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Therapy-dependent inconsistencies in self-reported use of complementary and alternative medicine in the general population: Findings from a longitudinal study

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Therapy-dependent inconsistencies in self-reported use of complementary and alternative medicine in the general population: Findings from a longitudinal study

Heidi Amalie Rosendahl Jensen¹ (harj@sdu.dk)

Ola Ekholm^{1*} (oek@sdu.dk)

¹National Institute of Public Health, University of Southern Denmark

*Corresponding author

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ABSTRACT

Objective: Information on the use of complementary and alternative medicine (CAM) in the general population is often collected by means of surveys, causing the reliability of data to rely on the memory accuracy of the respondent. The objective of the present study was to examine the consistency in self-reported CAM use using data from two survey waves 4 years apart.

Design: Longitudinal study.

Setting/participants: Data were obtained from the Danish Health and Morbidity Surveys. A nationally representative subsample of the individuals invited in 2013 was re-invited in 2017. In all, 2,297 individuals (≥16 years) completed the self-administered questionnaire in both waves, including questions on e.g. CAM use.

Main outcome measures: The use of six different CAM therapies (acupuncture; craniosacral therapy; faith healing and/or clairvoyance; nutritional counselling; massage; osteopathy or other manipulative therapies; reflexology) was assessed by the response categories 'Yes, within the past 12 months', 'Yes, but previously than within the past 12 months' and 'No'. For each CAM therapy, an inconsistent response was defined as either the response combination 1) 'Yes, within the past 12 months' in 2013 and 'No' in 2017, or 2) 'Yes, within the past 12 months' or 'Yes, but previously than within the past 12 months' in 2013 and 'No' in 2017.

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Results: The inconsistency percentages varied across CAM therapies. The highest levels of inconsistency for CAM use within the past 12 months were observed for nutritional counselling (64.9 %) and faith healing and/or clairvoyance (36.4 %). The lowest proportion of inconsistent responses was observed for acupuncture (18.3%). Overall, the same pattern was observed for lifetime CAM use.

Conclusions: The results highlight the difficulty in obtaining reliable prevalence estimates on the use of CAM in the general population. Future studies should take these findings into account when interpreting similar analyses.

Strengths and limitations of this study

- No previous study has investigated the inconsistencies in self-reported use of CAM therapies
- Due to the study design, findings can be generalized to the adult general population
- The inclusion of six different CAM therapies makes it possible to compare inconsistencies in response patterns across the included therapies
- Variations in specificity and number of CAM therapies within the CAM therapy response categories may affect comparability across CAM therapies
- Loss to follow-up during the study period may, to some extent, compromise the validity of inconsistency estimates

Key words (3-6): Complementary medicine, public health, epidemiology

Background

During the last decades, an increase in the use and acceptance of complementary and alternative medicine (CAM) has been observed in Western countries.¹⁻³ In Europe, the most commonly used CAM therapies are herbal medicine, homeopathy, chiropractic, acupuncture, reflexology, and massage (for definitions of specific CAM therapies, please see),⁴ and it is estimated that up to 86 % of the general population in Europe use CAM each year.^{5,6} However, comparing prevalence rates of CAM use across countries is very difficult since there is a large variation over time and between countries in which therapies that are considered to be conventional therapies or CAM therapies.⁷

CAM is typically used to complement biomedical care^{8,9} and for relaxation or improvement in subjective well-being.^{5,10} Sociodemographic analyses find that CAM users are more likely to be females, middle-aged, and have a higher education.^{5,6,11} According to systematic reviews, a wide variety of health conditions is associated with CAM use with the most common being musculoskeletal problems,⁵ back problems, depression, insomnia, severe headache or migraines, and stomach or intestinal illnesses.⁶

The use of CAM in the general population is typically estimated by means of survey data.^{5,9,12} Such surveys rely greatly on the accuracy of the respondents' recall. Thus, the importance of accurate long-term memory is even more pronounced when the respondent is asked about lifetime use of CAM. Other factors that may affect data reliability include the respondent's motivation to provide truthful information on CAM. Reliable and accurate data is an important and valuable tool for various stakeholders and policy makers in order to monitor health behaviour in the population, evaluate the effectiveness of existing policies, and make or justify decisions. Also, it is well-known that CAM is often used by specific populations, i.e. those suffering from diseases such as cancer,¹³⁻¹⁵ diabetes,¹⁶⁻¹⁸ coronary heart disease,¹⁹⁻²¹ and mental illness.^{22,23} As these specific populations often receive biomedical treatment as well, data on CAM use may serve as an

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4 71 important basis for determining if there are compromising or beneficial effects on disease progression if
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12 74 The reliability of self-reported data on CAM use in the population can be examined by exploring their
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16 76 no previous study has examined the consistency in self-reported CAM use over time. Previous studies have,
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18 77 however, carried out similar consistency analyses for other health-related indicators, e.g. illicit drug use,^{24,25}
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20 78 smoking,^{26,27} and specific health conditions.^{28,29} Results from these studies indicate that inconsistency
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22 79 percentages are often surprisingly high. Furthermore, concerns have been raised about the validity of self-
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24 80 reported health care utilisation.³⁰ Thus, the aim of the present study was to examine inconsistencies in the
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26 81 use of various CAM therapies using longitudinal data from two survey waves conducted 4 years apart.
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34 83 **Methods**

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36 84 Data were derived from the Danish Health and Morbidity Surveys, which are nationally representative
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38 85 health surveys that have been carried out regularly since 1987.³¹ The overall aim of the surveys is to
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40 86 describe the status and trends in health and morbidity in the general adult population in Denmark and
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42 87 factors that may influence health status. In the present study, we use data from the two most recent survey
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44 88 waves in 2013 and 2017. In 2013, a random sample of 25,000 adults (≥ 16 years) was drawn from the Danish
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46 89 Civil Registration System (in which each citizen with an official residence in Denmark is registered with a
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48 90 unique personal registration number).³² All randomly selected individuals were sent a postal questionnaire
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50 91 in 2013, but throughout the data collection period it was also possible to complete an identical web
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52 92 questionnaire. A total of 14,265 individuals completed the self-administered questionnaire in 2013,
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54 93 corresponding a response rate of 57%. In 2017, a nationally representative subsample of 3,147 respondents
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56 94 were re-invited to participate in the next survey wave in 2017 using the same mode of administration as in
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2013. As 161 individuals were lost to follow-up due to death or emigration, and 689 were lost due to non-response, the total sample size in the present study included 2,297 individuals. The data collection period was between February and mid-May in both survey waves. Furthermore, in both survey waves, CAM use was assessed by asking the respondents whether they had ever been treated by therapists outside the general health services and used any of the following providers or forms of therapies: acupuncture; craniosacral therapy; faith healing and/or clairvoyance; nutritional counselling; massage, osteopathy or other manipulative therapies; reflexology (of which foot reflexology is the frequently used form in Denmark). Possible response categories for each CAM therapy were 'Yes, within the past 12 months', 'Yes, but previously than within the past 12 months', and 'No'. The respondents were also asked about their use of other CAM therapies (e.g. applied kinesiology and homeopathy), but these therapies were excluded from the present study due to low prevalence estimates. In the present study, two types of inconsistencies were examined for each CAM therapy. The first type of inconsistent response was defined as when a respondent answered 'Yes, within the past 12 months' to a specific CAM therapy in the survey wave in 2013, but then answered 'No' to the same CAM therapy in the 2017 survey wave. The second type of inconsistent response was defined as when a respondent answered 'Yes, within the past 12 months' or 'Yes, but previously than within the past 12 months' to a specific CAM therapy in the survey wave 2013, but then answered 'No' to the same CAM therapy in 2017 survey wave.

Information on sex and age were obtained from the Danish Civil Registration System.³² Educational level was the self-reported highest completed level of education.

Patient and Public Involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Statistical analysis

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The inconsistencies are presented as percentages with 95 % confidence intervals (CI), which were calculated using the Wilson score method.

Multiple logistic regression models were used to identify factors associated with inconsistent response among lifetime use of acupuncture, massage, osteopathy or other manipulative therapies and reflexology, respectively. The results are presented as odds ratios (OR) with 95% confidence intervals (CI). The first model was adjusted for sex, age and use of CAM practitioner within the past 12 months reported at baseline. The second model was further adjusted for combined school and vocational education (these analyses were restricted to individuals aged 25 years or older) since most have completed their education by this point. Statistical analyses were performed using SAS Version 9.4.

Results

The baseline characteristics of the respondents completing the self-administered questionnaire in both 2013 and 2017 are presented in Table 1. In all, 21.2% had used massage, osteopathy or other manipulative therapies within the past 12 months. Acupuncture and reflexology had the second and third highest prevalence estimate, respectively, at 8.4% and 5.3%. The table also shows that CAM users were more likely to be women than men for all six CAM therapies. The mean age of CAM users varied between 48.1 years (massage, osteopathy or other manipulative therapies) and 53.5 years (nutritional counselling). Furthermore, prevalence rates of lifetime use of CAM therapies varied between 36.4% (massage, osteopathy or other manipulative therapies) and nutritional counselling (6.0%).

Table 1. Baseline characteristics of the study population (n=2,297)

CAM therapy	Use within the past 12 months (%)	Women (%) ¹	Mean age (SD) ¹	Lifetime use (%) ²	Women (%) ¹	Mean age (SD) ¹
Acupuncture	8.4	67.2	50.1 (15.7)	28.2	65.6	52.0 (14.7)
Craniosacral therapy	2.7	81.0	48.2 (15.1)	7.4	80.5	49.1 (14.0)
Faith healing and/or clairvoyance	2.6	81.8	52.8 (14.6)	8.3	78.5	49.8 (14.1)
Nutritional counselling	1.7	73.0	53.5 (16.8)	6.0	76.7	52.0 (15.7)
Massage, osteopathy or other manipulative therapies	21.2	64.5	48.1 (15.2)	36.4	62.7	48.7 (15.1)
Reflexology	5.3	69.9	52.7 (14.6)	24.6	70.3	52.4 (14.1)

¹Among individuals who have used CAM before baseline²Lifetime use of CAM

In Table 2, the inconsistency percentages for each CAM therapy is presented for CAM use within the past 12 months and for lifetime use of CAM, respectively. The inconsistency percentages vary greatly across CAM therapies. In all, 64.9% of the individuals who in the baseline survey (in 2013) reported that they had used nutritional counselling within the past 12 months answered that they had never used this therapy in the subsequent survey wave (in 2017). A high proportion of inconsistent responses was also observed for faith healing and/or clairvoyance (36.4%). The lowest inconsistency percentages were observed for acupuncture (18.3%) and massage, osteopathy, or other manipulative therapies (22.9%). Table 2 also shows that 62.0 % of the individuals who in the baseline survey (in 2013) reported that they had ever used nutritional counselling (i.e. lifetime use) answered that they had never used this therapy in the subsequent survey wave (in 2017). The inconsistency pattern for lifetime use of CAM is similar to that seen for CAM use within the past 12 months.

Table 2. Inconsistent response frequencies and percentages with 95% confidence intervals (CI) for six CAM therapies

CAM therapy	CAM use within the past 12 months				Lifetime use of CAM			
	Cases who had visited a CAM practitioner within the past 12 months in 2013 (n)	Inconsistent cases in 2017 (n)	Inconsistency % (95% CI)		Cases who had visited a CAM practitioner in their lifetime in 2013 (n)	Inconsistent cases in 2017 (n)	Inconsistency % (95% CI)	
Acupuncture	180	33	18.3	(13.4-24.6)	605	134	22.1	(19.0-25.6)
Craniosacral therapy	58	16	27.6	(17.8-40.2)	159	45	28.3	(21.9-35.8)
Faith healing and/or clairvoyance	55	20	36.4	(24.9-49.6)	177	57	32.2	(25.8-39.4)
Nutritional counselling	37	24	64.9	(48.8-78.2)	129	80	62.0	(53.4-69.9)
Massage, osteopathy or other manipulative therapies	454	104	22.9	(19.3-27.0)	788	239	30.6	(27.5-33.9)
Reflexology	113	30	26.6	(19.3-35.4)	528	143	27.1	(23.5-31.0)

Table 3 shows the inconsistency percentages for lifetime use of CAM according to sex. The inconsistency percentages were significantly higher among men than women for two CAM therapies (massage, osteopathy, or other manipulative therapies, and reflexology). The percentages were higher among men for three out of the four other CAM therapies, although the results were not statistically significant.

Table 3. Inconsistent response percentages with 95% confidence intervals (CI) for lifetime use of six CAM therapies by sex

CAM therapy	Men	Women	<i>p</i>
Acupuncture	23.1 (17.9-29.3)	21.7 (17.9-26.0)	0.691
Craniosacral therapy	25.8 (13.7-43.3)	28.9 (21.8-37.3)	0.731
Faith healing and/or clairvoyance	36.8 (23.4-52.7)	30.9 (23.9-39.1)	0.490
Nutritional counselling	73.3 (55.6-85.8)	58.6 (48.7-67.8)	0.145
Massage, osteopathy or other manipulative therapies	36.1 (30.8-41.8)	27.3 (23.6-31.5)	0.01
Reflexology	37.0 (29.8-44.7)	22.9 (18.9-27.5)	<0.001

The results from the multiple logistic regression analyses revealed that the predictors that were associated with inconsistent response varied by lifetime use of CAM therapies (table 4). For example, male sex was associated with increased odds of inconsistent response (in 2017) for massage, osteopathy, or other manipulative therapies (OR: 1.47, 95% CI: 1.06-2.04) and reflexology (OR: 1.94, 95% CI: 1.29-2.93), respectively. However, we found no significant association between sex and inconsistent response for individuals who reported lifetime use of acupuncture. Age was an independent predictor of all three outcomes, but the pattern of associations differed slightly by CAM therapy. Furthermore, table 4 shows that individuals who had not used massage, osteopathy, or other manipulative therapies within the past 12 months had 2.38 (95% CI: 1.73-3.28) times higher odds of reporting never having used this CAM therapy in the subsequent wave than individuals who had used it within the past year. Interestingly, no significant associations were observed between use within the past year and the two other CAM therapies. Finally, the results of the logistic regression models indicated that an inconsistent response was associated with a lower level of education among all three CAM therapies, however only borderline significant for lifetime use of massage, osteopathy, or other manipulative therapies.

Table 4. Adjusted odds ratios (OR) and 95% confidence intervals of inconsistent response (in 2017) among individuals who (in 2013) reported lifetime use of different CAM therapies

	Acupuncture				Massage, osteopathy or other manipulative therapies				Reflexology			
	Model 1 OR (95% CI)	<i>p</i>	Model 2 ¹ OR (95% CI)	<i>p</i>	Model 1 OR (95% CI)	<i>p</i>	Model 2 ¹ OR (95% CI)	<i>p</i>	Model 1 OR (95% CI)	<i>p</i>	Model 2 ¹ OR (95% CI)	<i>p</i>
Sex		0.916		0.924		0.021		0.015		0.002		0.003
Men	1.02 (0.68-1.54)		1.02 (0.67-1.55)		1.47 (1.06-2.04)		1.53 (1.09-2.15)		1.94 (1.29-2.93)		1.93 (1.26-2.96)	
Women	1		1		1		1		1		1	
Age		0.916		0.068		<0.001		<0.001				0.031
16-44 y.	0.77 (0.47-1.24)		0.83 (0.49-1.40)		0.65 (0.45-0.93)		0.64 (0.43-0.95)		1.19 (0.75-1.90)		1.28 (0.78-2.10)	
45-64 y.	1		1		1		1		1		1	
≥65 y.	1.83 (1.14-2.94)		1.62 (1.00-2.64)		2.96 (1.91-4.61)		2.68 (1.69-4.23)		2.28 (1.40-3.71)		1.98 (1.19-3.29)	
CAM use within the past 12 months		0.188		0.120		<0.001		<0.001		0.866		0.738
Yes	1		1		1		1		1		1	
No	1.35 (0.87-2.10)		1.45 (0.91-2.31)		2.38 (1.73-3.28)		2.36 (1.68-3.29)		1.04 (0.64-1.69)		1.09 (0.66-1.80)	
Education				0.037				0.074				0.041
Primary/secondary, vocational or short-cycle higher education			1.61 (1.03-2.52)				1.44 (0.97-2.14)				1.60 (1.02-2.51)	
Medium- or long-cycle higher education			1				1				1	

173 ¹Analysis restricted to individuals aged 25 years or older in 2013

Discussion

The present study examined the inconsistency in self-reported use of various CAM therapies using longitudinal data from two survey waves conducted 4 years apart. To our knowledge, no previous studies have examined this matter. We found high levels of inconsistencies for all CAM therapies. The highest proportion of inconsistent responses was observed for nutritional counselling and the lowest for acupuncture. Although there are no comparable studies, the response patterns are, to some extent, similar to those found for other health-related outcomes. For example, it has been shown that response consistency over time depends on the severity and type of health condition.^{28,29} Applying a similar logic to the findings from the present study, one could argue that the more 'invasive' the CAM therapy, the lower inconsistency percentages. This could probably be explained by the fact that people tend to remember experiences that create a lasting memory, e.g. pain due to acupuncture needles inserted into the body as opposed to e.g. increased well-being due to massage. Moreover, acupuncture is a very well-defined CAM therapy, whereas e.g. nutritional counselling, the CAM therapy exhibiting the highest proportion of inconsistent responses, is a quite vague definition, which may have introduced some uncertainties in the respondents. For example, is it considered nutritional counselling or not if a friend recommends that you eat healthier or a TV show or a book inspire you to do so? Or should the nutritional counselling have been provided by a certified dietitian to be considered nutritional counselling? Another factor that may blur the memory of nutritional counselling is related to the fact that information on diet and nutrition is often provided from other sources than educated counsellors or dietitians, i.e. by the media. Accordingly, the respondent may simply forget the origin of the nutritional advice, thus resulting in response inconsistencies over time.

Our results revealed some interesting sociodemographic patterns in relation to CAM use, which are in line with the findings from previous studies. For example, all CAM therapies are more frequently used by

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4 198 women than by men and with a mean age by users of around 50 years.^{5,6,11} Inconsistent responses were
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6 199 related to both sex, age, educational level, and use of CAM therapy within the past year, depending on the
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16 203 reported use of CAM therapies, which makes the study its own of its kind. Also, an important strength of
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21 205 report inconsistencies in the use of CAM therapies. Moreover, the long list of various CAM therapies makes
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23 206 it possible to compare inconsistencies in response patterns across the included therapies.

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29 208 The present study has some potential limitations that need to be addressed. Firstly, the included CAM
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34 210 response category ‘acupuncture’ includes only one specific CAM therapy, whereas the response category
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36 211 ‘Massage, osteopathy or other manipulative therapies’ includes more and less well-defined CAM therapies.
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38 212 This makes it somewhat difficult to compare specific CAM therapies. Moreover, loss to follow-up during the
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40 213 study period may, to some extent, have compromised the validity of inconsistency estimates. Lastly, a
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42 214 general source of bias when examining self-reported use of CAM is related to societal trends in and
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45 215 definitions of which therapies that are considered conventional therapies or CAM therapies, respectively.
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47 216 Acupuncture, for example, which was defined as a CAM therapy in our study may also be considered a
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49 217 conventional therapy by some respondents as it may sometimes be offered to specific patient groups in
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51 218 public hospital settings. Such gray zone areas concerning the constitution and definition of CAM therapies
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54 219 may have considerable implications for survey results and, accordingly, inconsistency estimates.

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Recommendations from previous research in other scientific areas exploring inconsistencies in self-reported health-related behavior highlight the importance of using repeated measures or ask about the frequency of the behavior of interest.²⁵ In this way, one may find out that the majority of inconsistent responses occur in respondents who only engage in that specific behavior, e.g. used nutritional counselling, once or twice in their life. Such responses may then not be considered relevant from a public health perspective. Similar recommendations could be formulated based on the findings from the present study. Another recommendation could be to primarily assess the use of CAM in face-to-face and telephone interview surveys where an interviewer is present to explain the question/therapies in detail and probe for more information if the respondent is uncertain about a certain question.

Conclusions

In conclusion, the high proportions of inconsistent responses demonstrated in the present study highlight the difficulty in obtaining reliable prevalence estimates on the use of CAM in the general population. Although inconsistencies were found for all included CAM therapies, large inconsistency variations across CAM therapies were demonstrated with the highest proportion of inconsistent response for nutritional counselling, the lowest for acupuncture. Our results provide new insight into possible methodological challenges in health surveys which include questions on CAM use that need to be addressed and taken into account when interpreting findings from similar studies and planning future studies.

Footnotes

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Contributors: The study was conceptualised by both authors. HARJ wrote the first draft of the manuscript; OE carried out the statistical analyses. Both authors critically reviewed and approved the final version of the manuscript.

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Competing Interests statement: None declared.

Patient consent for publication: Not required.

Ethics approval: The study was approved by SDU RIO (ID 10.899). SDU RIO examine and approve all scientific and statistical projects at the University of Southern Denmark according to the Danish Data Protection Regulation. Ethical approval is not required for surveys according to Danish legislation.

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Reporting checklist for cohort study.

Based on the STROBE cohort guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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			Page
Reporting Item			Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1

1	Abstract	#1b	Provide in the abstract an informative and balanced summary	1
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6	Introduction			
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10	Background /	#2	Explain the scientific background and rationale for the	3-4
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one group. Give information separately for for exposed and unexposed groups if applicable.

Bias	#9	Describe any efforts to address potential sources of bias	5
Study size	#10	Explain how the study size was arrived at	4-5
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	5-6
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	5-6
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	6
Statistical methods	#12c	Explain how missing data were addressed	5
Statistical methods	#12d	If applicable, explain how loss to follow-up was addressed	5
Statistical methods	#12e	Describe any sensitivity analyses	
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Results			
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility,	6 (and 4-5)

		confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	
Participants	#13b	Give reasons for non-participation at each stage	5
Participants	#13c	Consider use of a flow diagram	
n/a (see 4-5)			
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	6-7
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	
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Descriptive data	#14c	Summarise follow-up time (eg, average and total amount)	
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Outcome data	#15	Report numbers of outcome events or summary measures over time. Give information separately for exposed and unexposed groups if applicable.	
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Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence	9,10

		interval). Make clear which confounders were adjusted for and why they were included	
Main results	#16b	Report category boundaries when continuous variables were categorized	10
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
n/a			
Other analyses	#17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	6,9-10
Discussion			
Key results	#18	Summarise key results with reference to study objectives	11
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	12
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	11-13
Generalisability	#21	Discuss the generalisability (external validity) of the study results	12
Other Information			

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Funding

#22

Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

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- Notes:
- 13a: 6 (and 4-5)
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Therapy-dependent inconsistencies in self-reported use of complementary and alternative medicine in the general population: Findings from a longitudinal study

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Therapy-dependent inconsistencies in self-reported use of complementary and alternative medicine in the general population: Findings from a longitudinal study

Heidi Amalie Rosendahl Jensen¹ (harj@sdu.dk)

Ola Ekholm^{1*} (oek@sdu.dk)

¹National Institute of Public Health, University of Southern Denmark

*Corresponding author

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ABSTRACT

Objective: Information on the use of complementary and alternative medicine (CAM) in the general population is often collected by means of surveys, causing the reliability of data to rely on the memory accuracy of the respondent. The objective of the present study was to examine the consistency in self-reported CAM use using data from two survey waves 4 years apart.

Design: Longitudinal study.

Setting/participants: Data were obtained from the Danish Health and Morbidity Surveys. A nationally representative subsample of the individuals invited in 2013 was re-invited in 2017. In all, 2,297 individuals (≥16 years) completed the self-administered questionnaire in both waves, including questions on e.g. CAM use.

Main outcome measures: The use of six different CAM therapies (acupuncture; craniosacral therapy; faith healing and/or clairvoyance; nutritional counselling; massage; osteopathy or other manipulative therapies; reflexology) was assessed by the response categories 'Yes, within the past 12 months', 'Yes, but previously than within the past 12 months' and 'No'. For each CAM therapy, an inconsistent response was defined as either the response combination 1) 'Yes, within the past 12 months' in 2013 and 'No' in 2017, or 2) 'Yes, within the past 12 months' or 'Yes, but previously than within the past 12 months' in 2013 and 'No' in 2017.

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Results: The inconsistency percentages varied across CAM therapies. The highest levels of inconsistency for CAM use within the past 12 months were observed for nutritional counselling (64.9 %) and faith healing and/or clairvoyance (36.4 %). The lowest proportion of inconsistent responses was observed for acupuncture (18.3%). Overall, the same pattern was observed for lifetime CAM use.

Conclusions: The results highlight the difficulty in obtaining reliable prevalence estimates on the use of CAM in the general population. Future studies should take these findings into account when interpreting similar analyses.

Strengths and limitations of this study

- No previous study has investigated the inconsistencies in self-reported use of CAM therapies
- Due to the study design, findings can be generalized to the adult general population
- The inclusion of six different CAM therapies makes it possible to compare inconsistencies in response patterns across the included therapies
- Variations in specificity and number of CAM therapies within the CAM therapy response categories may affect comparability across CAM therapies
- Loss to follow-up during the study period may, to some extent, compromise the validity of inconsistency estimates

Key words (3-6): Complementary medicine, public health, epidemiology

Background

During the last decades, an increase in the use and acceptance of complementary and alternative medicine (CAM) has been observed in Western countries.¹⁻³ In Europe, the most commonly used CAM therapies are herbal medicine, homeopathy, chiropractic, acupuncture, reflexology, and massage (for definitions of specific CAM therapies, please see),⁴ and it is estimated that up to 86 % of the general population in Europe use CAM each year.⁵⁻⁸ However, comparing prevalence rates of CAM use across countries is very difficult since there is a large variation over time and between countries in which therapies that are considered to be conventional therapies or CAM therapies.⁹

The Danish health care system is universal and based on the principle that access to conventional health care is equal and free of charge for all citizens.¹⁰ However, according to a Danish survey,¹¹ around 80 % of the population are interested in using one or more types of CAM, whereas 51 % believe that CAM can be just as effective as treatment offered by the conventional health care system. Also, more than half of the population fully or partly agree that they would be interested in combining CAM with conventional medical treatment if they got ill.¹¹ Based on these findings, we consider the Danish population to be rather open to the potential health benefits embedded in CAM, and if diagnosed with a disease, preferably in combination with conventional health care.

CAM is typically used to complement biomedical care^{12,13} and for relaxation or improvement in subjective well-being.^{5,14} Sociodemographic analyses find that CAM users are more likely to be females, middle-aged, and have a higher education.^{5,6,15} According to systematic reviews, a wide variety of health conditions is associated with CAM use with the most common being musculoskeletal problems,⁵ back problems, depression, insomnia, severe headache or migraines, and stomach or intestinal illnesses.⁶

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The use of CAM in the general population is typically estimated by means of survey data.^{5,13,16} Such surveys rely greatly on the accuracy of the respondents' recall. Thus, the importance of accurate long-term memory is even more pronounced when the respondent is asked about lifetime use of CAM. Other factors that may affect data reliability include the respondent's motivation to provide truthful information on CAM. Reliable and accurate data is an important and valuable tool for various stakeholders and policy makers in order to monitor health behaviour in the population, evaluate the effectiveness of existing policies, and make or justify decisions. Also, it is well-known that CAM is often used by specific populations, i.e. those suffering from diseases such as cancer,¹⁷⁻¹⁹ diabetes,²⁰⁻²² coronary heart disease,²³⁻²⁵ and mental illness.^{26,27} As these specific populations often receive biomedical treatment as well, data on CAM use may serve as an important basis for determining if there are compromising or beneficial effects on disease progression if conventional and alternative treatment are used simultaneously.

The reliability of self-reported data on CAM use in the population can be examined by exploring their consistency over time, although consistency does not necessarily guarantee reliability. To our knowledge, no previous study has examined the consistency in self-reported CAM use over time. Previous studies have, however, carried out similar consistency analyses for other health-related indicators, e.g. illicit drug use,^{28,29} smoking,^{30,31} and specific health conditions.^{32,33} Results from these studies indicate that inconsistency percentages are often surprisingly high. Furthermore, concerns have been raised about the validity of self-reported health care utilisation.³⁴ Thus, the aim of the present study was to examine inconsistencies in the use of various CAM therapies using longitudinal data from two survey waves conducted 4 years apart.

Methods

Data were derived from the Danish Health and Morbidity Surveys, which are nationally representative health surveys that have been carried out regularly since 1987.³⁵ The overall aim of the surveys is to describe the status and trends in health and morbidity in the general adult population in Denmark and factors that may influence health status. In the present study, we use data from the two most recent survey waves in 2013 and 2017. In 2013, a random sample of 25,000 adults (≥ 16 years) was drawn from the Danish Civil Registration System (in which each citizen with an official residence in Denmark is registered with a unique personal registration number).³⁶ All randomly selected individuals were sent a postal questionnaire in 2013, but throughout the data collection period it was also possible to complete an identical web questionnaire. A total of 14,265 individuals completed the self-administered questionnaire in 2013, corresponding a response rate of 57%. In 2017, a nationally representative subsample of 3,147 respondents were re-invited to participate in the next survey wave in 2017 using the same mode of administration as in 2013. As 161 individuals were lost to follow-up due to death or emigration, and 689 were lost due to non-response, the total sample size in the present study included 2,297 individuals. The data collection period was between February and mid-May in both survey waves. Furthermore, in both survey waves, CAM use was assessed by asking the respondents the following question: 'Have you ever been treated by therapists outside the general health services and, for example, used any of the following providers or forms of treatment?'. The following providers or forms of therapies were included: acupuncture; craniosacral therapy; faith healing and/or clairvoyance; nutritional counselling (individualized nutrition counseling); massage, osteopathy or other manipulative therapies; reflexology (of which foot reflexology is the frequently used form in Denmark). Possible response categories for each CAM therapy were 'Yes, within the past 12 months', 'Yes, but previously than within the past 12 months', and 'No'. The respondents were also asked about their use of other CAM therapies (e.g. applied kinesiology and homeopathy), but these therapies were excluded from the present study due to low prevalence estimates. In the present study, two types of inconsistencies were examined for each CAM therapy. The first type of inconsistent response was defined as when a respondent answered 'Yes, within the past 12 months' to a specific CAM therapy in the

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survey wave in 2013, but then answered ‘No’ to the same CAM therapy in the 2017 survey wave. The second type of inconsistent response was defined as when a respondent answered ‘Yes, within the past 12 months’ or ‘Yes, but previously than within the past 12 months’ to a specific CAM therapy in the survey wave 2013 (i.e. lifetime use), but then answered ‘No’ to the same CAM therapy in 2017 survey wave.

Information on sex and age were obtained from the Danish Civil Registration System.³⁶ Educational level was the self-reported highest completed level of education.

Patient and Public Involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Statistical analysis

The inconsistencies are presented as percentages with 95 % confidence intervals (CI), which were calculated using the Wilson score method.

Multiple logistic regression models were used to identify factors associated with inconsistent response among lifetime use of acupuncture, massage, osteopathy or other manipulative therapies and reflexology, respectively. The results are presented as odds ratios (OR) with 95% confidence intervals (CI). The first model was adjusted for sex, age and use of CAM practitioner within the past 12 months reported at baseline. The second model was further adjusted for combined school and vocational education (these

analyses were restricted to individuals aged 25 years or older) since most have completed their education by this point. Statistical analyses were performed using SAS Version 9.4.

Results

The baseline characteristics of the respondents completing the self-administered questionnaire in both 2013 and 2017 are presented in Table 1. In all, 21.2% had used massage, osteopathy or other manipulative therapies within the past 12 months. Acupuncture and reflexology had the second and third highest prevalence estimate, respectively, at 8.4% and 5.3%. The table also shows that CAM users were more likely to be women than men for all six CAM therapies. The mean age of CAM users varied between 48.1 years (massage, osteopathy or other manipulative therapies) and 53.5 years (nutritional counselling). Furthermore, prevalence rates of lifetime use of CAM therapies varied between 36.4% (massage, osteopathy or other manipulative therapies) and nutritional counselling (6.0%).

Table 1. Baseline characteristics of the study population (n=2,297)

CAM therapy	Use within the past 12 months (%)	Women (%) ¹	Mean age (SD) ¹	Lifetime use (%) ²	Women (%) ¹	Mean age (SD) ¹
Acupuncture	8.4	67.2	50.1 (15.7)	28.2	65.6	52.0 (14.7)
Craniosacral therapy	2.7	81.0	48.2 (15.1)	7.4	80.5	49.1 (14.0)
Faith healing and/or clairvoyance	2.6	81.8	52.8 (14.6)	8.3	78.5	49.8 (14.1)
Nutritional counselling	1.7	73.0	53.5 (16.8)	6.0	76.7	52.0 (15.7)
Massage, osteopathy or other manipulative therapies	21.2	64.5	48.1 (15.2)	36.4	62.7	48.7 (15.1)
Reflexology	5.3	69.9	52.7 (14.6)	24.6	70.3	52.4 (14.1)

¹Among individuals who have used CAM before baseline

²Lifetime use of CAM

In Table 2, the inconsistency percentages for each CAM therapy is presented for CAM use within the past 12 months and for lifetime use (i.e. ever use) of CAM, respectively. The inconsistency percentages vary

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greatly across CAM therapies. In all, 64.9% of the individuals who in the baseline survey (in 2013) reported that they had used nutritional counselling within the past 12 months answered that they had never used this therapy in the subsequent survey wave (in 2017). A high proportion of inconsistent responses was also observed for faith healing and/or clairvoyance (36.4%). The lowest inconsistency percentages were observed for acupuncture (18.3%) and massage, osteopathy, or other manipulative therapies (22.9%). Table 2 also shows that 62.0 % of the individuals who in the baseline survey (in 2013) reported that they had ever used nutritional counselling (i.e. lifetime use) answered that they had never used this therapy in the subsequent survey wave (in 2017). The inconsistency pattern for lifetime use of CAM is similar to that seen for CAM use within the past 12 months.

Table 2. Inconsistent response frequencies and percentages with 95% confidence intervals (CI) for six CAM therapies

CAM therapy	CAM use within the past 12 months				Lifetime use of CAM			
	Cases who had visited a CAM practitioner within the past 12 months in 2013 (n)	Inconsistent cases in 2017 (n)	Inconsistency % (95% CI)		Cases who had visited a CAM practitioner in their lifetime in 2013 (n)	Inconsistent cases in 2017 (n)	Inconsistency % (95% CI)	
Acupuncture	180	33	18.3	(13.4-24.6)	605	134	22.1	(19.0-25.6)
Craniosacral therapy	58	16	27.6	(17.8-40.2)	159	45	28.3	(21.9-35.8)
Faith healing and/or clairvoyance	55	20	36.4	(24.9-49.6)	177	57	32.2	(25.8-39.4)
Nutritional counselling	37	24	64.9	(48.8-78.2)	129	80	62.0	(53.4-69.9)
Massage, osteopathy or other manipulative therapies	454	104	22.9	(19.3-27.0)	788	239	30.6	(27.5-33.9)
Reflexology	113	30	26.6	(19.3-35.4)	528	143	27.1	(23.5-31.0)

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4 167 Table 3 shows the inconsistency percentages for lifetime use of CAM according to sex. The inconsistency
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6 168 percentages were significantly higher among men than women for two CAM therapies (massage,
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9 169 osteopathy, or other manipulative therapies, and reflexology). The percentages were higher among men
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11 170 for three out of the four other CAM therapies, although the results were not statistically significant.
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14 **Table 3.** Inconsistent response percentages with 95% confidence intervals (CI) for lifetime use of six CAM
15 therapies by sex

CAM therapy	Men	Women	<i>p</i>
Acupuncture	23.1 (17.9-29.3)	21.7 (17.9-26.0)	0.691
Craniosacral therapy	25.8 (13.7-43.3)	28.9 (21.8-37.3)	0.731
Faith healing and/or clairvoyance	36.8 (23.4-52.7)	30.9 (23.9-39.1)	0.490
Nutritional counselling	73.3 (55.6-85.8)	58.6 (48.7-67.8)	0.145
Massage, osteopathy or other manipulative therapies	36.1 (30.8-41.8)	27.3 (23.6-31.5)	0.010
Reflexology	37.0 (29.8-44.7)	22.9 (18.9-27.5)	<0.001

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28 172 The results from the multiple logistic regression analyses revealed that the predictors that were associated
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30 173 with inconsistent response varied by lifetime use of CAM therapies (table 4). For example, male sex was
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32 174 associated with increased odds of inconsistent response (in 2017) for massage, osteopathy, or other
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35 175 manipulative therapies (OR: 1.47, 95% CI: 1.06-2.04) and reflexology (OR: 1.94, 95% CI: 1.29-2.93),
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37 176 respectively. However, we found no significant association between sex and inconsistent response for
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39 177 individuals who reported lifetime use of acupuncture. Age was an independent predictor of all three
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41 178 outcomes, but the pattern of associations differed slightly by CAM therapy. Furthermore, table 4 shows
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43 179 that individuals who had not used massage, osteopathy, or other manipulative therapies within the past 12
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46 180 months had 2.38 (95% CI: 1.73-3.28) times higher odds of reporting never having used this CAM therapy in
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48 181 the subsequent wave than individuals who had used it within the past year. Interestingly, no significant
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50 182 associations were observed between use within the past year and the two other CAM therapies. Finally, the
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53 183 results of the logistic regression models indicated that an inconsistent response was associated with a
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55 184 lower level of education among all three CAM therapies, however only borderline significant for lifetime
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57 185 use of massage, osteopathy, or other manipulative therapies.
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Table 4. Adjusted odds ratios (OR) and 95% confidence intervals of inconsistent response (in 2017) among individuals who (in 2013) reported lifetime use of different CAM therapies

	Acupuncture				Massage, osteopathy or other manipulative therapies				Reflexology			
	Model 1 OR (95% CI)	<i>p</i>	Model 2 ¹ OR (95% CI)	<i>p</i>	Model 1 OR (95% CI)	<i>p</i>	Model 2 ¹ OR (95% CI)	<i>p</i>	Model 1 OR (95% CI)	<i>p</i>	Model 2 ¹ OR (95% CI)	<i>p</i>
Sex		0.916		0.924		0.021		0.015		0.002		0.003
Men	1.02 (0.68-1.54)		1.02 (0.67-1.55)		1.47 (1.06-2.04)		1.53 (1.09-2.15)		1.94 (1.29-2.93)		1.93 (1.26-2.96)	
Women	1		1		1		1		1		1	
Age		0.916		0.068		<0.001		<0.001				0.031
16-44 y.	0.77 (0.47-1.24)		0.83 (0.49-1.40)		0.65 (0.45-0.93)		0.64 (0.43-0.95)		1.19 (0.75-1.90)		1.28 (0.78-2.10)	
45-64 y.	1		1		1		1		1		1	
≥65 y.	1.83 (1.14-2.94)		1.62 (1.00-2.64)		2.96 (1.91-4.61)		2.68 (1.69-4.23)		2.28 (1.40-3.71)		1.98 (1.19-3.29)	
CAM use within the past 12 months		0.188		0.120		<0.001		<0.001		0.866		0.738
Yes	1		1		1		1		1		1	
No	1.35 (0.87-2.10)		1.45 (0.91-2.31)		2.38 (1.73-3.28)		2.36 (1.68-3.29)		1.04 (0.64-1.69)		1.09 (0.66-1.80)	
Education				0.037				0.074				0.041
Primary/secondary, vocational or short-cycle higher education			1.61 (1.03-2.52)				1.44 (0.97-2.14)				1.60 (1.02-2.51)	
Medium- or long-cycle higher education			1				1				1	

186 ¹Analysis restricted to individuals aged 25 years or older in 2013

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Discussion

The present study examined the inconsistency in self-reported use of various CAM therapies using longitudinal data from two survey waves conducted 4 years apart. To our knowledge, no previous studies have examined this matter. We found high levels of inconsistencies for all CAM therapies. The highest proportion of inconsistent responses was observed for nutritional counselling and the lowest for acupuncture. Although there are no comparable studies, the response patterns are, to some extent, similar to those found for other health-related outcomes. For example, it has been shown that response consistency over time depends on the severity and type of health condition.^{32,33} Applying a similar logic to the findings from the present study, one could argue that the more ‘invasive’ the CAM therapy, the lower inconsistency percentages. This could probably be explained by the fact that people tend to remember experiences that create a lasting memory, e.g. pain due to acupuncture needles inserted into the body as opposed to e.g. increased well-being due to massage. Moreover, acupuncture is a very well-defined CAM therapy, whereas e.g. nutritional counselling, the CAM therapy exhibiting the highest proportion of inconsistent responses, is a quite vague definition, which may have introduced some uncertainties in the respondents. For example, is it considered nutritional counselling or not if a friend recommends that you eat healthier or a TV show or a book inspire you to do so? Or should the nutritional counselling have been provided by a certified dietitian to be considered nutritional counselling? Another factor that may blur the memory of nutritional counselling is related to the fact that information on diet and nutrition is often provided from other sources than educated counsellors or dietitians, i.e. by the media. Accordingly, the respondent may simply forget the origin of the nutritional advice, thus resulting in response inconsistencies over time.

Our results revealed some interesting sociodemographic patterns in relation to CAM use, which are in line with the findings from previous studies. For example, all CAM therapies are more frequently used by

women than by men and with a mean age by users of around 50 years.^{5,6,15} Inconsistent responses were related to both sex, age, educational level, and use of CAM therapy within the past year, depending on the type of CAM therapy. We also found that use of CAM therapies was more prevalent among women than among men. This finding is in keeping with a recent study based on data from 21 European countries.⁸ Thus, the sex-dependent inconsistent responses reported in the present study could probably, at least partly, be explained by men being more likely to forget their previous use because of their low(er) use. Women, on the other hand, report higher rates of unmet needs, more health care utilization, and poorer health, which may make them more likely to actively seek for alternative treatment options, i.e. CAM.⁸ These motivations may cause women to better remember their previous CAM use than men.

The main strength of our study is that no previous study has investigated the inconsistencies in self-reported use of CAM therapies, which makes the study its own of its kind. Also, an important strength of the study is that the findings can be generalised to the adult general population in relation to the self-report inconsistencies in the use of CAM therapies. Moreover, the long list of various CAM therapies makes it possible to compare inconsistencies in response patterns across the included therapies.

The present study has some potential limitations that need to be addressed. Firstly, the included CAM therapy response categories differed in e.g. their specificity and the number of therapies. For example, the response category 'Acupuncture' includes only one specific CAM therapy, whereas the response category 'Massage, osteopathy or other manipulative therapies' or 'Faith healing and/or clairvoyance' includes more and less well-defined CAM therapies. This makes it somewhat difficult to compare specific CAM therapies. For the CAM therapy 'Nutritional counselling', it was not specified whether only verbal counselling was included, or if also nutritional supplements were provided. Moreover, loss to follow-up during the study period may, to some extent, have compromised the validity of inconsistency estimates. Lastly, a general

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4 235 source of bias when examining self-reported use of CAM is related to societal trends in and definitions of
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6 236 which therapies that are considered conventional therapies or CAM therapies, respectively. Acupuncture,
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9 237 for example, which was defined as a CAM therapy in our study may also be considered a conventional
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11 238 therapy by some respondents as it may sometimes be offered to specific patient groups in public hospital
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13 239 settings. Such gray zone areas concerning the constitution and definition of CAM therapies may have
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15 240 considerable implications for survey results and, accordingly, inconsistency estimates.
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21 242 Recommendations from previous research in other scientific areas exploring inconsistencies in self-
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23 243 reported health-related behavior highlight the importance of using repeated measures or ask about the
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26 244 frequency of the behavior of interest.²⁹ In this way, one may find out that the majority of inconsistent
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28 245 responses occur in respondents who only engage in that specific behavior, e.g. used nutritional counselling,
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30 246 once or twice in their life. Such responses may then not be considered relevant from a public health
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33 247 perspective. Similar recommendations could be formulated based on the findings from the present study.
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35 248 Another recommendation could be to primarily assess the use of CAM in face-to-face and telephone
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37 249 interview surveys where an interviewer is present to explain the question/therapies in detail and probe for
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39 250 more information if the respondent is uncertain about a certain question. Lastly, it is recommended for
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41 251 future surveys on CAM use to include clear definitions of all types of CAM use and define CAM in general in
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44 252 all surveys.

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49 254 **Conclusions**

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52 255 In conclusion, the high proportions of inconsistent responses demonstrated in the present study highlight
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54 256 the difficulty in obtaining reliable prevalence estimates on the use of CAM in the general population.
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57 257 Although inconsistencies were found for all included CAM therapies, large inconsistency variations across
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59 258 CAM therapies were demonstrated with the highest proportion of inconsistent response for nutritional
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counselling, the lowest for acupuncture. Our results provide new insight into possible methodological challenges in health surveys which include questions on CAM use that need to be addressed and taken into account when interpreting findings from similar studies and planning future studies. Indeed, our results underscore the importance of including clear and well-defined questions when asking about CAM in surveys.

Footnotes

Contributors: The study was conceptualised by both authors. HARJ wrote the first draft of the manuscript; OE carried out the statistical analyses. Both authors critically reviewed and approved the final version of the manuscript.

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Data availability statement: The datasets used and/or analysed for the present study are available from the corresponding author upon reasonable request. The authors encourage collaboration, and that data are used by other researchers.

Competing Interests statement: None declared.

Patient consent for publication: Not required. In the letter of introduction, all invited individuals were informed that participation implied that the results from the survey will only be published in a form where individuals cannot be identified.

Ethics approval: The study was approved by SDU RIO (ID 10.899). SDU RIO examines and approves all scientific and statistical projects at the University of Southern Denmark according to the Danish Data Protection Regulation. Ethical approval is not required for surveys according to Danish legislation.

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Reporting checklist for cohort study.

Based on the STROBE cohort guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cohort reporting guidelines, and cite them as:

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			Page
Reporting Item			Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1

Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	#3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	#4	Present key elements of study design early in the paper	4
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.	4-5
Eligibility criteria	#6b	For matched studies, give matching criteria and number of exposed and unexposed	n/a
Variables	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than	5

1		one group. Give information separately for for exposed and	
2		unexposed groups if applicable.	
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6	Bias	#9 Describe any efforts to address potential sources of bias	5
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9	Study size	#10 Explain how the study size was arrived at	4-5
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12	Quantitative	#11 Explain how quantitative variables were handled in the	5-6
13			
14	variables	analyses. If applicable, describe which groupings were	
15		chosen, and why	
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19	Statistical	#12a Describe all statistical methods, including those used to	
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21	methods	control for confounding	
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28	Statistical	#12b Describe any methods used to examine subgroups and	6
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30	methods	interactions	
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33	Statistical	#12c Explain how missing data were addressed	5
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38	Statistical	#12d If applicable, explain how loss to follow-up was addressed	5
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44	Statistical	#12e Describe any sensitivity analyses	
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52	Results		
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56	Participants	#13a Report numbers of individuals at each stage of study—eg	6 (and 4-
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58		numbers potentially eligible, examined for eligibility,	5)
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confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.

Participants	#13b	Give reasons for non-participation at each stage	5
Participants	#13c	Consider use of a flow diagram	
n/a (see 4-5)			
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	6-7
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	
8			
Descriptive data	#14c	Summarise follow-up time (eg, average and total amount)	
4			
Outcome data	#15	Report numbers of outcome events or summary measures over time. Give information separately for exposed and unexposed groups if applicable.	
5-7			
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence	9,10

1		interval). Make clear which confounders were adjusted for	
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3		and why they were included	
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6	Main results	#16b Report category boundaries when continuous variables were	10
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11	Main results	#16c If relevant, consider translating estimates of relative risk into	
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13		absolute risk for a meaningful time period	
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19	Other analyses	#17 Report other analyses done—eg analyses of subgroups and	6,9-10
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21		interactions, and sensitivity analyses	
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25	Discussion		
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28	Key results	#18 Summarise key results with reference to study objectives	11
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31	Limitations	#19 Discuss limitations of the study, taking into account sources	12
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33		of potential bias or imprecision. Discuss both direction and	
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35		magnitude of any potential bias.	
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39	Interpretation	#20 Give a cautious overall interpretation considering objectives,	11-13
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41		limitations, multiplicity of analyses, results from similar	
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43		studies, and other relevant evidence.	
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46	Generalisability	#21 Discuss the generalisability (external validity) of the study	12
47			
48		results	
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52	Other Information		
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Funding [#22](#) Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based 14

Notes:

- 13a: 6 (and 4-5)
- 13c: n/a (see 4-5) The STROBE checklist is distributed under the terms of the Creative Commons Attribution License CC-BY. This checklist was completed on 24. March 2021 using <https://www.goodreports.org/>, a tool made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)