality and homogeneity of variances were only checked for continuous variables.

Results and Discussion
Frequencies of consumption

Despite the increase in consumption of soft drinks in Western countries (Sartot *et al.,* 2011), to around one can (355ml) per day (Renwick and Nordmann, 2007), general results of this study showed that consumption of both regular and light soft drinks was low with mean values of 2.82 and 2.73 respectively. On a 7-point scale these means indicate that the consumption is almost once per week with the exception of heavy regular users (11.5%) and heavy light users (11.5%) which indicates high consumption of almost every day. Table 2 compares the frequency of consumption between five groups of soft drink users: non, low, medium, heavy light and heavy regular. Results showed that heavy light users, who consume light soft drinks daily or almost every day, had lower consumption of regular soft drinks to almost less than once per week compared to heavy regular users, medium and low users. Heavy regular users had a higher frequency of regular drinks consumption from 2-4 times a week to several

times a day compared to low, medium and heavy light users but they had low frequency of light soft drinks consumption.

drinks (more than once per day) compared to adults. Similar results were found by Zoellner *et al.* (2012) that younger people consumed

Table 2: Consumption frequency of soft drink user groups (n=504)[1] n(%)

	Non users	Low users	Medium users	Heavy light users	Heavy regular users	P-value
Total sample	50	209	79	83	83	
Frequency of consumption						
Regular soft drinks (2.82±1.76)[3]	1.00±0.00	2.36±0.85	3.13±1.15	1.63±0.68	5.94±0.80	<0.001[2]
never	0(0)	21 (10)	8 (10.1)	40 (48.2)	0 (0)	
less than once a week	0(0)	120 (57.4)	25 (31.6)	34 (41.0)	0 (0)	
once a week	0(0)	39 (18.1)	19 (24.1)	9 (10.8)	0 (0)	
2-4 times a week	0(0)	29 (13.9)	17 (21.5)	0 (0)	29 (34.9)	
daily/almost everyday	0(0)	0 (0)	9 (11.4)	0 (0)	30 (36.1)	
several times a day	0(0)	0 (0)	1 (1.3)	0 (0)	24 (28.9)	
Light soft drinks (2.73±1.99)[3]	1.00±0.00	1.58±0.63	4.47±0.93	**6.19±0.63**	1.54±0.67	<0.001[2]
never	0(0)	104 (49.7)	0 (0)	0 (0)	45 (54.2)	
less frequently	0(0)	89 (42.6)	0 (0)	0 (0)	32 (38.6)	
once a week	0(0)	16 (7.7)	10 (12.6)	0 (0)	5 (6.0)	
2-4 times a week	0(0)	0 (0)	59 (74.7)	10 (12.7)	1 (1.2)	
daily/almost everyday	0(0)	0 (0)	8 (10.1)	47 (56.6)	0 (0)	
several times a day	0(0)	0(0)	2 (2.5)	26 (31.3)	0 (0)	

[1] All values are means value ± Standard deviations
[2] P values are from the chi-square test for comparison between consumption characteristics and soft drink users.
[3] Overall mean for regular and light soft drinks

Socio-demographic differences among soft drinks users

Generally most participants, males and females were low users of soft drinks representing 41% and 40% respectively (Table 3). There were no differences between males and females (P= 0.260). The mean age was different (P<0.001) among groups of soft drink users and the significant difference was between non users and the rest of the groups. Non users were in general older than other groups, and age decreased from low users to heavy regular users, (Table 3). These results revealed that older people limit their soft drink consumption, which is in line with studies by Kvaavik, *et al.* (2004) and Vandevijvere *et al.* (2008). Kuusela *et al.* (1999) also reported children to have a higher consumption of soft

more sugar sweetened (regular) beverages than older people. The age difference may attribute to difference in taste preferences between older and younger people. The mean BMI of participants was 25.2±4.6, which indicates overweight in the general sample, but this differed significantly between groups of soft drink users (P<0.001). Mean BMI was observed to be significantly higher in heavy light users compared to the remaining groups (Table 3). These results are supported by Grenby (1991) who wrote that although low energy foods and drinks supply few calories to the body, excessive intake can lead to accumulation of many calories resulting to overweight and obesity. However, these data do not provide enough evidence to establish the effect unless a prospective study is done

Table 3: Socio-demographic differences among soft drink users n (%)[1]

Characteristic	Total sample	Non users	Low users	Medium users	Heavy light users	Heavy regular users	P-value
Gender	**(N = 504)**	**(n=50)**	**(n=209)**	**(n=79)**	**(n=83)**	**(n=83)**	**0.260[2]**
male	208 (41.7)	23 (11)	86 (41.3)	34 (16.3)	26 (12.5)	39 (18.6)	
female	291 (58.3)	27 (9.3)	119(40.1)	45 (15.5)	57 (19.6)	43 (14.8)	
Age(y)	43.4±15.4	54.5±14.3a	45.5±15.7b	40.0±14.3c	41.4±11.7b,c	36.5±14.7c	<0.001[3]
BMI	**(N = 504)**	**(n=50)**	**(n=209)**	**(n=79)**	**(n=83)**	**(n=83)**	**0.005[2]**
underweight	16	0 (0)	7 (43.8)	2 (12.5)	3 (18.8)	4 (25)	
normal weight	263	31 (11.8)	112 (42.6)	42 (15.9)	29 (11)	49 (18.6)	
over weight	141	14 (9.9)	63 (44.7)	17 (12)	25 (17.7)	22 (15.6)	
obese	75	2 (2.7)	23 (30.7)	16 (21.3)	24 (32)	7 (9.3)	
BMI (kg/m^2)	25.2±4.6	24.8±3.9b	24.9±4.5b	25.0±4.1b	27.3±5.3a	24.1±4.4b	<0.001[3]
Education level	**(N=502)**	**(n=48)**	**(n=209)**	**(n=79)**	**(n=83)**	**(n=83)**	**0.321[2]**
low level	65	5 (7.7)	29 (44.6)	6 (9.2)	15 (23.1)	10 (15.4)	
medium level	63	6 (9.5)	19 (30.1)	12 (19.1)	11 (17.5)	15 (23.8)	
high level	374	37 (9.9)	161 (43.0)	61 (16.3)	57 (15.2)	58 (15.5)	
Living	**(N=502)**	**(n=50)**	**(n=208)**	**(n=79)**	**(n=83)**	**(n=82)**	**0.172[2]**
alone	71	8 (10.9)	20 (28.2)	13 (18.3)	16 (22.5)	14 (19.7)	
together with	431	42 (9.7)	188 (43.6)	66 (15.3)	67 (15.5)	68 (15.8)	
Children <14y/hh	(N=442)	(n=48)	(n=180)	(n=69)	(n=71)	(n=74)	0.511[2]
no children	390	44 (11.3)	161 (41.3)	58 (14.9)	60 (15.4)	67 (17.2)	
having children	52	4 (7.7)	19 (36.5)	11(21.2)	11(21.2)	7 (13.5)	
Occupation	**(N=504)**	**(n=50)**	**(n=209)**	**(n=79)**	**(n=83)**	**(n=83)**	**0<0.01[2]**
paid	357	25 (7.0)	149 (41.7)	59 (16.5)	70 (19.6)	54 (15.0)	
retired	69	19 (27.5)	32 (46.6)	9 (13.0)	3 (4.3)	6 (8.7)	
full time high education	52	0 (0)	22 (42.3)	8 (15.3)	6 (11.5)	16 (30.8)	
unemployed	26	6 (23.1)	6 (23.1)	3 (11.5)	4 (15.4)	7 (26.9)	
Income levels	**(N=495)**	**(n=49)**	**(n=208)**	**(n=76)**	**(n=82)**	**(n=80)**	**<0.137**
not well	25	2(8)	8(32)	4(16)	4(16)	7(28)	
modest	100	11(11)	37(37)	14(14)	17(17)	21(21)	
well	370	36(9.7)	163(44.1)	58(15.7)	61(16.5)	52(14.1)	

[1] Except if otherwise stated, i.e. mean value ± standard deviation (SDs)

[2] P values are from the chi-square test for comparison of sample characteristics between groups of soft drink users

[3] Value derived from parametric test (one way ANOVA)

Superscript letters indicate that similar letters denote lack of significant difference, and vice versa for non-similar letters.

to investigate the causal relationship between excessive intake of diet soft drinks and the development of overweight and obesity.

No relationship was found between educational level and the amount of soft drinks consumption (P>0.05). About 85.9% of consumers were living together with other members in the household but there was no difference in consumption of soft drinks with those living alone (P=0.172). The number of children in the household was found not to be associated with the degree of soft drink consumption as there was no significant difference observed between households with children and those without children (P=0.511). This may be due to the fact that, very few participants (11.8%) reported to have children in their households which might affect comparison between groups. An association was observed between the occupational level and groups of soft drink users (P<0.001). Income levels were not found to be significantly different among groups of soft drink users (P= 0.137).

Objective nutrition knowledge
Objective nutrition knowledge of participants was measured in relation to selected demographic variables. The mean score for objective nutrition knowledge was 12.7±3.3 measured on 20 points which is more than 60%. This indicates that most participants scored higher.

There were no observed differences among objective nutrition knowledge scores with gender, BMI categories and the educational level (P>0.05) (Table 4). However, significant differences in objective nutrition knowledge scores were found among age groups or soft drinks user groups (P<0.001). Objective nutrition knowledge scores were significantly higher in the age groups of 17-30 and 31-50 years compared to the age group above 50 years. Objective nutrition knowledge scores were also observed to be significantly higher among heavy light users than in heavy regular users, non users and low users (P<0.001). These results are somehow surprising, because age group 17-30 and heavy light users found with higher objective nutrition knowledge they are also heavy users of soft drinks. This might indicate that they do not actually apply their knowledge

to limit the consumption.

Table 4: Objective nutrition knowledge about soft drinks of participants (n=507)[1] in relation to selected variables

Variable tested	Objective nutrition knowledge scores	P-value
Gender		**0.064[2]**
male	12.33 ± 3.54	
female	12.70 ± 3.14	
BMI category		**0.392[3]**
underweight	12.88 ± 3.84	
normal weight	12.48 ± 3.20	
overweight	12.87 ± 3.47	
obese	13.05 ± 3.38	
Soft drinks user groups		**<0.001[3,4]**
non user	11.50 ± 3.61[b]	
low user	12.52 ± 3.24[b]	
medium user	13.04 ± 3.40[a,b]	
heavy light user	14.44 ± 2.86[a]	
heavy regular user	11.71 ± 3.01[b]	
Educational level		**0.101[3]**
low level	12.15 ± 3.38	
medium level	12.16 ± 3.72	
high level	12.71 ± 3.32	
Age groups		**<0.001[4]**
17-30 years	12.91 ± 3.13[a]	
30-50 years	13.40 ± 3.22[a]	
above 50 years	11.96 ± 3.41[b]	

[1]   All values are means value ±SDs
[2]   Value derived from non parametric test (Mann -Whitney U test)
[3]   Value derived from non parametric (Kruskal Wallis test)
[4]   Value derived from parametric test (one Factor ANOVA)
Superscript letters indicate that similar letters denote lack of significant difference, and vice versa for non-similar letters

Subjective nutrition knowledge
Associations were studied between the subjective

nutrition knowledge and other descriptive variables such as: gender, BMI categories and the educational level. There were no differences found in subjective nutrition knowledge scores among the tested demographic variables (all P>0.05). The mean score for all variables was low, showing that most participants estimated their subjective nutrition knowledge about soft drinks to be rather low. They did not consider themselves as experts in evaluating nutritional aspects of soft drinks. It is important for policy makers to reinforce policies regarding information provision on soft drinks to impart enough subjective nutrition knowledge. This study opposes the study reported by Grunert *et al.* (2012), that subjective and objective knowledge relate with gender and education. They found that females and people with higher education have higher levels of both subjective and objective nutrition knowledge. However, a relation between socio-demographic factors and nutrition knowledge has not been confirmed in most studies. House *et al.* (2004) reported significant variations between nutrition knowledge with age and education. Older people with lower education tend to have lower levels of both objective and subjective knowledge.

Attitude towards consumption of regular soft drinks
Results (Table 5) showed that, heavy regular users of soft drinks had the most positive attitude towards regular soft drink consumption compared to the remaining groups. This might indicate that they consume more regular drinks because they are satisfied. Heavy light and medium users also have a more positive attitude towards regular drinks in comparison to low users and non- users. Non users had the most negative attitude towards regular soft drinks (Table 5). Results also showed differences between males and females in their attitude towards regular soft drinks where males had a favourably higher mean score compared to females. This was also found by Zoellner *et al.* (2012), namely that men and younger people consumed more regular soft drinks (sugar sweetened beverages or SSB) compared to females, but he found no relationship between consumption of SSB and education, or BMI which is the same with this study. Attitudes towards regular soft drinks consumption was not

different among the BMI categories (P=0.628, Table 5). There were significant differences in attitudes towards regular consumption of soft drinks between the age groups (P<0.001). Participants in the age range of 17-30 years had the most positive attitude towards regular soft drinks consumption compared to groups 31-50 and above 50 years. Elfhag *et al.* (2007) found similar results where regular drinks were preferred by younger individuals. Educational levels did not differ with the attitude towards regular soft drinks consumption (P>0.05). Therefore, the appropriate interventions towards reduction of regular soft drinks consumption should be targeted to the age group of 17-30 years and the heavy regular users. Although attitude seems to be generally low, it may influence behaviour after a certain period of exposure to soft drinks. Results also indicated that there was no difference in attitude towards regular soft drinks consumption according to the nutrition objective knowledge (P >0.05). Also no correlation was found between subjective nutrition knowledge and attitudes towards regular soft drinks consumption.

Attitude towards consumption of light soft drinks
Attitude towards light soft drink consumption differed among groups of consumers. Significant differences were found between non, low, medium, heavy light, and heavy regular users and attitudes towards light soft drinks. All groups had more positive attitude compared to non-users. Heavy light and medium users had a more positive attitude to light soft drinks than low and heavy regular users (Table 5). However, heavy light users were most interested in light soft drinks and non-users were least interested (P<0.05). Males and females showed significant difference in their attitude towards light soft drinks (P=0.015), with males having a higher mean score compared to females. This differed with Freeman and Booth (2010) who found that young females liked low calorie drinks as they perceived that sweetness implies more energy in the soft drinks. A significant difference was also observed in the attitude towards consumption of light soft drinks between BMI categories (P<0.001). Obese people had a more positive attitude towards light soft drink consumption

Table 5: Attitude towards soft drink consumption, all p values are delivered from ANOVA unless stated otherwise

	Attitude towards regular soft drinks	P²-value	Attitude towards light soft drinks	P²-value
Soft drinks user groups	N=493	<0.001	N=492	<0.001
non users	2.68 ± 1.04[d]		2.35 ± 1.00d	
low users	3.49 ± 0.89[c]		2.91 ± 0.96c	
medium users	3.94 ± 0.76[b]		3.93 ± 0.85b	
heavy light users	3.82 ± 0.93[b]		4.40 ± 0.66a	
heavy regular users	4.34 ± 0.72[a]		2.86 ± 1.03c	
Gender	N=492	<0.001[5]	N=490	0.015[5]
Males	3.93 ± 0.89 [a]		3.40 ± 1.08	
Females	3.50 ± 0.99 [b]		3.15 ± 1.15	
BMI	N=487	0.628	N=486	0.038
underweight	3.93 ± 0.77		3.35 ± 1.04a,b	
normal	3.66 ± 1.00		3.12 ± 1.08b	
overweight	3.72 ± 0.98		3.31 ± 1.17a,b	
obese	3.62 ± 0.93		3.53 ± 1.18a	
Age groups	N=496	<0.001	N=495	0.28[3]
17-30 years	3.99 ± 0.86[a]		3.35 ± 1.12	
30-50 years	3.55 ± 0.91[b]		3.27 ± 1.12	
above 50 years	3.55 ± 1.06[b]		3.16 ± 1.14	
Educational level		0.548		0.498
low level	3.59 ± 1.00		3.03 ± 1.62	
medium level	3.78 ± 1.02		3.46 ± 1.76	
high level	3.68 ± 0.97		3.08 ±1.84	
Objective knowledge	N=496	0.4803	N=495	<0.001[3]
Pearson's correlation	0.032*		0.167**	
Subjective knowledge	N=496	0.1213	N=495	0.462[3]
Pearson's correlation	-0.70		0.033	

[1]   Means value ± SDs
[2]   Value derived from parametric test (one way ANOVA)
[3]   Value derived from Pearson's correlation
[4]   Values derived from Mann-Whitney test
[5]   Values derived from independent t-test
*   Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
Superscript letters indicate that similar letters denote lack of significant difference, and vice versa for non-similar letters

than normal weight individuals. This finding is in line with results of Elfhag *et al.* (2007) who claim that people with high body weights tend to prefer light soft drinks because they avoid intake of excessive amounts of energy. Objective nutrition knowledge had positive and strong association with attitudes towards consumption of light soft drinks (P<0.001), indicating that people with high objective knowledge prefer light soft drinks over regular soft drinks. No

association was found between attitudes towards consumption of light soft drinks and (1) age (P=0.283), (2) educational level (P=0.498) and (3) subjective knowledge (P=0.462). Generally, it can concluded that attitude is the determinant of behaviour as postulated by Ajzen (1991).

Conclusion and Recommendations
Conclusion
This study aimed at assessing consumers' attitudes, nutrition knowledge, and consumption of soft drinks. General results from present study showed consumption of soft drinks was low, on average around once per week except for heavy regular and heavy light users who were found to be heavy consumers. Social demographics such as age, BMI and occupation type showed significant difference with the consumption of soft drinks. Heavy light users were found to be most obese in this study, however, long prospective studies are needed to establish this cause-effect relationship. Objective nutrition knowledge was observed to be high in respondents compared to subjective nutrition knowledge. More positive attitude towards soft drinks was found in heavy light users and heavy regular users. From these findings, provision of adequate information and knowledge will be useful in raising objective and subjective nutrition knowledge among adults who are soft drink users. Young adults (17-30 years) was the group with most positive attitude and consume more soft drinks.

Recommendations
Due to increased concern of dietary related health problems in developed countries, consumption of light soft drinks can be encouraged because they contain low amount of energy but precaution should be taken to limit excessive intake (Grenby, 1991). This study found generally less favourable attitude and low consumption of soft drinks among Belgian adults, they can play a significant role in behavioural change of their children. In order to check for effectiveness of informative intervention targeting at adult's soft drink consumption, their attitude and nutrition knowledge, further studies are needed. Again studies on nutrition interventions on soft drinks should pay more attention to young adults who were heavy consumers. In addition increase of

nutrition knowledge is also necessary since this knowledge is not static, it changes as knowledge on health and diet increase, subjecting dietary recommendations to changes as well (Spillmann *et al.,* 2011).

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