

## OPINION OF SOUTH AFRICAN PRE- AND POST-MENOPAUSAL WOMEN ON THE POTENTIAL MENOPAUSE-RELATED HEALTH BENEFITS OF SOY AND SOY PRODUCTS

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### ABSTRACT

*The increased use of alternative treatment for menopausal symptoms is mainly due to women's changing opinions of conventional hormone replacement therapy (HRT). The objective of this study was to assess the opinion of pre- and post-menopausal South African women regarding the potential menopause-related health benefits of soy. The sample used for the study was a sub-dataset of 825 respondents, which included only pre- and post-menopausal women that had heard of soy before, selected from a representative sample of the adult South African metropolitan and rural populations. A structured questionnaire was used. Neither age nor racial groups differed practically significantly in opinion regarding any of the various statements. The study also shows that a practically significant lower proportion of women in the sub-population across both age and race groups had a positive opinion on the health benefits of soy as an alternative to HRT and reliever of menopausal symptoms than those who acknowledged its benefit for preventing cardiovascular disease and osteoporosis. Practically significantly more women who used soy than women who never used soy agreed that soy keeps bones strong. In addition, more women who were of opinion that soy has few or no health benefits disagreed that soy could be used as an alternative to HRT compared to*

women who held a positive opinion.

## OPSOMMING

*Die toenemende gebruik van alternatiewe behandelings vir menopousale simptome kan aan vroue se veranderende opinies oor konvensionele hormoonvervangingsterapie (HVT) toegeskryf word. Die doel van hierdie studie was om pre- en post-menopousale Suid-Afrikaanse vroue se opinie aangaande die potensiële menopouseverwante gesondheidsvoordele van soja te bepaal. Die steekproef vir die studie het uit 'n subdatastel bestaan van 825 vroue in hul pre- en post-menopousale stadium wat al voorheen van soja gehoor het, en is vanuit 'n verteenwoordigende steekproef van die volwasse Suid-Afrikaanse metropolitaanse en plattelandse bevolking gekies. 'n Gestruktureerde vraelys is gebruik. Geen prakties betekenisvolle verskille is tussen die verskillende ouderdoms- of rasgroepe se opinie oor enige van die stellings gevind nie. Die studie dui ook daarop dat 'n prakties betekenisvolle laer verhouding Suid-Afrikaanse vroue, van beide ouderdoms- en rasgroepe, 'n positiewe opinie oor die gesondheidsvoordele van soja as HVT en verligter van menopousale simptome gehad het as oor soja se voordele om kardiovaskulêre siektes en osteoporose te voorkom. Prakties betekenisvol meer van die vroue wat soja gebruik het as dié wat dit nooit gebruik het nie, het saamgestem dat soja bene sterk hou. Meer vroue wat van die opinie was dat soja geen of min gesondheidsvoordele het nie was ook negatief teenoor die gebruik van soja as 'n alternatief vir HVT as dié wat 'n positiewe opinie daarvoor gehad het.*

## INTRODUCTION

Menopause, if not induced surgically, is part of the normal female physiology and marks an important transition in healthy women of about 50 years of age (McKee & Warber, 2005:319). In menopause, oestrogen production declines, signalling the end of the reproductive period. With diminished production of oestrogen, women may experience symptoms associated with menopause, including vasomotor symptoms, such as hot flushes and genital atrophy, and an increased risk of osteoporosis and coronary heart disease (CHD) (Zapantis & Santoro, 2003:33).

Traditional combination hormone replacement therapy (HRT) is increasingly recommended for the prevention and treatment of diseases related to oestrogen deficiency. Sound evidence suggests that long-term hormonal treatment is necessary for a substantial decrease in the risk of these diseases, but serious side effects, such as an increase in the risk and incidence of breast cancer, stroke and CHD, discourage long-term HRT use (Chiechi, Secretob, D'Amorec, Fanellid, Venturellib, Cantatorec, Valerioa, Laselvac & Loizzia, 2002; Messina, 2002:272; WHII, 2002:321; Messina, 2003:1-3).

Studies linking diet and health have been published over the past decade, and consumers are demanding more

information on how to achieve health benefits through food and nutritional supplements (McKee & Warber, 2005:319). A survey by Adams and Cannell (2001:433) on women's views on alternative therapies to HRT reports that when compared with conventional HRTs, most respondents believed that plant-derived HRTs have fewer risks, fewer or no side effects, and are equally or more effective in managing menopausal symptoms. These results support the trend that more women are looking at phytoestrogens, such as the isoflavones, genistein and diadzein found in soy, to tailor their menopausal therapy in a "natural" way (Carusi, 2000:259). Soy isoflavones may also be superior to HRT in restoring immune physiology, since they may have a better ratio of anti-oxidant/oestrogen potencies which may protect against immune senescence with application in cancer chemoprevention, in addition to complementation of hormone levels (Dijsselbloem, Vanden Berghe, De Naeyer & Haegeman, 2004:1178). Women's views on conventional HRT and trends towards alternative medicines have globally contributed to a more integrative approach to the treatment of menopause by involving diet, exercise and supplements (McKee & Warber, 2005:319).

Researchers have investigated the relationship between consumption of soy products and reduced hot flushes. In a clinical intervention trial by Nahas, Neto, De Luca, Traiman, Pontes and Dalben (2004:372), a significant

reduction was found in the incidence of hot flushes in women using 60 g of soy germ (approximately 1 290 mg of isoflavones) per day, while hot flushes completely disappeared in 44% of the women. Another study by Han, Soares, Haidar, Roderigues de Lima and Baracat (2002:389) suggests that an isoflavone regime treatment of 100 mg of isoflavone extract/day for four months might be a safe and effective alternative therapy for the significant reduction of menopausal symptoms. McKee and Warber (2005:322) reviewed several studies concerning the effect of different soy products on menopausal symptoms, and concluded that there is controversy about the benefit of soy, since soy treatments were not always significantly more effective than placebos. This data points out the high rate of the placebo effect, which makes it difficult to distinguish between the difference in effects of soy protein, soy flour, soy germ and soy isoflavones.

Whereas epidemiological studies and menopausal animal models suggest that soy isoflavones may prevent endometrial proliferation or cancer soy protein isolate (SPI) with isoflavones co-administered with low-dose exogenous oestradiol ( $E_2$ ) to post-menopausal women, they did not protect them from endometrial hyperplasia (Murray, Meyer, Lessey, Oi, Dewire & Fritz, 2003:462).

Potter, Baum, Teng, Stillman, Shay and Erdman (1998:1378S) observed significant increases in high density lipoprotein (HDL) cholesterol, bone mineral content and bone mineral density in the spine of menopausal women consuming isolated soy proteins (ISPs). This indicates that soy protein is effective in modulating the risks of CHD by altering lipoprotein profiles and that it is also effective in osteoporosis prevention by protecting against bone loss in menopausal women. In 2002, Morabito, Crisafulli, Vergara, Gaudio, Lasco, Frisina, D'Anna, Corrado, Pizzoleo, Cincotta, Altavilla, lentile and Squadrito (2002:1908) confirmed, for the first time in a randomised double-blind placebo-controlled clinical trial amongst post-menopausal women, the important role of the phytoestrogen genistein in the prevention of bone loss (induced by oestrogen deficiency) and new bone formation without any significant adverse effect on the uterus and breasts. A review of supporting data from many in vitro and in vivo studies, as well as epidemiologic and dietary intervention studies, confirms that diets rich in phytoestrogens have long-term bone-sparing effects. The review does, however, suggest that

soy isoflavones may offer maximum benefit in the prevention rather than the treatment of osteoporosis (Setchell & Lydeking-Olsen, 2003:605S).

The 13th Annual National Report of the United Soybean Board (USB) in the USA (2006:6) regarding consumer attitudes towards and awareness of nutrition states that 82% of Americans perceive soy as being healthy compared to the 74% formerly reported. It also reports that 26% of American consumers are aware that soy may help relieve the symptoms of menopause. The significant increase in the awareness of the health benefits of soy is due, among other factors, to the approval of the US Food and Drug Administration (FDA) of the health claim of the cholesterol-lowering effect of 25 g/d of soy protein as part of a diet low in saturated fat and cholesterol (FDA, 1999:699). Statements have also been issued by the American Heart Association advocating the substitution of animal protein with soy protein to reduce the risk of CHD in people with elevated cholesterol (Erdman, 2000:2555). Isolated isoflavones are not, however, part of the FDA health claim, since a review of previous studies showed that isoflavone supplements have no effects on lowering serum cholesterol or lipid levels and there is little evidence that they have the same clinical effects as isoflavone-rich foods (Setchell, Brown, Desai, Zimmer-Nechemias, Wolfe, Brashear, Kirschner, Cassidy & Heubi, 2001:1374S). Although no intervention studies to date have actually examined the impact of soy consumption on coronary events, the available evidence suggests that soy and isoflavones warrant inclusion as part of an overall lifestyle aimed at reducing CHD risk (Messina, 2002:276).

The significant increase in the awareness of and overall positive opinion towards soy, evident in the USA, is not evident in South Africa. Although there is a considerable increase in soy production in South Africa, which could imply a growing market for soy products (such as texturised vegetable protein, soy milk and shakes, soy containing energy and health bars), little data is available on soy consumption (Hinze, Karg, Mohamed & Steyn, 2004:40). To fully understand the marketing potential, it is necessary to have some knowledge of consumers' opinions on soy products since choice of food is strongly influenced by personal preferences and opinions (Liu, 2000:46; Childs, 2001:518). There is minimal information on South African consumers' overall opinions on the general and menopause-related health

benefits of soy. It would seem that not only do the nutritional benefits of soy consumption, as shown by the research, seem to be overlooked by uninformed South African consumers, but also that the potential of improved nutrition and health education in this regard is not well communicated. The lack of South African scientific research in this field may also serve as proof of the underestimated nutritional and qualitative value of this globally important and relevant field of study. Therefore, the objective of this study was to determine the opinion of pre-menopausal (35-44 years) and post-menopausal (50-59 years) South African women, who had heard of soy, regarding the potential menopause-related health benefits of soy and soy products. Furthermore, the study aimed to determine whether there was a difference in opinion between different age and race groups in this sub-population regarding the potential menopause-related health benefits of soy and soy products and to determine if there was a relationship between the consumption and use of soy versus opinion on various health benefits of soy.

## **MATERIALS AND METHODS**

### **Respondents**

Respondents were selected by stratified random sampling from metropolitan areas ( $n = 1\,997$ ) and rural areas ( $n = 1\,004$ ) from the nine provinces in South Africa. The four main race groups were represented in the total sample size of 3 001 adults ( $= 16$  years), also representing both genders (50/50 split). The sample was based on the 1996 census data of South Africa and was stratified to ensure that the sample was representative of the South African population and that the results could be extrapolated to reflect the adult metropolitan and rural population based on gender, age, life standards measurement (LSM) and race distribution.

The sample was stratified by province and within each province, by community size, city, township and suburb. Within each group, sampling points were determined by a systematic random selection, based on cumulative population figures per group. A starting point per sampling point was selected at random. Every third household was chosen until a cluster of five was completed. When there was more than one household on a stand, one was randomly selected. Within a household all qualifying members of the household were listed

and the qualifying respondent determined by a random selection grid. The face-to-face interview was carried out in the respondent's home, in the preferred language of the respondent.

Of the total sample of 3 001, a sub-dataset was created, which included only those respondents that had heard of soy and only women from the pre-menopausal (35-44 years) and post-menopausal (50-59 years) age groups. This comprised the total number of respondents used for further statistical analyses, namely 825 (277 whites, 395 blacks, 93 coloureds and 60 Indians) for this study. The random sample was then weighted using cell weighing of the 1996 census data of Statistics South Africa to reflect the projected adult population based on gender, age and racial distribution of the year 2000 (SAARF, 2004).

### **The questionnaire**

The questionnaire was developed by a panel of nutrition researchers in cooperation with business partners to obtain data regarding South African consumers' opinions and perceptions on food- and health-related topics of specific importance and relevance to the South African food industry. Opinion is defined as a person's feelings or thoughts about something or somebody, rather than a fact (Hornby, 2005:1024) and perception as the way a person perceives things, the ability to understand the true nature of something and the belief a person has as a result of how they see or understand something (Hornby, 2005:1079). The questionnaire was originally developed in English, but it was also translated into six other languages, namely Afrikaans, Zulu, Tswana, Xhosa, Sotho and Northern Sotho.

Validity was addressed by various measures. Face validity was ensured by compiling the measuring instrument in such a way that it not only measured the topics under consideration as accurately as possible, but also appeared to be a relevant measure of the topics investigated (De Vos, Strydom, Fouché & Delpont, 2005:161). The panel agreed on the adequacy of the questions investigating the food- and health-related topics applicable to this study, which, according to Babbie and Mouton (2001:122), is an indication of face validity of the questionnaire.

According to Babbie and Mouton (2001:123), content

validity refers to the extent to which a measure covers the range of meanings included in the concept. A wide range of questions was gathered by the panel, representing all the stakeholders. The questionnaire consisted of 17 sections in total, four of which (27 statements) contained information regarding soy, soy products and the health benefits of soy.

To meet the objectives of this part of the bigger study, the following seven statements (Table 1) were selected for statistical analysis from one of the four sections on soy, since they were considered most relevant in this regard.

Construct validity is concerned with the meaning of the instrument, in other words, what it measures, and is related to the underlying theory of the constructs being measured (De Vos *et al.* 2005:162). In this sub-study, construct validity was investigated by performing factor analysis on the results of the seven questions given in Table 1. A confirmatory factor analysis was performed and, according to the Keizer criterion, one main factor was extracted, accounting for 56% of the total variance (Field, 2005:633). A few factors that together explain a substantial proportion of the variance and high communalities on each item (which were obtained for this study) are good indications of construct validity. It can therefore be assumed that the results of this confirmatory factor analysis indicate satisfactory construct validity.

According to Babbie and Mouton (2001:119), reliability refers to whether a particular technique applied repeatedly to the same object would yield the same result each time. One of the measures to ensure reliability in this study was the thorough training of the fieldworkers and subjecting them to practice sessions (Babbie &

Mouton, 2001:122). Another measure for reliability used in this sub-study was the computing of Cronbach alpha coefficients. A value of 0.88 was found, indicating excellent reliability (Field, 2005:668).

Trained fieldworkers from the market research company Markinor administered and counterchecked the questionnaires. These fieldworkers had a minimum of a Grade 12 education. A minimum 20% back-check, either by personal visit or telephone call, was made by the team supervisor to further ensure reliability of the data collected by the interviewer. Furthermore, the questionnaire was tested for clarity and specificity on ten prospective respondents as suggested by Babbie and Mouton (2001:122).

## STATISTICAL ANALYSES

Statistical analyses were performed with the Statistica® program using weighted frequencies. The seven statements were analysed individually to determine the consumers' opinion on the health benefits of soy and soy products as relevant to the objectives of the study. Cross-tabulation was done to determine frequencies of consumers' opinions regarding the different statements for various age and race groups. The respondents expressed their opinions regarding the statements in Table 1 on a Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree. If a respondent did not understand or answer a question and therefore had or gave no opinion in this regard, his or her response was indicated as "don't know". In the statistical analysis these responses were considered as missing data, which had an influence on the weighted totals of the South African pre- and post-menopausal population, as shown in Tables 2-5. In processing the data, response categories 1 and 2 were

**Table 1: Statements used for statistical analysis**

Soy has many health benefits
Soy lowers cholesterol
Soy keeps your bones strong
Soy can be used as an alternative to hormone replacement therapy (HRT)
Soy can cure certain diseases
Soy can relieve menopausal symptoms
Soy helps keep your heart healthy

combined (indicating disagreement), the neutral response category remained unchanged, while response categories 4 and 5 were also combined (indicating agreement) to simplify the interpretation of the results. The age groups were defined as pre- and post-menopausal groups and the race groups as white, black, coloured and Indian. Two-way frequency tables and chi-square tests were used to determine if there were any practically significant differences between the weighted frequencies and percentages of the seven statements for different age and race groups.

As this article represents only part of a larger study, it was justified to use two additional statements from the larger study to correlate with each of the seven items in Table 1. The two additional statements were:

- I eat/drink soy products.
- I never use soy.

Detailed two-way tables were used to determine if any relationship was found between these and the other seven statements.

## Practical significance

The South African population of pre- and post-menopausal women who had heard of soy are represented in the weighted sample and therefore statistical inference and P-values are not relevant. Instead of only reporting descriptive statistics in these cases, effect sizes can be used to determine practical significance. Practical significance can be understood as a large enough difference to have an effect in practice (as applied in Tables 2-5).

In two-way frequency tables it is important to know whether a relationship between two variables is practically significant, e.g. between consumers' opinions on the health benefits of soy and their opinions of soy as an alternative to HRT. For random samples, the statistical significance of such relationships is determined by means of chi-square tests (as applied in Tables 2-5), but it is actually also important to know whether the relationship is large enough to be of practical importance. In this case the effect size is given by  $w = \sqrt{\frac{X^2}{n}}$ , where  $X^2$  is the usual chi-square statistic for the contingency table and  $n$  is the sample size (Steyn, 2002:11). The following guidelines for the interpretation of the effect size are recommended in the current case:

- (a) small effect:  $w = 0.1$  (b) medium effect:  $w = 0.3$   
 (c) large effect  $w = 0.5$

A relationship with  $w \geq 0.5$  is considered as practically significant, while a medium effect is regarded as a visible effect.

Cohen's d-values were computed for the difference in

proportions,  $d = \frac{|p_1 - p_2|}{\sqrt{p(1-p)}}$  where  $p_1$  and  $p_2$  are the respective proportions and  $p = \frac{X_1 + X_2}{n_1 + n_2}$  the aver-

age proportion, with  $X_1$  and  $X_2$  the number of responses from each group and  $n_1$  and  $n_2$  the respective sample sizes. The following guidelines apply for the interpretation of the effect size in the current case:

- (a) small effect:  $d = 0.2$  (b) medium effect:  $d = 0.5$   
 (c) large effect:  $d = 0.8$ . We consider data with  $d \geq 0.8$  as practically significant, since it is the result of a difference having a large effect.

## RESULTS

### Opinion

The first question regarding whether the respondents had heard of soy was necessary to define the sub-population and to determine the opinions of only those pre- and post-menopausal women who had heard of soy before. Results of the study indicate that 81% of the total South African consumer population had heard of soy. In all other questions, respondents' personal opinions were determined. Table 2 presents the weighted frequencies and percentages of the opinions of a sub-population of the pre- and post-menopausal women on the different statements regarding the health benefits of soy, as well as the combined results. In Table 3 the weighted frequencies and percentages of these statements are presented for different race groups in this sub-population.

No practically significant differences were found between either the percentages of the different age or race groups for each statement, since only small effect sizes were observed. Therefore the results of pre- and post-menopausal age groups were combined. Table 2 indicates that, of those who expressed an opinion, 73% of the women in this sub-population agreed that soy has many health benefits, 56% agreed that it lowers cholesterol,

**Table 2: Weighted frequencies<sup>#</sup> and percentages (%) of opinions of pre- and post-menopausal (n = 22 926) women on the health and menopause-related benefits of soy**

STATEMENTS re. health benefits of soy (n)	Weighted frequencies <sup>#</sup> and percentages of opinions						Effect size (w)	COMBINED PRE - AND POST - MENOPAUSAL RESULTS		
	PRE-MENOPAUSAL			POST-MENOPAUSAL				Dis-agree	Neutral	Agree
	Dis-agree	Neutral	Agree	Dis-agree	Neutral	Agree				
Has many health benefits (4 643)	214 <sup>#</sup> 7%	731 24%	2 142 69%	61 4%	273 18%	1 222 78%	0.09*	275 6%	1 004 22%	3 364 73%
Lowers cholesterol (3 157)	208 9%	823 38%	1 128 53%	85 8%	269 27%	644 65%	0.12*	293 9%	1 092 35%	1 772 56%
Keeps bones strong (3 924)	235 9%	766 30%	1 585 61%	100 7%	283 21%	955 71%	0.10*	335 9%	1 049 27%	2 540 65%
Soy as an alternative to HRT (2 355)	343 20%	799 48%	534 32%	82 12%	350 52%	247 36%	0.10*	425 18%	1 149 49%	781 33%
Cures certain diseases (3 099)	527 25%	773 36%	833 39%	129 13%	335 35%	502 52%	0.15*	656 21%	1 108 36%	1 335 43%
Relieves menopausal symptoms (2 049)	371 26%	769 54%	278 20%	164 26%	284 45%	183 29%	0.11*	535 26%	1 053 51%	461 23%
Keeps heart healthy (3 699)	268 11%	703 30%	1 397 59%	90 7%	329 25%	912 69%	0.10*	358 9.7%	1 032 28%	2 309 62%

Effect size: small effect (w = 0.1) = \*; medium effect (w = 0.3) = \*\*; large effect (w = 0.5) = \*\*\*

65% that it keeps bones strong and 62% that it keeps your heart healthy, while a relatively small percentage (10% or less) of women disagreed with these statements. In contrast, a smaller percentage of women agreed that soy can cure certain diseases (43%), be used as an alternative to HRT (33%) and can relieve menopausal symptoms (23%), while 50% or less held neutral opinions and 21%, 18% and 26%, respectively, held negative opinions on these latter three statements. Cohen's d-values were computed, indicating that there is a medium practically significant lower proportion of women in the sub-population who acknowledged the health benefits of soy as a cure for certain diseases, an alternative to HRT and as a reliever of menopausal symptoms, than those who agreed that soy has many health benefits and who realised its benefit for preventing cardiovascular disease and osteoporosis (d-values varied between 0.38 and 0.84) (Steyn, 2006).

Since no practically significant differences were found between the percentages of the different race groups

for each statement, the results of pre- and post-menopausal race groups were also combined, giving the same mean values formerly reported in Table 2 (combined results). Interestingly, percentages of opinions between the different race groups regarding the statements that soy keeps bones strong and that it can cure certain diseases varied more (although were not of practical significance) than their opinions on the other statements. While 69% of both black and coloured respondents expressed a positive opinion, only approximately 43% of whites and Indians were positive about the bone-strengthening function. 47% of blacks, 40% of coloureds and approximately 30% of whites and Indians were positive about the statement that soy could cure certain diseases.

***Relationship between the consumption and use of soy versus opinion on various health benefits of soy***

Of all the potential differences in opinion between groups, a medium effect size (thus a visible difference)

**Table 3: Weighted frequencies# and percentages (%) of opinions of pre- and post-menopausal women (n = 22 926) within different race groups regarding the health and menopause-related benefits of soy**

STATEMENT (n)	WHITE			BLACK			COLOURED			INDIAN			Effect size (w)
	Dis- agree	Neutral	Agree	Dis- agree	Neutral	Agree	Dis- agree	Neutral	Agree	Dis- agree	Neutral	Agree	
Has many health benefits (4 643)	49# 6%	167 19%	664 75%	182 6%	746 24%	2 223 70%	36 8%	61 14%	347 78%	8 5%	30 18%	130 77%	0.08*
Lowers cholesterol (3 157)	35 6%	222 37%	337 57%	230 11%	728 35%	1 114 54%	20 6%	97 28%	231 66%	8 6%	45 31%	90 63%	0.11*
Keeps bones strong (3 924)	49 9%	241 49%	228 44%	225 8%	682 23%	2 023 69%	31 9%	72 22%	227 69%	30 21%	54 37%	62 42%	0.21*
Alternative to HRT (2 355)	85 22%	214 56%	82 22%	287 17%	792 47%	603 36%	33 15%	117 53%	70 32%	20 28%	26 36%	26 36%	0.13*
Cures certain diseases (3 099)	128 26%	208 43%	152 31%	402 18%	779 35%	1 050 47%	75 31%	72 29%	98 40%	51 38%	49 36%	35 26%	0.17*
Relieves meno- pausal symptoms (2 049)	94 27%	178 51%	75 22%	361 25%	756 53%	316 22%	57 31%	70 39%	54 30%	23 26%	49 56%	16 18%	0.08*
Keeps heart healthy (3 699)	40 7%	225 37%	348 57%	273 11%	707 27%	1 611 62%	25 8%	63 19%	243 73%	20 12%	37 23%	107 65%	0.12*

Effect size: small effect (w = 0.1) = \*; medium effect (w = 0.3) = \*\*; large effect (w = 0.5) = \*\*\*



was found in only two cases, while differences in all other relationships had small effect sizes. Therefore, only those two cases in which a medium effect size was found are reported in Table 4.

A medium effect size ( $w = 0.31$ ) was found for the difference in opinion between those who ate or drank soy in the sub-population and those who did not regarding the potential of soy to cure certain diseases. Considering the frequency of opinion of those respondents who ate or drank soy, a majority of 69% expressed a positive opinion when asked if soy can cure certain diseases. Of the respondents who did not eat or drink soy, 39% had a positive opinion, whereas 32% held a neutral opinion and 29% expressed a negative opinion of soy as a cure for certain diseases.

A medium effect size ( $w = 0.39$ ) was also found for the difference in opinion between those in the sub-population who used soy and those who never used soy regarding the potential of soy to keep bones strong. Of those who indicated that they used soy, the majority (81%) agreed that soy has a bone-strengthening benefit. Only 43% of those who never used soy were positive about the bone-strengthening benefit of soy, whereas 37% held a neutral opinion and 20% expressed a negative opinion in this regard.

### ***Relationships between the health benefits of soy versus opinion on soy as an alternative to HRT and as a reliever of menopausal symptoms***

Medium to large effects were yielded in the relationships between opinions of pre- and post-menopausal respondents on the statements that:

- soy has many health benefits versus soy can be used as an alternative to HRT; and
- soy has many health benefits versus soy can relieve menopausal symptoms.

The results are reported in Table 5.

According to Table 5, the difference between those respondents in the sub-population who were of the opinion that soy has many health benefits and those who were not, and their opinion regarding the potential of soy to be used as an alternative to HRT, is of practical significance with an effect size of  $w = 0.57$ . Of those who agreed that soy has many health benefits, only 44% expressed a positive opinion and 45% were neutral regarding its role as an alternative to HRT. Ninety percent of the respondents who thought that soy has few or no health benefits expressed a negative opinion of soy as an alternative to HRT.

An effect size of  $w = 0.42$  (medium to large effect) was

**Table 4: Two-way frequency table for pre- and post-menopausal women's consumption/use of soy versus their opinion on various menopause-related health benefits of soy**

Eats/drinks soy (n = 2 102)	<b>Soy can cure certain diseases</b>					
	<b>Disagree</b>		<b>Neutral</b>		<b>Agree</b>	
	%	n	%	n	%	n
Eats/drinks soy (597)	16	94	15	89	69	414
Does not eat/drink soy (1 505)	29	432	32	490	39	583
Use of soy (n = 2 771)	<b>Soy keeps your bones strong</b>					
	<b>Disagree</b>		<b>Neutral</b>		<b>Agree</b>	
	%	n	%	n	%	n
I use soy (2 115)	6	122	13	279	81	1 714
I never use soy (656)	20	129	37	244	43	283

**Table 5: Two-way frequency tables for opinions of pre- and post-menopausal women on the health benefits of soy versus their opinion on soy as an HRT and as a menopausal symptom reliever**

Health benefits of soy (n =1 265)	<b>Soy can be used as an alternative to HRT</b>					
	Disagree		Neutral		Agree	
	%	n	%	n	%	n
Soy has few or no health benefits (109)	90	98	4	5	6	6
Soy has many health benefits (1 156)	11	131	45	521	44	504
Health benefits of soy (n = 1 083)	<b>Soy can relieve menopausal symptoms</b>					
	Disagree		Neutral		Agree	
	%	n	%	n	%	n
Soy has few or no health benefits (113)	87	98	8	9	5	6
Soy has many health benefits (970)	23	225	47	454	30	291

computed for the difference between respondents in the sub-population who were of the opinion that soy has many health benefits and those who were not regarding the statement that soy can relieve menopausal symptoms. Of the respondents who agreed that soy does have many health benefits, almost half (47%) expressed a neutral opinion, whereas only 30% had a positive opinion in this regard. Of the respondents who were of the opinion that soy has few or no health benefits, however, the majority (87%) also expressed a negative opinion on soy as a reliever of menopausal symptoms.

## DISCUSSION AND CONCLUSION

As soy food products and supplements containing soy isolates are growing in the South African market, this study investigated the opinion of South African pre- and post-menopausal women on the potential menopause-related health benefits of soy. The results of the larger study indicate that 81% of the total South African consumer population had heard of soy. Neither different age groups, nor the race groups in this pre- and post-menopausal sample of women, selected from the sub-dataset, that had heard of soy before, differed practically significantly in opinion regarding the various statements relating to the potential menopause-related

health benefits of soy. Although age and race groups differed statistically significantly, the size of the difference was not of practical significance.

Of those who expressed an opinion in the present study, most (73%) of the South African pre- and post-menopausal women within the age and race groups agreed that soy has many health benefits. This is similar to the percentage of American consumers (82%) who perceived soy products as healthy (USB, 2006:6). Approximately 60% of South African women within the age and race groups also agreed that soy has a cholesterol-lowering effect (56%) and that soy keeps bones strong (65%) and the heart healthy (62%). Only 43% of women in this sub-population held a positive opinion regarding the statement that soy could cure certain diseases.

Dietary soy products and soy isoflavones have been suggested as possible alternatives to HRT, although the current evidence base for these products is modest (Newton, Buist, Keenan, Anderson & Lacroix, 2002:25). A survey by Adams and Cannell (2001:433) reveals that 71% of American consumers believed that plant-derived HRT have fewer associated risks and can thus be used as a safe alternative to conventional HRT, while 26% of American consumers were aware that soy

might relieve menopausal symptoms (USB, 2003-2004:4). According to a telephone survey by Newton *et al.* (2002:24), only 7.4% of American women between 45 and 65 years of age reported that they were actually using soy products as an alternative to HRT and only 4.4% were using soy products to manage their menopausal symptoms. From the results of the present study, 33% of South African pre- and post-menopausal women in the different age and race groups agreed that soy can be used as an alternative to HRT, while only 23% of the women agreed that soy can relieve menopausal symptoms. Insufficient evidence on the safety and the potential health benefits of soy, as well as a lack of information distribution in South Africa, could possibly be the reason for this uncertainty and/or negativity among South African consumers.

Differences of medium practical significance were found between pre- and post-menopausal women who consumed or used soy and those who did not, and their opinion as to whether soy can cure certain diseases and keep bones strong. This could be an indication that the positive opinion of pre- and post-menopausal South African women on these health benefits of soy in practice is influenced by whether they consume or use soy, implying that consumers and users of soy mostly hold a positive opinion regarding these two statements. According to Bokomo Foods, a division of Pioneer Foods, over 60% of South African people who drink soy milk do so for health reasons (Neall, 2005:16).

Furthermore, in the present study, a practically significant difference was found between the opinions of pre- and post-menopausal women on the overall health benefits of soy and on soy as an alternative to HRT. Interestingly, an unconvincing majority of pre- and post-menopausal respondents who expressed a positive opinion on the health benefits of soy had a positive opinion of soy as an alternative to HRT and its ability to relieve menopausal symptoms; these respondents merely expressed a neutral opinion. This highlights that if consumers are not informed about the benefits and disadvantages of certain foods or food ingredients, they cannot make informed decisions as to whether or not to use soy as an alternative therapy for HRT.

Although it is clear that most pre- and post-menopausal South African women were of the opinion that soy has many health benefits, lowers cholesterol, keeps

bones strong and your heart healthy, their opinions on the potential use of soy as a cure for certain diseases, as an alternative to HRT and as a reliever of menopausal symptoms were less positive. According to Nahas *et al.* (2004:379), there is still not enough evidence for the use of soy isoflavones as an alternative to HRT, but as it has been shown to exert favourable effects on vasomotor symptoms, bone maintenance and lipid profiles, it may be a viable alternative mode of therapy in the improvement of health in pre- and post-menopausal women with contra-indications or intolerance to conventional HRT. It is thus reasonable to recommend including soy food products in the diet of pre- and post-menopausal women for their potential menopause-related health benefits accompanied by their low risk (McKee & Warber, 2005:322). The implementation of strategies to improve public knowledge of the benefits of soy in the diet of pre- and post-menopausal women is therefore recommended and could possibly have important public health implications.

According to Badham (2002:39-40), the problem facing marketers of functional foods, such as soy, is that the link between food and health has become increasingly complex, and this could create confusion among consumers, which may lead to a negative opinion of functional foods. However, advances in communication sciences, sensory technology and consumer behaviour allow for the development of powerful tools to increase consumers' awareness of functional food (Fuller, 2001:35). Possible strategies to increase knowledge of soy foods could include solid scientific evidence to support health claims made, food technology advances in processing of soy foods to ensure a wider availability of a range of products for the consumer to choose from, and increased marketing of soy foods to increase consumer awareness of such products and the health benefits they offer (Liu, 2000:56). It would be in the interest of public health for South Africa to consider following the example of countries such as Finland and Sweden, where strong diet and health messages have been part of their public health efforts since the 1970s. In these countries, the food industries have a long history of working with public health educators to produce and advocate the consumption of healthier foods (Mellentin, 2005:26).

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