Author's response to reviews

**Title:** The Dutch Healthy Diet index (DHD-index): an instrument to measure adherence to the Dutch Guidelines for a Healthy Diet

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**Author's response to reviews:** see over
Dear Editor,

Thank you for the opportunity to revise our manuscript entitled “The Dutch Healthy Diet index (DHD-index): an instrument to measure adherence to the Dutch guidelines for a healthy diet” and willingness to reconsider publication in Nutrition Journal.

We have made changes according to the comments and suggestions of the reviewers. These changes are explained below, point by point, and are with “tracked changes” added to the revised manuscript.

We are thankful to the reviewers and believe their comments and suggestions contributed to a much improved manuscript. We hope that we responded satisfactorily.

On behalf of all authors,
kind regards,

Linde van Lee, MSc
Email: Linde.vanLee@wur.nl
Reviewer: Jean Freeland-Graves

1) P2. L.19 This conclusion is too vague about the results. Nothing is mentioned here about page 15, l.3-4 of the inability of the CO to discriminate

Reply:
We do agree with this comment and therefore we changed the sentence in the abstract and discussion as follows:

Abstract:
“The DHD-index is capable of ranking participants according to their adherence to the Dutch Guidelines for a Healthy Diet by reflecting variation in nine out of ten components that constitute the index assessed on two 24-hour recalls.” (Page 2-3, lines 21-2)

Discussion:
“The DHD-index is capable of ranking participants according to their adherence to the Dutch Guidelines for a Healthy Diet by reflecting variation in the components that constitute the index, except for the ADF component. This component showed a low variation and is consequently not discriminative in ranking subjects according to their adherence to the guidelines.” (Page 14, lines 5-9)

2) P3.L.18 These are not the major differences. 2010 American guidelines do not limit acid foods, and emphasize balancing calories to manage weight and building healthy eating patterns.

Reply:
We do agree with this comment and added these differences to the introduction. However, the Dutch dietary guidelines also emphasize balancing calories. To elaborate more on this issue we added some sentences to the discussion.

Introduction
“The major differences are the American guidelines on milk, on meat and on energy intake. On the other hand, the Dutch guidelines include a restriction on the number of consumption occasion with acidic drinks and foods (ADF) [5, 6].” (Page 4, lines 18-22)

Discussion
“In the HEI-2005, energy intake from solid fats, alcoholic beverages, and added sugars is included as component of the index[11]. For the Dutch situation, no operational guideline for energy intake is available. The health council states that the guidelines are meant for the apparently healthy population with a healthy and stable weight. Consequently, no component is constructed for energy intake in the DHD-index. Energy adjustments should be studied when examining diet-disease associations.” (Page 17, lines 12-18)
3) p4., l. 13 Clarify what is meant by “Due to revisions”

Reply:
We clarified the sentence by changing it as follows:

“We clarified the sentence by changing it as follows: “Due to the renewal of the Dutch guidelines, no Dutch index is yet available.” (Page 5, lines 19-20)

4) p5. l.8 Identify which micronutrients were selected

Reply:
We added the identified micronutrients in the section ‘data analyses of the manuscript. We changed the sentences as follows:

“We selected the micronutrients calcium, folate, iron, magnesium, potassium, riboflavin, thiamin, vitamin A, vitamin B6, vitamin B12, vitamin C and vitamin E because of relevance and availability in the database[19, 20].” (Page 6, lines 20-22)

5) p5.,l.9-10 What were the specific criteria for rejection with a quality check?

Reply:
The quality check was mainly based on the observed energy ratio and tested for significant differences between the first and the second recall, between weeks of data collection and between interviewers. No significant differences were observed so no rejection or additional adjustments during statistical analyses were done. Furthermore, missing values, typing errors, and false answers (that were not in the range of possible answers) in the EPICsoft version were changed when the information was available on the paper version.

To clarify the specific criteria in the manuscript we changed the sentence as follow: “Furthermore, a quality check was done on inconsistencies between first and second recall on general data as birth date. Differences between interviewers and weeks of data collection were checked by using the estimated energy intake divided by estimated basal metabolic rate. Missing values, false answers (that were not in the range of possible answers), typing errors and inconsistencies were changed in the EPICsoft using the original recall data. Underreporting was estimated to be 11% based on the estimated energy intake divided by estimated basal metabolic rate.” (Page 6-7, lines 23-7)

6) p6,l.14 Appendix A gives range of 30 – 40; here it says 30-35 g dietary fiber.

Reply:
The numbers were checked and the numbers in the manuscript were changed to the correct numbers. We changed the sentence as follows:
“The fourth component is based on the recommendation of 30-40 grams of dietary fiber per day.” (Page 8, lines 12-13)

7) p6,l.14-15 This sentence is unclear as the energy recommendation is not listed as a & Table 1 component for Table 1. Explain precisely how energy “was used in the index.” Previously it said that there were 10 components, with a maximum score of 100 points (p5, l.18).

Reply:
The fiber component was energy adjusted to obtain a more precise criterion for calculation of the component. So instead of using the range of 30-40 fiber per day, we used 14 grams fiber per 4.2 MJ. Besides the energy adjustment of saturated fatty acids and trans fatty acids, no energy component was included in the score. To clarify the operational criterion of the fiber component, we changed the sentence as follows:

“The criterion used was stated in the background document and was 14 grams dietary fiber per 4.2 MJ per day[22].” (Page 8, lines 13-15)

8) p6, l. 20 Please clarify whether the Dutch guidelines for a Healthy Diet permit the use of fish oil capsules as a substitute for eating portions of actual fish.

Reply:
The Dutch guidelines for a healthy diet permit the use of fish oil capsules as a substitute for actual fish intake. The background document states: “Because fish oil is probably mainly responsible for the protective effect of fish consumption, fish oil capsules and fish oil enriched food products can be an acceptable alternative for people that do not want to consume fish.” (Health Council of the Netherlands: Guidelines for a healthy diet 2006 - Background document. The Hague, 2006. publication no. A06/08, page 48). To clarify that fish oil capsules are permitted we added the following sentence:

“Fish oil capsules are permitted as substitute for fish consumption by the health council of the Netherlands [22].” (Page 8, lines 20-21)

9) p7,l.3 The guideline of limiting acids foods is not understood at this point how it relates to healthy eating – only in the discussion. Can you add a bit of information in the introduction?

Reply:
The guideline of limiting acidic drinks and foods is added to the Dutch guidelines for prevention of dental caries and risk reduction of dental erosion. To clarify the guideline of consumption occasions we added the following sentence to the introduction:

“The guideline for ADF is added to the guidelines in view of the prevention of dental caries and risk reduction of dental erosion.” (Page 5, lines 18-19)

10) p9, l.9 This explanation is difficult to follow.
The short questionnaire to assess health-enhancing physical activity (SQUASH) was needed to estimate the physical activity component within the DHD-index. Without this data no representing total score could be estimated. Therefore, one participant, who did not fill in the SQUASH completely, was excluded for all analyses. We changed the sentence as follows:

“One participant was excluded from these analyses due to an incomplete SQUASH, which led to a total of 749 participants.” (Page 11, lines 16-17)

11) p10,l.11 “Following a diet regime” is not in the methods. Please add how this was determined.

Reply:
We added in the methods how ‘following diet regime’ was determined. The changed sentence is as follows:

“Characteristics of the recall days as following a diet regime and special day were asked during the 24-hour recalls.” (Page 6, lines 13-14)

12) P11,L.17 Specify whether the association is positive or negative for each.

Reply:
We now specify whether the associations were negative or positive for each subject characteristic. The sentences changed as follows:

“Furthermore, the index score is positively associated with ‘following a diet regime’ and inversely associated with energy intake, which were not included in the index.” (Page 14, lines 9-11)

13) p13,l.19 Unclear what is meant by “have a more nutrient composition”

Reply:
We changed the sentence as follows:

“This latter result indicates that participants in the higher quintiles of the DHD-index have a more nutrient-dense composition of the diet. However, they have a lower absolute intake of these micronutrients, because of the inverse association of energy intake across quintiles of the DHD-index.” (Page 16, lines 14-18)

14) Table 1 Consumption Occasions sounds like a unit, not a food component as are the other components listed. Suggest changing the name to Acid Foods or something similar here and throughout text

Reply:
We changed the name consumption occasions to “acidic drinks and foods (ADF)” throughout the manuscript.
15) Reference 15 The reference and related text should use the newer 2010 dietary guidelines of the USA – not this old 2005 pdf.

Reply:
We changed the reference to the newer 2010 dietary guidelines for Americans. The reference changed to:


16) Reference 16 Lacks page numbers

Reply:
We added the page numbers to reference 16:


17) Reference 38 Lacks volume and page numbers

Reply:
We added the volume and page numbers to reference 38 as follows:

Reviewer: Patricia Guenther

Major Compulsory Revisions:

1) It is a problem that one of the components was based on predicted usual intakes (using a method that is questionable for the current purpose) while the other food-related components are based on 2-day means. All the components should be estimated using the same methodology. For most applications of a diet quality index, scoring based on 2-day means would be fine. The authors have not justified their attempt to estimate usual intake of fish fatty acids, while not attempting to estimate usual intakes of the other food-based components. Did the survey ask about the frequency of supplement use? Perhaps people take fatty acid supplements on a daily basis. Then fish fatty acid intake would not be episodic. On the other hand, perhaps fruit and alcohol are episodically consumed. The authors should construct a table that shows for each component, the percent of participants who consumed the relevant food on both of the 2 days, on only 1 of the 2 days, and on neither of the 2 days. This table is likely to show that foods other than fish are episodically consumed.

Reply:
We agree with the reviewer that all components should be estimated with the same methodology. Therefore, we changed the fish component to the same methodology as the other components. The main argument for this decision was that the index will probably be used on population level. Furthermore, future index users can decide for themselves what dietary assessment method will be used to estimate dietary intake and consequently dietary patterns. The use of the 2-day average had some consequences within this study, such as the wider distribution of the fish component. However, the main associations with micronutrients did not change significantly, except for vitamin B12. When fish was estimated with the NCI method, Vitamin B12, showed an inverse association across quintiles of the DHD-index, the association disappeared after adjustment for energy intake. Vitamin B12, estimated with the 2-day average showed no association. This could be explained by the sources of vitamin B12, which are animal products such as fish.

We constructed a table as suggested to see whether more components were episodically consumed, additionally we listed the information available on usual intake based on the FFQ.

<table>
<thead>
<tr>
<th>Component</th>
<th>On only 1 day</th>
<th>Both days</th>
<th>None day</th>
<th>Non-consumers (data of FFQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>34.5%</td>
<td>47.5%</td>
<td>18.0%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Vegetable</td>
<td>29.9%</td>
<td>65.6%</td>
<td>4.5%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Fiber</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>34.5%</td>
<td>4.8%</td>
<td>60.8%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Trans fat</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>33.0%</td>
<td>14.4%</td>
<td>52.6%</td>
<td>17.3%</td>
</tr>
</tbody>
</table>
Unfortunately, no data was available on the usual intake of fish oil supplements. Only consumption of fish oil supplements on the two recalls days were available.

From this table we can conclude that fish consumption is episodically consumed. Around 17% of the population can be classified as ‘true’ non-consumers according to data of the FPQ. Furthermore, fruit is not consumed on both days by 18% of the population. Alcohol is not consumed on both days by 53% of the population, however 17% are non-consumers identified by the FFQ.

The tables changed by recalculating all results for the index by using the 2-day average for the fish component.

We omitted the following parts:

Methods
“Next, fish was recognized as an episodically consumed food. Consequently, usual fish intake could not be estimated accurately from two 24-hour recalls[27]. Therefore, a statistical method for estimating individual usual intake of episodically consumed foods, named the National Cancer Institute (NCI) method, was applied[27-29]. The reported fish intake of the two 24-hour recalls, the frequency of fish intake from the FFQ and the variables sex, body mass index (BMI) and age were used in the model to estimate individual usual fish intake. The weighted average of the fish fatty acid contents of the top six of fishes consumed in this population was: shrimps, salmon, canned tuna, canned salmon, fish fingers, and codfish. The weighted average was used for conversion of usual fish intake to usual fish fatty acid intake and was estimated to be 0.56 grams EPA and DHA per 100 grams of fish.” (Page 10-11, line 20-7)

Results
“The distribution of the fish component was, as expected, narrower when based on estimated usual fish intakes (SD=0.8) as compared to 2-day average fish intakes (SD=2.4). The mean score was 0.9 points when the fish component was estimated with the use of the NCI method as compared to 1.0 without using the NCI method. Based on the average intake of fish fatty acids a total of 31 (4.1%) participants adhered to the component of fish intake. After estimation of usual intakes, none of the participants achieved to adhere the full score on the component.” (Page 13-14, line 18-2)

Discussion
“A strength of the estimation of the fish component was the use of the NCI method, a method for estimation of usual consumption distributions. This method has been validated and compared with other methods[36, 38, 40, 41]. Furthermore, the covariates included in the model have been shown to improve the estimated intakes[38]. A limitation within the estimation of the usual fish intake was the assumption on the average n-3 fatty acid content of the fish consumed and of the fish oil capsules. These assumptions could have introduced over- or underestimation of the intake. Estimation of usual intake by using the NCI method is not necessary when a food frequency questionnaire (FFQ) is used to assess dietary intake. A FFQ, however, is designed for ranking participants according to their intake and not for estimation of absolute intakes[39]. Moreover, a FFQ cannot be used to estimate the component consumption occasions. The combination of two non-consecutive 24-hour
recalls and a FFQ are therefore the preferred data to estimate the DHD-index, as in this study." (Page 19, line 10-23)

We added a paragraph within the discussion as follows:
“The estimation of the components of the DHD-index was based on the 2-day average of the population. Although, two 24-hour recalls are an acceptable dietary assessment method for assessing dietary intake[36], the estimation of some components could be underestimated by the low frequency of consumption. A FFQ designed to assess usual intake could give better estimates for intake of episodically consumed foods. A FFQ, however, is designed for ranking participants according to their intake and not for estimation of absolute intakes[37]. Moreover, a FFQ cannot be used to estimate the component ADF. More than 2 recall or biomarkers of intake may give better estimates and would be the preferred method for dietary assessment." (Page 18-19, line 20-10)

2) Page 2, line 3--The purpose should state why the index was applied to the survey data. Was it to assess the diet quality of Dutch men and women, aged 19-30, in 2006? Was it to determine whether the diets of Dutch men and this age differed in quality? Was it to determine the relationship between the index scores and nutrient intakes?

Reply:
We added the purpose of applying the index to the survey data to the abstract and to the introduction of the manuscript. The following sentences were changed as follows:

Abstract
“The objective was to develop an index based on the Dutch guidelines for a healthy diet of 2006 that reflects dietary quality and to apply it to the Dutch National Food Consumption Survey (DNFCS) to examine the associations with micronutrient intakes.” (Page 2, line 2-5)

Introduction
“Therefore, we developed a new index, the Dutch Healthy Diet index (DHD-index), based on the Dutch Guidelines for a Healthy Diet of 2006, the official background document[16] and the information provided by de Netherland Nutrition Centre (NNC)[17]. Furthermore, we applied the index to data of the Dutch National Food Consumption Survey of 2003 (DNFCS-2003) to examine the associations with micronutrient intakes. We hypothesized that participants with higher DHD-index scores will have a more nutrient-dense diets and thus higher intakes of vitamins and minerals.” (Page 5-6, line 20-4)

3) Page 2, lines 14-18—These results do not clearly relate to the stated purpose of the study. The purpose, therefore, needs to be clarified.

Reply:
We added the purpose of the study to the introduction (see reply 2).

4) Page 3, line 10—Omit “individual.” In interventions, change does not need to be detected at the individual level. Detecting change at the group level is adequate.
“Indices can be used to measure dietary quality in populations and monitor it over time[7] or measure changes in diets in intervention studies[8].” (Page 4, line 9-11)

5) Page 5, lines 9-10—What is the operational definition of “inconsistency between first and second interview”? People do not eat the same foods every day, so how can an inconsistency be detected? How was underreporting detected and dealt with?

Reply:
General data as birth date and gender were checked on consistency between the first and second recall. Underreporting was detected by the energy ratio (estimated energy intake divided by estimated basal metabolic rate), for this population the energy ratio was 1.38. The energy ratio should be around 1.54, based on the low average physical activity level of this population and literature. The underreporting was, therefore, estimated to be 11%.

We changed the sentences as follows:

“Furthermore, a quality check was done on inconsistencies between first and second interview on general data as birth date. Differences between interviewers, and weeks of data collection were checked by using the estimated energy intake divided by basal metabolic rate. Missing values, false answers and typing errors (that were not in range of possible answers) were changed in the EPICsoft using the original recall data. Underreporting based on the estimated energy intake divided by basal metabolic rate, was observed to be 11%.” (Page 6-7, line 23-7)

6) Page 5, line 16—Please explain how a continuous scoring system facilitates observing the changes in an individual’s diet. This seems unlikely to be true.

Reply:
In an intervention study, focusing on adapting a healthier eating pattern, participants will change some food habits. For example, an index score of 60 at baseline can easily be improved to 70 points by having small changes within the components of interest. In comparison to a dichotomous index, like the HDI, participants have to increase their intake to the advised cut-off values to gain more points. Small improvements within the diet cannot be noted in that situation. Our DHD-index can observe small changes within the diet. This, however, will be dependent on the accuracy of the dietary assessment method used in the study.

We changed the sentence as follows:

“By choosing a continuous scoring system we assume that we can also observe changes within individual diets of intervention studies better than with a dichotomous scoring system.” (Page 7, line 11-13)
7) Page 6, lines 11-13—Please explain how these six types of juice were selected and why others were not counted. Were minimum amounts of folate and vitamin C required?

Reply:
In the population under study 6 juices were consumed that naturally contained folate and vitamin C. No minimum amounts of folate or vitamin C are required. Juices with added folate or vitamin C were excluded.

To elaborate about this in more detail in the manuscript, we changed the sentence as follows:

“*The NNC communicates that a maximum of 100 grams can be replaced by all fruit juices which naturally contain folate and vitamin C.[21]* Based on consumption data of the DNFCS-2003 six types of juice complied with the criterion (orange juice with and without pulp, pineapple juice, berry juice, grapefruit juice and mixed fruit juice) and could be included in the fruit group for a maximum of 100 grams in total.” (Page 8, line 6-12)

8) Page 6, lines 20-21—The guidelines recommend fish and do not state that fish oil capsules may be substituted. The authors cannot, therefore, claim that the index reflects the guidelines. Even though the amount of fish recommended is based on fatty acid content, the following quote from the Dutch guidelines suggests that substituting supplements for food would not be in keeping with their purpose: “The report emphasises that, in the context of diet-related chronic diseases, the focus needs to be on dietary pattern, not on individual foods or food components. The best way to reduce the risk of chronic diseases is to have a diet which is rich in fruit, vegetables, whole-grain cereal products and vegetable oils, which entails the regular consumption of fish and low-fat dairy and meat produce, and which is low in high energy-dense and low nutrient-dense foods, in combination with a physically active lifestyle, moderate alcohol consumption and abstinence from smoking.”

Reply:
The Dutch guidelines for a healthy diet permit the use of fish oils capsules as a substitute for actual fish intake. The background document states “Because fish oil is probably mainly responsible for the protective effect of fish consumption, fish oil capsules and fish oil enriched food products can be an acceptable alternative for people that do not want to consume fish.”

To clarify that fish oil capsules are permitted by the Dutch Health Council we added the following sentence:

“*Fish oil capsules are permitted as substitute for fish consumption by the health council of the Netherlands[22].”* (Page 8, line 20-21)
9) Page 7, line 4—Give the reference for this definition of a consumption occasion.

Reply:
We added the reference for this definition which was based on a food frequency questionnaire designed to investigate dietary factors that are associated with tooth erosion.


10) Page 7, line 16-page 8, line 9—Were the scoring standards applied to the average of the 2-day intakes available for each person; or were they applied to each day, and then the scores of the two days averaged? Because of the truncation of the scores, these two methods of scoring will not yield the same results. Are the guidelines to be met each day or over time? The scoring system should reflect the answer to this question. It appears that the guidelines are to be met over time; that is, they are intended to be daily averages, but it isn’t entirely clear, especially for the CO and alcohol components.

Reply:
The scoring standards were applied to the average of 2-day intakes for all components, except physical activity. We averaged the intake of the two days to get a better estimate of the usual intake. We added the following sentence to clarify this:

“All scores were based on the 2-days average intake.” (Page 9, line 19)

11) Page 7, line 16-page 8, line 1—The values were set at the 85th percentiles of what exactly? Of 2-day average intakes? Of usual (long-term average daily) intakes? Please clarify here that these distributions were the sample distributions.

Reply:
The 85th percentiles of the sample distribution of the 2-day average intakes were used as cut-off values. We changed the sentence as follows:

“The threshold values were determined based on the 85th percentiles of the 2-day average intakes of the sample population.” (Page 10, line 5-6)

12) Page 8, line 16—The NCI method “predicts” usual intake for use in statistical models, but does not “estimate” usual intakes by individuals per se as was done here.

Reply:
See the reply of question 1.
We decided to estimate the fish component without using the NCI method.

13) Page 9, line 1—The conversion factor needs clarification. Does the 100 grams refer to the raw, whole fish; to the edible portion of raw fish; to the whole cooked fish; or to the cooked, edible portion of fish?

Reply:
Because the fish component is now estimated based on the 2-day average the conversion factor is not used anymore.

For some types of fish 100 grams refers to the prepared edible portion of fish and for some to the raw edible portion of fish. This depends on the data as it was coded in the dataset. Of the fish in the top 6 only the fish fingers were raw for calculating the conversion factor.

14) Page 9, line 1—Was the estimated intake of fatty acids from supplements added to the estimates from fish?

Reply:
The estimated intakes of fatty acids from supplements were added to the 2-day average of fish fatty acids. We added the following sentence:

“Fish oil capsules were assumed to contain 200 mg of fish fatty acids per capsule, based on labeling information of the fish oil capsules available in the Netherlands. The fish fatty acids from the capsules were added to the 2-day average intake of EPA and DHA from fish.” (Page 8-9, line 21-1)

15) Page 9, lines 4-6—The more reasonable conclusion to draw from this result would be that the CO guideline is not a useful one to include as a component of the index. Just because something is mentioned in the guidelines, doesn’t necessarily mean it will be useful in an index.

Reply:
We agree that based on this study the component Acidic Drinks and Foods can be omitted from the index. However, based on only one population of 19-30 year old, we do not want to exclude this component from the index. We describe this in the discussion on page 18, line 4-13.

“The average score of the component ADF ranged from 8.9 to 9.9 across quintiles, consequently, the variation of this component was low (SD = 1.8). Therefore this component is not that discriminative in ranking subjects according to their adherence to the guidelines. The component was included in the Dutch guidelines because it is important for the prevention of teeth erosion, what is quite different from the aims for prevention of chronic diseases and nutrient deficiencies of the other recommendations[5]. We advise to adapt or delete the component ADF from the index in future research, if variation in the component appears to be low in other studies as well."

*The name of the component CO changed to ‘acidic drinks and foods (ADF)’ as suggested by reviewer 1
16) Page 9, lines 10-11—Fish intake was estimated differently.

Reply:
See also reply on question 1 and 12.
The estimation of fish intake is changed to the same methodology as was used for
the other components.

17) Page 9, lines 10-11—Were the number of COs also averaged over 2
days? If so, it’s not clear that that would be appropriate, given that one
might assume that the guideline should be met each day and not on
average over time.

Reply:
We choose to average all nutrient and food intakes and number consumption
occasions with Acidic Drinks and Foods’ over 2 days. This is appropriate because the
guideline should be met each day and is therefore comparable to the eight other
guidelines (fruit, vegetable, fish, fiber, trans fat, saturated fat, sodium and alcohol).
We therefore choose to do the analyses the same for all nine components. The tenth
component, physical activity, is an exception because, it should be met per week
instead of per day.
The sentence changed as follows:

“All food and nutrient intakes and number of ADF were averaged over two days
before being used to score individual dietary intakes.” (Page 11, line 17-19)

18) Page 11, lines 1-5—The scoring system for fruit and the results
presented here do not reflect the guideline for fruit, described on page 6,
lines 9-10, which says that up to 100 g of fruit can be replaced with fruit
juices with particular characteristics. If someone had 200 grams of fruit,
including such juices, and at least 100 g of fruit that was not in juice
form, they should get full credit for meeting the fruit guideline.

Reply:
At page 11, lines 1-5 we described the effect of including the maximum of 100 grams
for fruit juices. The results presented in tables 3-5 included the fruit component as
estimated based on the criterion of naturally containing folate and vitamin C. We
changed the sentence as follows:

“When, as part of a sensitivity analysis, fruit intake was estimated excluding the
intake of fruit juices, mean intake decreased by 83.2 grams, and the mean score
changed from 4.6 to 3.7 points.” (Page 13, line 12-17)

19) Page 11, line 16—The exception of the CO component should be
mentioned here.

Reply:
We changed the sentence as follows:
“The DHD-index is capable of ranking participants according to their adherence to the Dutch guidelines for a healthy diet by reflecting variation in the components that constitute the index, except for the component ADF. This component showed a low variation and is consequently not that discriminative in ranking subjects according to their adherence to the guidelines.” (Page 14, line 5-9)

20) Page 11, lines 20-23—This information should be presented in the Introduction.

Reply:
We added the information on the two other documents describing and communicating the guidelines to the introduction section. We added the following sentence:

“Therefore, we developed a new index, the Dutch Healthy Diet index (DHD-index), based on the Dutch guidelines for a healthy diet of 2006, the official background document[16] and information provided by de Netherland Nutrition Centre (NNC)[17]. Furthermore we applied the index to data of the Dutch National Food Consumption Survey of 2003 (DNFCS-2003) to examine the associations with micronutrient intakes.” (Page 5-6, line 20-2)

21) Page 12, lines 11-12—As explained above, the fruit recommendation was not properly reflected in the scoring system. This sentence and the analysis do not capture the fact that more than 100 g of juice could have counted as fruit when juice was included.

Reply:
We did include only a maximum of 100 g of juice in the fruit component. So if someone consumed 200 grams of juice and 80 grams of whole fruit, the total amount of fruit counted would be 180 grams thus that person would not get the maximum score.

22) Page 12, lines 12-14—The study cited does not relate to the findings presented here because the current study does not compare consumers and non-consumers of fruit juice. Furthermore, such a comparison is not very useful because if someone does not consume fruit juice on one particular day, that does not mean he/she never consumes it.

Reply:
We agree with the reviewer and we omitted the study cited.

We omitted the following sentence:
“Furthermore, fruit juice consumers were associated with higher scores on the HEI-2005 compared to the non-juice consumers[30].” (Page 15, line 5-7)

23) Page 13, lines 9-10—This is a low correlation. Please add a citation for the Statement that saturated fatty acids and trans-fatty acids appear
largely in the same foods. If this were true, one would expect the correlation to be higher.

Reply:
The correlation is lower compared to a correlation between intake of trans and saturated fatty acids due to the truncation of the component scores. The spearman correlation between intake of trans fatty acids and saturated fatty acids was 0.38. The DNFCS-2003 was in a population of 19-30 years old, which could lead to a smaller ranges of intake compared to the DNFCS of 2010 in participants of 18-70. In the DNFCS of 2010, the correlation between intake of trans fatty acids and saturated fatty acids was 0.59.

We added the following two citations to the statement:

We added the two reference to the sentence as follows:
“The correlation between the components SFA and TFA was 0.29, which is plausible as these fatty acids appear partly in the same products[16, 33].” (Page 16, line 3-5)

24) Page 13, lines 13-14—Hypotheses should be stated in the Introduction; and results of hypotheses testing should be given in the Results section, not introduced in the Methods section. The purpose of testing this hypothesis should also be stated in the Introduction.

Reply:
After the purpose in the introduction section we added our hypothesis. We added the following sentences:

Introduction:
“We hypothesized that participants with higher DHD-index scores will have a more nutrient-dense diets and thus higher intakes of vitamins and minerals.” (Page 6, line 3-4)

Results:
“For the micronutrients calcium, and vitamin E significant inverse associations across sex specific quintiles of the DHD-index scores were observed (table 5). However, when these intakes were adjusted for reported mean energy intake these associations disappeared. Riboflavin showed an inverse association across quintiles of the DHD-index, after adjustment for energy intake the association changed to a positive association. For the micronutrients folate, iron, magnesium, potassium, thiamin, and vitamin B6, significant positive associations with the DHD-index score were shown for the energy adjusted intakes, but not for the unadjusted intakes. Vitamin C was positively associated across the quintiles both in mg/day and in mg/9.8MJ.” (Page 13, line 3-11)
25) Page 13, line 19—This does not make sense. Should “nutrient” be “nutrient-dense”? 

Reply: 
We agree with the comment and changed the sentence as follows: 

“This latter result indicates that participants in the higher quintiles of the DHD-index have a more nutrient-dense composition of the diet. However, they have a lower absolute intake of these micronutrients, because of the inverse association of energy intake across quintiles of the DHD-index.” (Page 16, line 14-16) 

26) Appendix A—The Dutch Dietary Guidelines are key to understanding the DHD index; therefore, they should be presented in a figure, not as an appendix. 

Reply: 
We agree with this comment. We combined table 1 and the appendix into one table. 

Minor Essential Revisions: 

1) Page 2, line 11—Associations of what? 

Reply: 
We changed the sentence as follows: 

“Each component score increased across the sex-specific quintiles of the DHD-index score.” (Page 2, line 12-13) 

2) Page 2, line 12—The scores, not the index, were grouped into quintiles. 

Reply: 
We changed the sentence as follows: 

“Each component score increased across the sex-specific quintiles of the DHD-index score.” (Page 2, line 12-13) 

3) Page 3, line 6—A priori indexes are not “estimated,” they are created or constructed. 

Reply: 
We replaced the word ‘estimated’ by ‘constructed’. The sentence is as follows: 

“One approach of assessing dietary patterns is to construct an a priori dietary index.” (Page 4, line 6) 

4) Page 3, line 14—The hyphen is missing between “Index” and “2005.” 

Reply: 
We added the hyphen between Index and 2005 and the sentence is as follows: 

“A well-known example of an index is the American Healthy Eating Index-2005 (HEI-2005)[11]” (Page 4, line 13-14)
5) Page 5, line 20—“Consumption occasions” should be “number of consumption occasions per day.”

Reply:
We added the words “number of” before Acidic Drinks and Foods. The sentence changed as follows:
“The components physical activity, vegetable, fruit, fish, and fiber are adequacy components and the components SFA, TFA, number of occasions with acidic drinks and food (ADF), sodium and alcohol are moderation components.” (Page 7, line 15-17)

6) Page 5, line 21—This is the first time “activities” are mentioned. They need to be explained earlier.

Reply:
We added ‘physical’ to clarify the activities undertaken, the sentence is as follows:
“Cut-off values represent the required amount of consumption or physical activities undertaken (minimum for adequacy and maximum for moderation components), whereas the threshold value represents the level of intake or number of occasions that deserves zero points for the moderation components.” (Page 7, line 18-20)

7) Page 7, line 2—“Courses” should be “meals.”

Reply:
We changed the word “courses” to “meals”. The sentence changed as follows:
“The eighth component is based on the maximum recommended number of CO which is seven occasions per day including the three main meals”. (Page 9, line 3-5)

8) Page 8, lines 20-22—This section needs editing. In lines 20-21, omit “The weighted average of the fish fatty acids of,” change “the top six of fishes” to “The top six fish,” and change “was” to “were.” In line 22, after “weighted average,” add “level of fatty acids.”

Reply:
See also reply on question 1 and 12.
We omitted the NCI method in the methods, consequently the conversion factor is not used anymore.

9) Page 9, line 14—This sentence does not make sense. Perhaps “adjusted” should be the beginning of a new sentence that says, “Adjusted intakes are presented as mean nutrient intakes per 9.8 MJ.”

Reply:
We changed the sentences as follows:
“Adjusted intakes are presented as mean nutrient intakes per 9.8 MJ.” (Page 11, line 22-23)

10) Page 9, line 23—The description of the differences in education levels is
unclear.

Reply:
The differences in education levels are explained in table 4 and are as follows:
“low education=primary school, vocational and lower general secondary education. Moderate=higher secondary education and intermediate vocational training. High=higher vocational education and university”

We changed the sentence as follows:

“Furthermore, 26.5% of women were classified as lower educated compared to 18.5% of men” (Page 12, line 8-9)

11) Page 10, line 22—Change “mg/9.8MJ/day” to “mg/9.8 MJ."

Reply:
We changed the sentence as follows:
“Vitamin C was positively associated across the quintiles both in mg/day and in mg/9.8MJ.” (Page 13, line 10-11)

12) Page 10, line 22—9.8 is an odd number. Is this common practice? Why not use 10?

Reply:
We choose for 9.8 MJ because it is the average energy intake of the population under study.

13) Page 11, line 9—Change “without the NCI method” to “using 2-day means.”

Reply:
See also reply on question 1 and 12. We omitted the NCI method in the methods, consequently the sensitivity analysis is not shown anymore.

14) Page 11, line 12—Omit “to adhere.”

Reply:
See also reply on question 1 and 12. We omitted this part of text due to the changes within the methodology.

15) Page 12, line 19—Please clarify by saying, “However, the use of the 85th percentiles of the distributions of the 2-day averages of 19-30-year-olds...”

Reply:
We changed the sentence as follows:
“However, the use of the 85th percentiles of the distribution of the 2-day averages of 19-30-year-olds, the results of the DHD-index cannot be compared with other Dutch subpopulations, as the cut-off values will differ.” (Page 15, line 12-15)
16) Page 12, line 20—Change “between Dutch populations” to “with other Dutch subpopulations.”

Reply:
We changed the sentence as follows:
“However, the use of the 85th percentiles of the distribution of the 2-day averages of 19-30-year-olds, the results of the DHD-index cannot be compared with other Dutch subpopulations, as the cut-off values will differ.” (Page 15, line 12-15)

17) Page 13, line 12—“Weighing” should be “weighting.”

Reply:
We changed the sentence as follows:
“If judged necessary, differential weighting of the components could be applied.” (Page 16, line 7-8)

18) Page 15, line 8—Change “when” to “if.”

Reply:
We changed the sentence as follows:
“We advise to adapt or delete the component ADF from the index in future research, if variation in the component appears to be low in other populations as well.” (Page 18, line 10-13)

19) Page 16, lines 12-13—“Rule” should be “role.”

Reply:
We changed the sentence as follows:
“The sponsor had no role in the conduct of the study; in manuscript conception, statistical analyses, data interpretation, manuscript writing, review or approval of the manuscript.” (Page 20, line 14-16)

20) Table 5, title—Change “participants” to “men and women.”

Reply:
We changed the title of the table as follows:
“Table 5. Means (SD) of selected micronutrients across sex-specific quintiles of DHD-index in 749 Dutch men and women”

Discretionary Revision:

1) A reasonable conclusion to draw from the results shown in Table 5 would be that the DHD index is a good measure of the nutrient density of diets.

Reply:
We agree with the comment. In the following parts we added a sentence.

Abstract
“Furthermore, the index showed to be a good measure of nutrient density of diets.” (Page 3, line 2)

Discussion
“This latter result indicates that participants in the higher quintiles of the DHD-index have a more nutrient-dense composition of the diet. However, they have a lower absolute intake of these micronutrients, because of the inverse association of energy intake across quintiles of the DHD-index.” (Page 16, line 14-18)

Conclusion
“The DHD-index can be used to estimate the adherence to the Dutch Guidelines for a Healthy Diet and is a good measure of nutrient density of diets.” (Page 20, line 3-4)