Author's response to reviews

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Resveratrol food supplements: a survey on the role of individual consumer characteristics in explaining predicting the attitudes and adoption intentions in US and Danish samples respondents

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Abstract

Background: Consumers increasingly choose food supplements in addition to their diet. Research on supplement users finds they are likely to be female, older and well-educated; furthermore, supplement users are often characterised by as being especially health-oriented, an observation which is the latter observation termed the ‘inverse supplement hypothesis’.

However, results are dependent on the substance in question. Little is known so far about botanicals in general, and more specifically, little is known about resveratrol in specific. The psychographic variables of food supplement users are yet relatively underexplored in relation to food supplement users. By comparing US and Danish respondents, we aimed to identify whether sociodemographic variables, health status, health beliefs and behaviour and interest in certain food aspects of specific relevance for specifically relevant to resveratrol (e.g., naturalness, indulgence, and Mediterranean food) explain favourable attitudes and adoption intentions towards resveratrol supplements.

Methods: A survey sent to a representative online panel in the US and Denmark was analysed with using linear regression.

Results: We find that sociodemographic variables contribute little to explaining favourable attitudes toward and adoption intentions of resveratrol supplements, except for the a negative influence association with higher education in the US. The inverse supplement hypothesis was not confirmed. Belief in the favourable health effects of the substance resveratrol and usage of complementary and alternative medicine positively affects attitudes and adoption intention. An interest in the indulgence dimension of food explains positive attitudes in the US and adoption intentions in both countries.

Conclusions: The results indicate that potential consumers of resveratrol supplements are, rather than by sociodemographic variables, identified by their usage of complementary and alternative medicine, rather than by sociodemographic variables. They are not characterised
by especially healthy behaviours, which contradicts the inverse supplement hypothesis.

Instead, potential consumers of resveratrol supplements are may be characterised by the indulgence dimension of food.

Keywords

Consumer, resveratrol, supplement, health, individual, interest, attitude, intention, behaviour, alternative medicine.
Background

Introduction and research questions

Nowadays, citizens in industrialized countries can look forward to a high life expectancy. The crucial element for being able to enjoy this long life is good health. Public policy makers aim at improving citizens' health to ensure quality of life during aging, not least if not in order to reduce costs in the health care system. A lot of the responsibility for a person's health rests, though, on the individual: Their day-to-day decisions about what to eat, in which amount and combination and during the day are adding up to differing degrees of healthy lifestyles. Citizens are increasingly willing to take matters into their own hand: control of their diets [1,2]. One option citizens can choose are products with enhanced health properties, such as functional food [3–5] and food supplements [6].

It has been found that supplement users exhibit a certain sociodemographic profile, e.g. tend to be females, well-educated, and older [7]. In addition, it has been observed that supplement users appear to lead a relatively healthy lifestyle [8]. Thus, they do not necessarily constitute the segment in need of supplements, an observation which is termed the 'inverse supplement hypothesis' [9]. The probable cause of this is that consumers motivated and able to lead a healthy lifestyle are more inclined to and capable of adopting supplement usage behaviour. Supplement usage might be related to the increasing popularity of complementary and alternative medicine (CAM), which is driven by the search for a more self-determined and holistic approach to health, well-being and lifestyle [10,11]. However, it has been observed that consumers equate the 'naturalness' of e.g. botanical supplements with 'safety' [2], and therefore, at times do not inform their doctors about their supplement use, a fact that has caused worry about adverse health
effects [2,12]. A range of factors may influence how consumers assess supplements, e.g., the type of product or substance [13], the perceived relevance of the effect [13], and beliefs and expectations about health outcomes [9]. More general factors might also have an impact on supplement use, such as the prevalence of use in the respective country [7], or for example, the degree of celebrity supplement use and endorsement [14].

Supplement use or the type of supplement chosen might furthermore be influenced by individual attitudes and interests within the food and health domain, such as the degree of a preference for naturalness [15] or interests in certain food types and dietary trends [3,16]. As the influence of the factors listed above might vary considerably, depending on the substance and the individual in question [13], there is a need to test the interrelation for specific supplement groups or substances. Also, psychographic variables have not yet been explored thoroughly in the analysis of food supplement users [7].

The aim of this paper is to analyse the role of individual characteristics in determining favourable attitudes and adoption intentions towards the resveratrol supplement in two countries, namely the United States and Denmark. Resveratrol is as yet relatively unknown in Denmark, while it is a rather established substance among the food supplement range in the United States (see e.g., [17]), which is why the between-country comparison can shed light on the differences between a developed and an emerging food supplement market. Resveratrol is a substance which might play a role in reducing the risk of chronic diseases such as osteoporosis, cancer and Alzheimer’s disease; it is also said to potentially alleviate the negative effects of obesity, aging and lack of exercise [18–21]. It is a substance naturally found in grapes and wine and has been discussed in relation to the so-called ‘French paradox’ [22,23]. The French paradox is the observation that even though there is a high intake of saturated fats in France, the mortality rate from coronary heart disease is low. This effect was later linked to the traditional diet of the Mediterranean region (i.e., rich in...
whole-grain cereals, fruits, vegetables, wine, fish, legumes, nuts, and olive oil, and moderate in meat, see [24], and might be one of the reasons for the popularity of Mediterranean kitchen cuisine. Due to its varying possible effects and associations, resveratrol is a substance especially interesting to study, with regard to how psychographic constructs are related to food-impact health behaviours. Taking departure in a departure from previous research, the following four research questions are addressed:

1. … characterised by the same sociodemographic variables as has been found for other supplements or supplements in general (e.g., being female, relatively older, and well-educated)?

2. … of good health status and behaviour, indicating that the ‘inverse supplement thesis’ applies to the supplement in question?

3. … expressing favourable health beliefs and behaviours, indicating that they believe in non-medicinal actions in favour of health (expectations about the health effects of resveratrol, holistic health beliefs, and reporting the use of CAM)?

4. … characterised by psychographic constructs that can be assumed to explain general favourable reactions to botanicals in general and resveratrol in specific more specifically, reactions to resveratrol (e.g., higher interest in natural food, the indulgence dimension of food, and Mediterranean kitchen cuisine)?

In the following study, we outline the current state of research on the characteristics of supplement users, in relation to each of our four research questions. Country differences in usage and sociodemographic characteristics of food supplement users

The use of dietary supplements in industrialised countries is said to have increased over the course of the past decades [8,14,25]. In the US United States in the 1990s, around 40% of
the adult population was found to be regular supplement users, whereas 73% claimed to have taken supplements during the past twelve previous months [25]. Other studies, however, cite statistics such as 40–48% [12] or 49% (44% male, 53% female) [7]) for the US during the same time frame. The differences in numbers probably stem from differences in the definition of supplements or the definition of regular supplement use. Findings for Europe, though, generally tend to be generally lower: in 2001, a national survey cited in the UK that 17% of females use supplements [9], a representative survey in the Netherlands established that 30% of the respondents claimed to use functional food or a supplement at least once a week [13], while in Germany, 18% of men and 25% of females used supplements regularly [8]. In Switzerland, however, as much as 41.5% of the population appeared to use supplements [26]. Egan et al. (2011) conclude that within Europe, usage is highest in Scandinavian countries and lowest in the Mediterranean, citing results of the EPIC study that found the average share of users ranges from 2% to 52% among men and from 7% to 66% among women [7]. 

With regard to the sociodemographic profile of supplement users, it is rather established that females are overrepresented among supplement users [8,9,25–28]. In addition, results tend to show that higher age [9], higher education [26] and higher income characterise supplement users [9], as Egan et al. also concluded in their review [7]. However, a study focusing on weight loss supplements in the US found that users were typically only 25–34 years old and of lower education level [27], thus strengthening de Jong et al.’s (2003) conclusion that characteristics of users crucially depend on the substance in question [13]. Interestingly, a US study indicated that herbs and botanicals are chosen by men in particular [25], which shows user characteristics might be quite contrary to general findings when focusing on specific supplement types. 

Health state status and health behaviour of supplement users
Quite a number of authors comment that supplement users tend to exhibit a relatively healthy lifestyle—termed the ‘inverse supplement hypothesis’ - [2,9,13]. De Jong et al. (2003) and Beitz et al. (2004) found that supplement users indeed showed a healthier eating pattern for specific indicators in the Netherlands and Germany, concluding however that it depends on the substance [13] and that the healthier eating pattern is not related to a difference in energy intake, but rather to a difference in food composition [8]. Van der Horst et al. (2011) found evidence for the inverse supplement thesis in Switzerland, but at the same time also found support for the opposing hypothesis, because a share of some supplement users were eating consuming a significantly less healthy diet [26]. In addition, they observed supplement users being relatively less health conscious [26]. This suggests that, apart from user characteristics depending on the supplement substance in question, user groups of the same product might possibly differ in the role that they attach to supplements—as a ‘remedy’ against their existing unhealthy eating patterns or as one of many features of their healthy eating pattern.

Health beliefs and potential psychographic characteristics of supplement users

It is interesting to note that users of complementary and alternative medicine (CAM) are similarly characterised as food supplement users and—tending to be female, well educated, and relatively older [11]. Considering the similarity of the role of CAM and of supplements—both supporting health in a ‘soft’ way and acknowledging the close ties between nutrition, well-being and health - users of CAM and supplement users can be expected to overlap in their psychographic profile to at least some extent. It has been found that users of CAM hold strong beliefs about the influence of psychological factors (on health status, with psychological factors described by e.g. ‘state of mind’, stress, and well-being [10]) on health. Only a few studies further extended research on supplement users to a range of psychological measures and influence factors [7]. An example is an Australian study by Conner et al. (2001), who positively tested the explanatory value of the theory of planned
behaviour [9]. It has been found that CAM users exhibit modern health worries [10], such as worries about genetic modification and pesticides. Modern health worries, in turn, were found to be related to interest in the naturalness of food [29,30], and consumers tend to prefer ‘naturalness’ in foods more than in medicine [15]. Food supplements and botanicals are perceived as playing a role between either both of these, and the role of consumer’s preference, for naturalness in supplements specifically, in specific is not well known. Furthermore, the indulgence aspect of food might play a role for in psychological ‘well-being’, which, in the holistic view on of the food and health relations, is supposed to impact health.

Research on resveratrol and on botanicals in general

Little research can be found on consumer behaviour in relation to resveratrol towards resveratrol in particular, whether as a substance in a supplement or in a food product. To our knowledge, the only study published is one by Barreiro-Hurlé et al. (2008). The authors analysed Spanish wine consumers’ preferences for resveratrol-enriched wine with the help of a survey and choice test, and identified a willingness to pay a 55% premium for the health-enhancing wine. However, the respondents regarded wine as generally healthy, although few were able to explain why exactly they thought this to be the case [31]. Interestingly, the area of wine, health benefits of wine appear to be an emerging research area and point of consumer interest [32,33].

A large share of the supplements used consists of vitamins and minerals [25]. An important and growing area, though, are so-called botanicals [7]. Among the different categories of food supplements, resveratrol-containing products are likely to be subsumed under botanicals. Such plant-based supplements have been examined within the scope of an EU research project [7,34]. It is argued that plant-based supplements are more likely to be used by consumers as a means of medication than as a method to re-improvement of nutrition,
although it is difficult to draw the line between disentangle the use for one or from the other aim. From a public-health point of view, this calls for more intense scrutiny of consumer behaviour and the characteristics of users of this kind of supplement [7].

Methods

Survey method and measures

An online survey was developed and administered in the United States and Denmark. Respondents were presented with a description of the resveratrol food supplement. They responded with questions about their attitudes and adoption intentions. Their individual characteristics were measured in the following way. Firstly, to identify sociodemographic characteristics (research question 1), we collected the respondents’ country of residence, gender and age in years. Respondents were asked to state their level of education, which was classified into a binary variable indicating whether they had achieved a higher (university) education or not. Secondly, in order to identify the respondent’s actual and self-reported health status and their health behaviour, and thereby exploring the inverse supplement hypothesis (research question 2), they were asked to reveal their height and weight, which allowed calculating their body mass index (BMI). Respondents further assessed their fitness and their health status, which was merged into one self-reported indicator of ‘fitness and health’. For health behaviour, we used an indicator for ‘healthy lifestyle practices’ consisting of a 14-item scale measure [35]. It was chosen for its brevity and for its relative shortness, nevertheless encompassing various aspects of health behaviour. Additionally, the measure had been as well as having been developed in the United States, where a part of the survey was to take place.
Thirdly, to assess the respondent’s health beliefs and respective behaviour indicating their belief in non-medicinal actions in favour of health (research question 3), the following measures were used: To assess respondents’ belief in the health effects of the supplement, they rated ten statements describing the potential health effects of the product with which they were presented. The statements were derived from the literature.

Furthermore, respondents rated their beliefs about health needing to be approached ‘holistically’—understood as the relevance of psychological factors for physical health — using four statements selected from Furnham (2007), on attitudes toward science and medicine, and Hyland et al. (2003), on holistic health (choosing the two statements loading highest in each case) [10,36]. Finally, respondents were asked to state their frequency of using complementary and alternative medicine during the past year (assessed on a seven-point Likert scale ranging from ‘never’ to ‘regularly’).

In addition, we measured psychographic constructs on interests in food characteristics of that are specifically relevant to the substance resveratrol (research question 4). We used the established ‘natural product interest’ measure of Roininen et al. (1999), which is a sub-dimension of an attitude scale onto health and hedonic characteristics of food, developed through qualitative and representative quantitative surveys [37], and has been repeatedly tested since its introduction [38]. In addition, we selected three statements from the ‘health discourse’ measure developed by Chrysochou et al. (2010), on the basis of an ethnographic study by Kristensen et al. (2010) [39, 40]. These constitute the sub-dimension of ‘indulgence’, and were used as a measure of interest in the indulgence aspect of food. Furthermore, we asked respondents to assess their liking of the Mediterranean cuisine as one among other cuisine examples (Mediterranean-inspired, Danish or respectively American, respectively, Asian, other).
As dependent variables, we measured ‘attitude toward the product’ with three established statements taken from previous literature [41,38]. We also asked respondents to assess their likelihood of adopting intake of the product within the coming year as a measure of their intentions to use.

Data collection and analysis

The online survey was conducted in December 2012. The link to the survey was sent to respondents of a panel from a market research company, applying a quota for age, gender and region. The panel is representative of the Danish and US populations. Respondents were screened for supplement use in order to exclude individuals who were non-users or who had too little experience with food supplements. Respondents stating that they had ‘never’ or ‘a few times’ taken, or taken supplements ‘a few times’ in the last year, were excluded.

Before completing the survey, an introductory page briefly introduced resveratrol as follows:

“With this survey, we would like to explore your opinion about dietary supplements containing resveratrol, and what could be their role in your daily food and nutrition habits. Resveratrol can be found in various foods but especially in red grapes, and therefore also in red wine, which is often the reason somebody might have heard of it. It appears to have a number of potential benefits for health. Resveratrol is discussed in relation to diseases, such as certain cancer types, cardiac disease, dementia including Alzheimer’s disease, diabetes, obesity and general aging.”

We did not test for understanding the respondents’ comprehension of resveratrol and its effects.

The survey was originally completed by 1048 respondents, 527 in Denmark and 521 in the United States, with a mean completion duration of 16.3 min in
Denmark and 13.9 min in the United States. We assumed that spending less than five minutes signified respondents did not sufficiently read the product descriptions or deliberate over the questions; therefore, we excluded the 4% of respondents from the dataset who spent less than five minutes on the survey. Overall, 11% actually had used resveratrol supplements previously (3% in Denmark, 18% in the United States). We decided to exclude these respondents to achieve a more homogenous sample of supplement users who have in common a lack of experience with the exact substance presented. The analyses presented in the following were calculated with a sample size of 454 in Denmark and 376 in the United States (see Table 1). The two countries were analysed separately. We conducted linear regression to test for the influence relationships of all independent variables (enter procedure, see Table 2) with the dependent variable of attitude and second, the dependent variable of adoption intention (see Table 3). We used SPSS 21 for the analysis. All independent variables were checked for multi-collinearity, and VIF-values were below 2.

Results and discussion

Averages for the measures for the two countries are displayed in Table 1. It can be seen that US respondents showed significantly more favourable attitudes and favourable adoption intentions. Furthermore, they self-reported better general fitness and health, while Danish respondents tended to achieve a higher health behaviour score. US respondents had considerably higher health expectations for resveratrol supplements and expressed stronger holistic health beliefs. Danish respondents, in turn, reported more CAM use and expressed a higher interest in Mediterranean cuisine.

Respondents from the two countries did not differ in the natural and food indulgence interest.
In the following, the results of the regression (see Table 4 for the results on attitude and Table 5 for the results on adoption intention) are presented for each of the four research questions and afterwards discussed on the background of the literature.

Results

With regard to research question 1, i.e., the influence of sociodemographic characteristics on attitude toward the product and adoption intention of usage, the results show that neither gender, nor age and education were explanatory factors, except for a small effect of education in the United States—Higher education had a significant negative influence on attitudes (Table 4) and adoption intention (Table 5). As regards research question 2, where we tested indicators for the inverse supplement hypothesis, we do not find that BMI, self-reported fitness and health status as well as the health behaviour indicators were not related to resveratrol attitudes and adoption intention with regard to resveratrol. In Danish respondents, having favourable health behaviours of Danish respondents tended to negatively influence were linked negatively to attitudes toward the product, but this was only marginally significant on a 10% level of significance at p < .10 (Table 4).

Looking at the variables explored with regard to research question 3 (e.g., which are measures of health effect beliefs, CAM use and related holistic health belief), the results show that favourable expectations about the health effects of the product were significantly and positively influenced correlated with attitude and adoption intention in both countries. Current usage of complementary and alternative medicine was also a highly significant factor explaining associated with favourable attitudes and intentions in both Denmark and as well as the United States (Table 4 and 5). In the United States, respondents agreeing to statements describing a holistic health belief tended to were more likely to express favourable attitudes toward the resveratrol food supplement, but this was only marginally significant on a 10% level of significance at p < .10 (Table 4).
FinalLast, the variables included under research question 4, which aimed at exploring psychographic measures of potential relevance for the perception of resveratrol supplements, were considered. We did not find a significant influence of natural product interest, apart from observing a tentative negative influence on attitudes in the United States that is only significant on a 10% level of significance ($p < .10$). Agreement to the statements measuring an interest in the indulgence aspect of food, however, was significantly and positively related to explaining both attitudes and adoption intentions (Table 4 and 5), except for attitude in Denmark. In Denmark, however, a preference for Mediterranean kitchen tended to be related to more favourable attitudes, but only marginally significant on a 10% level of significance ($p < .10$).

Discussion

The fact that US respondents were reacting far more positive in both their attitudes and adoption intentions towards resveratrol food supplements matched the our expectations, given that the prevalence of use of supplement overall, and of resveratrol use in specific particular, is much greater in the United States than in Denmark [7]. Furthermore, there were far greater health expectations of the product among US respondents, which was linked to their is found to impact attitudes and intentions. The factors found to be explaining linked to favourable attitudes and adoption intentions are, however, very similar between the two countries, except for the influence negative association with higher education that was only found in the United States. Therefore, it appears as if resveratrol supplement usage is largely driven or explained by correlated to similar factors in the two countries.

Sociodemographics were not significantly linked found to be good explanatory factors. This is in contrast to the literature, which suggests that supplement users tend to be well-educated, female and relatively older [7]. Neither did we find men to be more favourable
toward resveratrol, contrary to Timbo et al. (2006), who indicated that men might be more likely to prefer botanicals in specific [25]. However, the sample consisted of at least (at minimum) occasional users of supplements, which is why the results need to be interpreted as factors explaining linked to the perceptions of resveratrol supplements among supplement users, and not in the population at large. It is surprising, though, that we found a small but statistically significant negative influence of association with education in the United States, as this is counter to previous research on supplement users' characteristics.

The inverse supplement hypothesis suggests that consumers who are in the least need of supplements are more likely to use supplements to boost their already favourable health state or behaviour [2,9,13]. However, our findings do not support this hypothesis, at least as far as not with the indicators that were used are concerned. Thus, the inverse supplement hypothesis either could not be uncovered by the approach taken, or does not apply to the botanical resveratrol. It is unknown whether the inverse supplement hypothesis might be more applicable to one type of supplement more than others, for example, depending on whether it is regarded as being closer to medicine—–as botanicals are—or closer to food.

The clearly best explanatory factor appears to be high expectations of towards the effects of the supplement on health, which we expected. However, it was also found that those respondents that stated they have used complementary and alternative medicine most likely to be favourable in both attitude and adoption intentions for the resveratrol supplement. We have not found this relation shown in the literature so far, apart from the fact that the sociodemographic characteristics of both CAM and supplement users are rather similar [11]. The finding might indicate that the same respondents are leaning toward the usage of supplements, as well as their choice of
complementary and alternative medicine, or even perceive the former as one action among belonging to the latter.

No positive relations were found between natural product interest and resveratrol food supplement interests; thus, we cannot confirm that a preference for ‘naturalness’ [15] is linked to impacts interest in resveratrol supplements as a plant-based supplement. Interestingly, however, we found that indulgence food interest was associated positively with attitude and adoption intention. Thus, the results show that it is possible to identify psychographic variables of explanatory relevance value, which in this case was related to the substance in question: Resveratrol is firstly associated with red wine and the related Mediterranean diet, and secondly, as well as with alleviating the negative effects of obesity. Both are, in turn, associated with the enjoyment of food, especially when thinking about the role of food in France [42] and the French paradox [22,23], and given that many consumers apply the taste = unhealthy ‘equation-intuition’ [43]. Our results suggest that especially the respondents who are interested in food enjoyment are, in fact, also more interested in the resveratrol food supplement. Interestingly, this indirectly indicates a contradiction of the inverse supplement hypothesis, at least assuming the foods these enjoyment consumers are envisioning while answering the statements were relatively unhealthy.

Conclusions

We conclude that among consumers who are at least occasionally use supplements, strong belief in the product’s health effects, CAM usage behaviour and interest in the indulgence dimension of food are best in explaining most strongly linked to favourable attitudes and adoption intention for a resveratrol food supplement. Furthermore, potentially interested consumers in the US United States are found among the less educated are more likely to be interested. The inverse supplement hypothesis was not confirmed for resveratrol
supplements, and even appeared to be indirectly contradicted, given that a indulgence food-
indulgence orientation was linked to explains interest in resveratrol.

As an implication for marketing resveratrol supplements, we suggest that apart from clearly
communicating the health benefits, messages should targeting should focus on consumers
who use CAM and are interested in food as a culinary’s culinary pleasure. More importantly,
from a public-policy point of view perspective, the results suggest that it might could be
consumers who might have or will develop health problems that who are especially be-drawn
to resveratrol supplements—at least when assuming that interest in the enjoyment of food
is related to unhealthy eating. Therefore, further research ought to explore whether consumers
misperceive resveratrol supplements as a magic solution, with use of the supplement
‘backfiring’, in the sense that they conduct-engage in even less-more unhealthy behaviour
after adopting the product [44]. Given that the other factor explaining linked to positive
attitudes and/or adoption intention of resveratrol supplements was is CAM usage, this relation
might shed light on inform how the prospective respective consumers that are open to
resveratrol usage can be approached, which is linked to communication on and about CAM.

Further research might also shed a light on illuminate whether and why those of with lower
education in the US United States might be more drawn to resveratrol in the US. Given that
consumers are more and more interested in supplements and that the availability of
established, as well as new, variants is increasing, the opportunities and challenges that
supplements offer or pose to public health should be monitored by continuous research on-the
market and consumer behaviour.

As a limitation, of the study it has to be mentioned that is that the cross-sectional nature of the
data does not allow for understanding developments over time with regard to these issue.

While the panel was representative, our the screening for supplement use, and the quota
sampling of respondents, means that the sample was not representative of the US or Danish population.

Competing interests

The authors declare that they have no competing interests.

Authors’ contributions

All authors contributed to the design of the study. JEAW conducted the statistical analysis and drafted the manuscript. All authors participated in the interpretation of the data, revision of the manuscript and also read and approved the final manuscript.

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References


19. Chachay VS, Kirkpatrick CMJ, Hickman IJ, Ferguson M, Prins JB, Martin JH: 
**Resveratrol - pills to replace a healthy diet?** *British Journal of Clinical Pharmacology* 2011, **72**:27-38.


26. van der Horst, Klazine, Siegrist M: **Vitamin and mineral supplement users. Do they have healthy or unhealthy dietary behaviours?** *Appetite* 2011, **57**:758-764.


37. Roininen K, Lähteenmäki L, Tuorila H: **Quantification of consumer attitudes to health and hedonic characteristics of foods.** *Appetite* 1999, **33:**71-88.

38. Urala N, Lähteenmäki L: **Attitudes behind consumers' willingness to use functional foods.** *Food Quality and Preference* 2004, **15:**793-803.


41. Grunert KG, Bredahl L, Scholderer J: **Four questions on European consumers attitudes toward the use of genetic modification in food production.** *Innovative food science and emerging technologies* 2003, **4:**435-445.


44. Bolton LE, Americus R, II, Volpp KG, Armstrong K: **How does drug and supplement marketing affect a healthy lifestyle?** *Journal of Consumer Research* 2008, **34:**713-726.
Table 1. Sample characteristics for each variable and per country

<table>
<thead>
<tr>
<th>Variable</th>
<th>Denmark (454)</th>
<th>US (376)</th>
<th>Sample comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, female</td>
<td>61.0%</td>
<td>51.1%</td>
<td>$\chi^2(1) = 8.284, p = .004$</td>
</tr>
<tr>
<td>Age, years</td>
<td>45.7</td>
<td>42.0</td>
<td>$t(828) = 3.982, p = .000$</td>
</tr>
<tr>
<td>Education, high</td>
<td>45.2%</td>
<td>51.6%</td>
<td>$\chi^2(1) = 3.419, p = .064$</td>
</tr>
<tr>
<td>BMI, $M (SD)$</td>
<td>25.7</td>
<td>27.4</td>
<td>$t(762) = -3.658, p = .000$</td>
</tr>
<tr>
<td>Self-reported fitness and health, $M (SD)$ (2 items)</td>
<td>4.40 (1.30)</td>
<td>4.60 (1.20)</td>
<td>$t(828) = -2.599, p = .010$</td>
</tr>
<tr>
<td>Health behaviour, $M (SD)$ (14 items)</td>
<td>4.30 (0.56)</td>
<td>4.23 (0.67)</td>
<td>$t(804) = 1.668, p = .096$</td>
</tr>
<tr>
<td>Health expectation, $M (SD)$ (10 items)</td>
<td>3.68 (1.06)</td>
<td>4.38 (1.07)</td>
<td>$t(828) = -9.364, p = .000$</td>
</tr>
<tr>
<td>Holistic health belief, $M (SD)$ (4 items)</td>
<td>5.29 (0.81)</td>
<td>5.43 (0.92)</td>
<td>$t(828) = -2.283, p = .023$</td>
</tr>
<tr>
<td>CAM use, $M (SD)$</td>
<td>2.50 (1.50)</td>
<td>2.10 (1.20)</td>
<td>$t(828) = 4.390, p = .000$</td>
</tr>
<tr>
<td>Natural product interest, $M (SD)$ (6 items)</td>
<td>4.29 (1.20)</td>
<td>4.17 (1.11)</td>
<td>$t(828) = 1.476, p = .140$</td>
</tr>
<tr>
<td>Food indulgence interest, $M (SD)$ (3 items)</td>
<td>4.50 (1.34)</td>
<td>4.51 (1.34)</td>
<td>$t(828) = -.019, p = .985$</td>
</tr>
<tr>
<td>Mediterranean kitchen cuisine interest, $M (SD)$</td>
<td>5.37 (1.59)</td>
<td>4.83 (1.72)</td>
<td>$t(828) = 4.633, p = .000$</td>
</tr>
<tr>
<td>Attitude, $M (SD)$ (3 items)</td>
<td>4.17 (1.21)</td>
<td>4.99 (1.17)</td>
<td>$t(828) = -9.752, p = .000$</td>
</tr>
<tr>
<td>Adoption intention, $M (SD)$</td>
<td>2.72 (1.75)</td>
<td>3.83 (1.78)</td>
<td>$t(828) = -9.034, p = .000$</td>
</tr>
</tbody>
</table>

Notes. $n = 830$. BMI could only be calculated when respondents opted to provide their weight and height.
Table 2. Independent measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Items</th>
<th>Cronbach’s alpha US - DK</th>
</tr>
</thead>
</table>
| Self-reported fitness and health | How do you assess your own fitness?  
How do you assess your own health status? | 0.748 0.790              |
| Health behaviour         | 14 items from [34]                                                  | n.a.n/a                  |
| Health expectation       | 10 items derived from the literature                                | 0.916 0.915              |
| Holistic health belief   | People sometimes feel worse rather than better after orthodox/conventional medical treatments.  
State of mind is a crucial part of achieving better health—positive thinking can enhance physical health.  
The symptoms of an illness can be made worse by depression.  
When people are stressed, it is important that they are careful about other aspects of their lifestyle, as their body already has enough to cope with. | 0.728 0.607              |
| CAM use                  | How often have you used what you would consider alternative or complementary medicine (medicine and/or treatments) during the last year? | - -                      |
| Natural product interest | 6 items from [36]                                                  | 0.774 0.787              |
| Food indulgence interest | I am inspired in my cooking by foreign cuisine and other new ideas.  
I am willing to spend extra time on my daily food consumption for the sake of culinary pleasure.  
I am willing to spend extra money on my daily food consumption for the sake of culinary pleasure. | 0.828 0.765              |
| Mediterranean kitchen cuisine interest | To what extent do you like the following cuisines / cooking styles? [Mediterranean-inspired] | - -                      |

Notes. All statements were measured on a seven-point scale, except for statements 1–11 from the health behaviour measure, which were measured on a 1 (never) to 9 (more than seven times) scale with a coding from 1 = never to 9 = more than seven times. The statements used for measuring health expectations can be provided upon request. Cronbach’s alpha was not computed for the health behaviour measure, as we regard this as a formative indicator. Please see supplementary tables for these statements.
### Table 3. Dependent measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Items</th>
<th>Cronbach’s alpha US - DK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>Taking this product is ...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = extremely bad, 7 = extremely good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I am [strongly against / strongly for] taking this product.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = strongly against, 7 = strongly for</td>
<td>0.908 0.905</td>
</tr>
<tr>
<td></td>
<td>I [dislike / like] taking this product.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = dislike, 7 = like</td>
<td></td>
</tr>
<tr>
<td>Adoption intention</td>
<td>How likely is it that you will take resveratrol supplements during the coming year?</td>
<td>- -</td>
</tr>
</tbody>
</table>

*Notes.* All statements were measured on a seven-point scale.
<table>
<thead>
<tr>
<th>Independent variables</th>
<th>$B$</th>
<th>$t$</th>
<th>$p$</th>
<th>$B$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DK:</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>US:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2 = .401$ (adjusted .383);</td>
<td></td>
<td></td>
<td></td>
<td>$R^2 = .409$ (adjusted .387);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F (12) = 22.118$, $p = .000$</td>
<td></td>
<td></td>
<td></td>
<td>$F (12) = 18.420$, $p = .000$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.116</td>
<td>1.110</td>
<td>.268</td>
<td>-.047</td>
<td>-.450</td>
<td>.653</td>
</tr>
<tr>
<td>Age</td>
<td>-.004</td>
<td>-1.112</td>
<td>.267</td>
<td>.005</td>
<td>1.329</td>
<td>.185</td>
</tr>
<tr>
<td>Education</td>
<td>.118</td>
<td>1.191</td>
<td>.234</td>
<td>-.328</td>
<td><strong>-3.061</strong></td>
<td><strong>.002</strong></td>
</tr>
<tr>
<td></td>
<td>$R^2 = .004$ (-.003), $F(3)=.531$</td>
<td></td>
<td></td>
<td>$R^2 = .025$ (.017), $F(3)=3.199$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.001</td>
<td>.067</td>
<td>.947</td>
<td>.013</td>
<td>1.525</td>
<td>.128</td>
</tr>
<tr>
<td>Reported fitness &amp; health</td>
<td>-.001</td>
<td>-.027</td>
<td>.979</td>
<td>.048</td>
<td>.912</td>
<td>.363</td>
</tr>
<tr>
<td>Health behaviour</td>
<td>-.013</td>
<td>-1.809</td>
<td>.071</td>
<td>-.010</td>
<td>-1.587</td>
<td>.114</td>
</tr>
<tr>
<td></td>
<td>$R^2 = .015$ (.007), $F(3)=2.011$</td>
<td></td>
<td></td>
<td>$R^2 = .004$ (-.005), $F(3)=.401$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health expectation</td>
<td><strong>.683</strong></td>
<td><strong>14.479</strong></td>
<td><strong>.000</strong></td>
<td><strong>.567</strong></td>
<td><strong>11.065</strong></td>
<td><strong>.000</strong></td>
</tr>
<tr>
<td>Holistic health beliefs</td>
<td>.065</td>
<td>1.033</td>
<td>.302</td>
<td>.113</td>
<td>1.781</td>
<td>.076</td>
</tr>
<tr>
<td>CAM use</td>
<td><strong>.087</strong></td>
<td><strong>2.649</strong></td>
<td><strong>.008</strong></td>
<td><strong>.125</strong></td>
<td><strong>2.837</strong></td>
<td><strong>.005</strong></td>
</tr>
<tr>
<td></td>
<td>$R^2 = .364$ (.360), $F(3)=85.788$</td>
<td></td>
<td></td>
<td>$R^2 = .350$ (.345), $F(3)=66.746$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural product interest</td>
<td>-.003</td>
<td>-.061</td>
<td>.951</td>
<td>-.090</td>
<td>-1.685</td>
<td>.093</td>
</tr>
<tr>
<td>Food indulgence interest</td>
<td>.002</td>
<td>.040</td>
<td>.968</td>
<td><strong>.139</strong></td>
<td><strong>3.131</strong></td>
<td><strong>.002</strong></td>
</tr>
<tr>
<td>Mediterranean</td>
<td>.065</td>
<td>1.845</td>
<td>.066</td>
<td>.032</td>
<td>.979</td>
<td>.328</td>
</tr>
<tr>
<td></td>
<td>$R^2 = .022$ (.016), $F(3)=3.404$</td>
<td></td>
<td></td>
<td>$R^2 = .062$ (.054), $F(3)=8.132$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* $R^2$ and $F$ values are given for each block of variables.
Table 5. Influence of individual characteristics on adoption intention to adopt a resveratrol supplement, linear regression

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>$B$</th>
<th>$t$</th>
<th>$p$</th>
<th>$B$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK:</td>
<td></td>
<td></td>
<td></td>
<td>US:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$ = .322 (adjusted .301);</td>
<td></td>
<td></td>
<td></td>
<td>$R^2$ = .411 (adjusted .389);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F$ (12) = 15.685, $p = .000$</td>
<td></td>
<td></td>
<td></td>
<td>$F$ (12) = 18.539, $p = .000$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.235</td>
<td>1.489</td>
<td>.137</td>
<td>.070</td>
<td>.436</td>
<td>.663</td>
</tr>
<tr>
<td>Age</td>
<td>.009</td>
<td>1.493</td>
<td>.136</td>
<td>.005</td>
<td>.767</td>
<td>.444</td>
</tr>
<tr>
<td>Education</td>
<td>.216</td>
<td>1.446</td>
<td>.149</td>
<td></td>
<td>.360</td>
<td>.294</td>
</tr>
<tr>
<td>$R^2$ = .008 (.002), $F$ (3) = 1.280</td>
<td></td>
<td></td>
<td></td>
<td>$R^2$ = .012 (.004), $F$ (3) = 1.447</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.013</td>
<td>.861</td>
<td>.390</td>
<td>.008</td>
<td>.637</td>
<td>.525</td>
</tr>
<tr>
<td>Reported fitness &amp; health</td>
<td>-.083</td>
<td>-1.188</td>
<td>.236</td>
<td>-.121</td>
<td>-1.508</td>
<td>.132</td>
</tr>
<tr>
<td>Health behaviour</td>
<td>-.017</td>
<td>-1.468</td>
<td>.143</td>
<td>.007</td>
<td>.742</td>
<td>.459</td>
</tr>
<tr>
<td>$R^2$ = .025 (.018), $F$ (3) = 3.437</td>
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<td></td>
<td></td>
<td>$R^2$ = .018 (.009), $F$ (3) = 2.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health expectation</td>
<td>.792</td>
<td>11.091</td>
<td>.000</td>
<td>.828</td>
<td>10.567</td>
<td>.000</td>
</tr>
<tr>
<td>Holistic health beliefs</td>
<td>.057</td>
<td>.603</td>
<td>.547</td>
<td>-.130</td>
<td>-1.333</td>
<td>.183</td>
</tr>
<tr>
<td>CAM use</td>
<td>.201</td>
<td>4.022</td>
<td>.000</td>
<td>.266</td>
<td>3.966</td>
<td>.000</td>
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<tr>
<td>$R^2$ = .283 (.278), $F$ (3) = 59.150</td>
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<td></td>
<td></td>
<td>$R^2$ = .323 (.317), $F$ (3) = 59.105</td>
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<td></td>
</tr>
<tr>
<td>Natural product interest</td>
<td>-.052</td>
<td>-.755</td>
<td>.451</td>
<td>-.025</td>
<td>-.311</td>
<td>.756</td>
</tr>
<tr>
<td>Food indulgence interest</td>
<td>.127</td>
<td>2.044</td>
<td>.042</td>
<td>.348</td>
<td>5.135</td>
<td>.000</td>
</tr>
<tr>
<td>Mediterranean</td>
<td>.009</td>
<td>.165</td>
<td>.869</td>
<td>-.067</td>
<td>-1.312</td>
<td>.191</td>
</tr>
<tr>
<td>kitchen_cuisine</td>
<td></td>
<td></td>
<td></td>
<td>$R^2$ = .018 (.012), $F$ (3) = 2.796</td>
<td>$R^2$ = .104 (.096), $F$ (3) = 14.332</td>
<td></td>
</tr>
</tbody>
</table>

Note: $R^2$ and F values are given for each block of variables.