

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Impact of the Nutri-Score front-of-pack nutrition label on purchasing intentions of individuals with chronic diseases: results of a randomized trial
AUTHORS	Egnell, Manon; Boutron, Isabelle; Péneau, Sandrine; Ducrot, Pauline; Touvier, Mathilde; Galan, Pilar; Fezeu, Léopold; Porcher, Raphaël; Ravaud, Philippe; Hercberg, Serge; Kesse-Guyot, Emmanuelle; Julia, Chantal

VERSION 1 – REVIEW

REVIEWER	Hallman , William K Rutgers The State University of New Jersey, Department of Human Ecology
REVIEW RETURNED	08-Jan-2022

GENERAL COMMENTS	<p>This is an interesting research study designed to address an important topic – the potential effect of including Nutri-Score information on the front of food packages on the purchase of foods by those with nutrition-related chronic diseases. The study found that the nutritional quality of the intended purchases was better (on average) among participants who viewed Nutri-Score information than those who saw Reference Intake information or saw no nutrition information on the front of packages (FoP). The nutritional quality of the intended purchases were not different between the groups who saw Reference Intake or no information on the packages. However, the results indicate that the improved nutritional quality of the intended purchases by those who saw Nutri-Score information did not appear to result from purchasing packaged products with better nutritional profiles, but rather from avoiding some packaged products (including vegetables, dairy and cheese products, starches, and sweets) and purchasing larger amounts of fresh fruit, meat, and water instead. The authors should consider adding this key finding to the abstract. Because none of the raw products were apparently labeled with Nutri-Score or Reference Intake information, the question that might logically be taken up by the authors is why those in the Nutri-Score condition apparently chose to make these substitutions for packaged goods bearing nutrition information. What is it about the letter and color-coded categorical system used by the Nutri-Score scheme that leads some consumers to avoid purchasing packaged products (presumably including some with A-grades) and to purchase fruit, meat, and water (with no letter-grade)? Perhaps the Nutri-Score scheme, which provides an explicit comparative scale simply indicates to consumers that many of the choices they would have ordinarily made (in the absence of Nutri-Score grading) would have been less healthy</p>
-------------------------	--

	<p>than fruit, meat, and water products, which they perceive to be particularly healthy (despite not bearing Nutri-Score grades). The Nutri-Score scheme may simply remind consumers with nutrition-related chronic diseases to follow nutrition advice they may have already received (or think they know) rather than helping them to discriminate among packaged products that may be more or less healthy. In doing so, the Nutri-Score scheme may cue concerns/motivations about eating healthier products overall, without necessarily helping consumers find packaged products that may be better for them.</p> <p>The choice to purchase more fresh fruits, meats, and water (perceived as A-grade products) may also suggest compensatory behaviors designed to offset choosing some C, D, and E-Grade products. It may also be worth noting that in choosing more fresh fruits, meats, and water, (rather than increasing the purchase of vegetables), consumers may also seek to balance the perceived healthiness of their choices with perceived taste/palatability.</p> <p>Of course, all of this is clearly speculative, and the authors did not collect the data necessary to address these possibilities (though they may want to bring them up). However, they may want to comment on whether the increased purchase of fresh fruits, meats, and water, and reductions in vegetables, dairy and cheese products, starches, and sweets was anticipated or are consistent with other studies examining FoP nutrition labeling schemes. Similarly, did they anticipate that the results calculated among those in the Reference Intake group would be no better than those who received no labeling information? Is this finding consistent with other studies?</p> <p>If they collected relevant information, it would also be helpful for the authors to comment on the level of engagement the participants had with the labeling schemes. That is, how do they know that the participants paid any attention to the labels or valued the information provided? Did they find them easy or difficult to use? Did they try to use the Reference Intake information to maximize or to minimize particular nutrients? Did they use the labeling information with the explicit goal of eating healthier overall, or with their particular chronic disease conditions in mind? What caused about half of the participants to fail to complete their shopping-cart task? If this information is not available, the authors may wish to discuss the need for it in future studies.</p> <p>Finally, FoP nutrition information is a hot topic, with an increasing amount of peer-reviewed research appearing regularly. The authors may wish to update their references to include relevant pieces written in the last year (2021).</p> <p>In sum, while the study has several limitations discussed by the authors, the research findings add to the literature and should be accepted with minor revisions.</p>
--	--

REVIEWER	Renteria-Mexia, Ana Instituto Tecnológico de Sonora, Biotechnology and Food Science
REVIEW RETURNED	07-Apr-2022

GENERAL COMMENTS	<p>Thank you for inviting me as a reviewer of this interesting paper, whose aim was to determine the effect of the Nutri-Score on purchasing intentions of individuals suffering from nutrition-related cardiometabolic chronic diseases, compared to the current French labelling situations, i.e. the RIs or no FoPL, as a secondary or primary prevention tool. I consider the paper is well written and it is statistically robust (according to Methods and Results), which makes it worthy to be published.</p>
-------------------------	---

	<p>As a reviewer, I have some suggestions about some issues that could be modified in order to improve the paper, or to have more clarity for readers.</p> <ol style="list-style-type: none"> 1. Author's names do not need to show grades (i.e. PhD). Please check author guidelines to be sure. 2. Row 24. I suggest to write "up to our knowledge" instead of using "has never been assessed" 3. Row 45-47. Conclusions need to be more specific according to the outcomes and findings. For example: The Nutri-Score exhibited a significant higher overall nutritional quality of "purchasing intentions"... and then close with general statements. 4. Please use "purchasing intentions" instead of purchases when applying, since "intention" was the correct measurement. 5. Row 75: "Saturated Fatty Acids" do not need to be in uppercase, but acronym can be. 6. Methods in general and Statistical Analyses are well explained and well accomplished, very clear and according to the aim and the way that results are presented 7. Row 271-273. Intention to treat analysis was accomplish according to Table S1, thus please include the exact name of this analysis either on rows 271-273 or on rows 291-292 (it is a strength). 8. Table 1, N=1,1180, "n" needs to be in lowercase. 9. Row 319-322. Due that authors are showing the Confidence Intervals, then the p values are not needed because are redundant. 10. Table 2. N values, "n" needs to be in lowercase. 11. In table 1 the results (mean± SD) are shown with the symbol ± , and in table 2 the SDs are shown with parenthesis. Please unify criteria in all tables. 12. Table 2. If you are showing Confidence Intervals, then the p value is redundant. 13. Please complete all the corresponding footnotes in all tables. 14. Row 353. Delete "s" in "arms". 15. Row 356-357. If you are showing Confidence Intervals, then the p value is redundant. 16. Row 374-375. Please write "intention-to-be purchased" instead of "purchase", or something similar, but not "purchase". 17. Row 426-428. Please mention as a strength that intention-to-treat analysis was carried out (table S1). 18. Row 431-432. "increase in variance" means a change in variance (before and after), and authors do not carried out a pre-and-post design. A high or wide variance is correct. 19. Please update some references since the most updated are for 2015.
--	--

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1 comments to the author

Dr. William K Hallman , Rutgers The State University of New Jersey

This is an interesting research study designed to address an important topic – the potential effect of including Nutri-Score information on the front of food packages on the purchase of foods by those with nutrition-related chronic diseases.

We thank the reviewer for their overall positive feedback on our manuscript. We are very grateful for the opportunity of revising it and the insightful comments from the reviewers allowed us to strengthen our manuscript. We hope the modifications will be to the reviewers' satisfaction.

The study found that the nutritional quality of the intended purchases was better (on average) among participants who viewed Nutri-Score information than those who saw Reference Intake information or saw no nutrition information on the front of packages (FoP). The nutritional quality of the intended purchases were not different between the groups who saw Reference Intake or no information on the packages. However, the results indicate that the improved nutritional quality of the intended purchases by those who saw Nutri-Score information did not appear to result from purchasing packaged products with better nutritional profiles, but rather from avoiding some packaged products (including vegetables, dairy and cheese products, starches, and sweets) and purchasing larger amounts of fresh fruit, meat, and water instead. The authors should consider adding this key finding to the abstract.

Following this comment, this was added to the abstract, as follows:

Results: The mean (SD) FSAm-NPS score was significantly lower in the Nutri-Score arm (1.29(3.61) points), reflecting a higher overall nutritional quality of purchases/purchasing intentions, compared to the RIs (1.86(3.23) points) and no label (1.92(2.90) points) arms (p -value=0.01). Moreover, the Nutri-Score led to significantly lower content in calories and saturated fatty acids compared to the two other arms. These differences resulted from participants avoiding some packaged products (sweets, dairy and starches) and purchasing larger amounts of fresh fruit and meat.

Because none of the raw products were apparently labeled with Nutri-Score or Reference Intake information, the question that might logically be taken up by the authors is why those in the Nutri-Score condition apparently chose to make these substitutions for packaged goods bearing nutrition information. What is it about the letter and color-coded categorical system used by the Nutri-Score scheme that leads some consumers to avoid purchasing packaged products (presumably including some with A-grades) and to purchase fruit, meat, and water (with no letter-grade)? Perhaps the Nutri-Score scheme, which provides an explicit comparative scale simply indicates to consumers that many of the choices they would have ordinarily made (in the absence of Nutri-Score grading) would have been less healthy than fruit, meat, and water products, which they perceive to be particularly healthy (despite not bearing Nutri-Score grades).

The Nutri-Score scheme may simply remind consumers with nutrition-related chronic diseases to follow nutrition advice they may have already received (or think they know) rather than helping them to discriminate among packaged products that may be more or less healthy. In doing so, the Nutri-Score scheme may cue concerns/motivations about eating healthier products overall, without necessarily helping consumers find packaged products that may be better for them.

The choice to purchase more fresh fruits, meats, and water (perceived as A-grade products) may also suggest compensatory behaviors designed to offset choosing some C, D, and E-Grade products. It may also be worth noting that in choosing more fresh fruits, meats, and water, (rather than increasing the purchase of vegetables), consumers may also seek to balance the perceived healthiness of their choices with perceived taste/palatability.

Of course, all of this is clearly speculative, and the authors did not collect the data necessary to address these possibilities (though they may want to bring them up). However, they may want to comment on whether the increased purchase of fresh fruits, meats, and water, and reductions in vegetables, dairy and cheese products, starches, and sweets was anticipated or are consistent with other studies examining FoP nutrition labeling schemes. Similarly, did they anticipate that the results calculated among those in the Reference Intake group would be no better than those who received no labeling information? Is this finding consistent with other studies?

We thank the reviewer for these comment. These very important and valuable hypotheses have been added to the discussion section, as follows:

When analyses were restricted to labelled items only, no significant difference of the overall nutritional quality between the Nutri-Score and the other arms was found. These results reflect that the use of the Nutri-Score may encourage also substitutions between food categories. Indeed, participants who

were exposed to the Nutri-Score tended to purchase more non-labelled raw products, in particular fruits, meat and poultry, characterized by healthier nutritional quality. This substitution between food categories has been observed in other populations under the same or similar experimental conditions [28,41,42]. Some hypotheses could explain these results. In general, the impact of front-of-pack labelling has been found to vary according the food category [43], partly in relation to consumer motivation [44]. More specifically, the Nutri-Score provides an explicit comparative scale of the nutritional quality of pre-packed foods and may have raised awareness as to the lower nutritional value of some pre-packed products. By comparison, this may have heightened the perceived healthiness fruit or meat products, even in the absence of any labelling. As to beverages, water being the only beverage receiving a 'A' Nutri-Score, its promotion is particularly straightforward in the system. Another hypothesis relates to the overall awareness to the importance of food choices that the presence of the Nutri-Score may have spurred, acting as a global reminder of previously received nutritional education in patients. In doing so, the Nutri-Score scheme may cue concerns/motivations about eating healthier products overall[45]. Finally, the choice to purchase more fresh fruits, meats, and water (perceived as A-grade products) may also suggest compensatory behaviours designed to offset choosing some less healthy products. It may also be worth noting that in choosing more fresh fruits, meats, and water, (rather than increasing the purchase of vegetables), consumers may also seek to balance the perceived healthiness of their choices with perceived taste/palatability. These speculations as to the motivations and goals underlying specific food choices patterns following the introduction of a front-of-pack labelling scheme should be further explored in future studies, to devise efficient strategies to reinforce the observed trends.

If they collected relevant information, it would also be helpful for the authors to comment on the level of engagement the participants had with the labeling schemes. That is, how do they know that the participants paid any attention to the labels or valued the information provided? Did they find them easy or difficult to use? Did they try to use the Reference Intake information to maximize or to minimize particular nutrients? Did they use the labeling information with the explicit goal of eating healthier overall, or with their particular chronic disease conditions in mind? What caused about half of the participants to fail to complete their shopping-cart task? If this information is not available, the authors may wish to discuss the need for it in future studies.

We thank the reviewer for their comment. Indeed, awareness, attention and goals of the participants would provide additional elements to better understand the mechanisms underlying food choices and the potential impact that front-of-pack labelling may have in this situation. Unfortunately, this information was not collected during this experiment.

Following this comment, the discussion section was modified, as follows:

When analyses were restricted to labelled items only, no significant difference of the overall nutritional quality between the Nutri-Score and the other arms was found. These results reflect that the use of the Nutri-Score may encourage also substitutions between food categories. Indeed, participants who were exposed to the Nutri-Score tended to purchase more non-labelled raw products, in particular fruits, meat and poultry, characterized by healthier nutritional quality. This substitution between food categories has been observed in other populations under the same or similar experimental conditions [28,41,42]. Some hypotheses could explain these results. In general, the impact of front-of-pack labelling has been found to vary according the food category [43], partly in relation to consumer motivation [44]. More specifically, the Nutri-Score provides an explicit comparative scale of the nutritional quality of pre-packed foods and may have raised awareness as to the lower nutritional value of some pre-packed products. By comparison, this may have heightened the perceived healthiness fruit or meat products, even in the absence of any labelling. As to beverages, water being the only beverage receiving a 'A' Nutri-Score, its promotion is particularly straightforward in the system. Another hypothesis relates to the overall awareness to the importance of food choices that the presence of the Nutri-Score may have spurred, acting as a global reminder of previously received nutritional education in patients. In doing so, the Nutri-Score scheme may cue concerns/motivations about eating healthier products overall[45]. Finally, the choice to purchase more fresh fruits, meats, and water (perceived as A-grade products) may also suggest compensatory behaviours designed to

offset choosing some less healthy products. It may also be worth noting that in choosing more fresh fruits, meats, and water, (rather than increasing the purchase of vegetables), consumers may also seek to balance the perceived healthiness of their choices with perceived taste/palatability. These speculations as to the motivations and goals underlying specific food choices patterns following the introduction of a front-of-pack labelling scheme should be further explored in future studies, to devise efficient strategies to reinforce the observed trends.

Finally, FoP nutrition information is a hot topic, with an increasing amount of peer-reviewed research appearing regularly. The authors may wish to update their references to include relevant pieces written in the last year (2021).

Following this comment, the reference list has been updated to add studies from 2021 relevant to the topic

In sum, while the study has several limitations discussed by the authors, the research findings add to the literature and should be accepted with minor revisions.

We thank the reviewer for their very positive feedback on our manuscript. We hope that the revised version will be considered acceptable.

Reviewer: 2 comments to the authors

Dr. Ana Renteria-Mexia, Instituto Tecnológico de Sonora

Thank you for inviting me as a reviewer of this interesting paper, whose aim was to determine the effect of the Nutri-Score on purchasing intentions of individuals suffering from nutrition-related cardiometabolic chronic diseases, compared to the current French labelling situations, i.e. the RIs or no FoPL, as a secondary or primary prevention tool. I consider the paper is well written and it is statistically robust (according to Methods and Results), which makes it worthy to be published. We thank the reviewer for their overall positive feedback on our manuscript.

As a reviewer, I have some suggestions about some issues that could be modified in order to improve the paper, or to have more clarity for readers.

We are very thankful for the opportunity of revising the manuscript according to their comments, which helped improve the manuscript considerably. Below is a point-by-point response to their comments, to which we hope to address to their satisfaction.

1. Author's names do not need to show grades (i.e. PhD). Please check author guidelines to be sure.

We thank the reviewer for their comment. We have checked with the editorial guidelines and indeed, titles are not to be included in the authors' list and have been removed

2. Row 24. I suggest to write "up to our knowledge" instead of using "has never been assessed" This has been modified

3. Row 45-47. Conclusions need to be more specific according to the outcomes and findings. For example: The Nutri-Score exhibited a significant higher overall nutritional quality of "purchasing intentions"... and then close with general statements.

Following this comment, the conclusion of the abstract was modified as follows:

Conclusions: The Nutri-Score exhibited a significant higher nutritional quality of purchasing intentions, encouraging appears to encourage healthier food choices among individuals suffering from cardiometabolic chronic diseases, for which an improvement of the dietary quality is often part of the treatment.

4. Please use "purchasing intentions" instead of purchases when applying, since "intention" was the correct measurement.

Following this comment, this has been modified throughout the manuscript

5. Row 75: "Saturated Fatty Acids" do not need to be in uppercase, but acronym can be. This has been modified

6. Methods in general and Statistical Analyses are well explained and well accomplished, very clear and according to the aim and the way that results are presented

We thank the reviewer for their positive feedback on the methods that we used

7. Row 271-273. Intention to treat analysis was accomplished according to Table S1, thus please include the exact name of this analysis either on rows 271-273 or on rows 291-292 (it is a strength).

We thank the reviewer for their comment. Intention to treat analyses were indeed provided through Table S1, and we also attempted to provide estimates of intention to treat results through multiple imputation (Tables S4 and S5), considering that participants that did not finalize the shopping task did not provide any information on the outcome measure that we could have introduced in the models. Following this comment, we have added the 'intention-to-treat' elements of methodology in the methods section and the results section, as follows:

Methods section

Multiple sensitivity analyses were then performed. First, sensitivity analyses were computed (1) including only labelled food products (i.e. pre-packed foods and beverages), (2) excluding participants whose spending amount was below the 5th percentile or over the 95th percentile of the distribution of the cost of the shopping carts in the sample, and (3) using multiple imputations on missing outcomes (25 imputed sets) to consider the non-response rate and thus provide intention-to-treat estimates. Missing primary and secondary outcomes of non-respondents were imputed using the individual characteristics of the individuals, including sociodemographic and nutrition-related lifestyle data collected in the inclusion questionnaire.

Results section

According to the flow diagram, approximately 50% of participants did not complete the virtual shopping task. Individual characteristics between respondents and non-respondents were compared for intention-to-treat analyses and results are displayed in Table S1.

Results of the sensitivity analyses using multiple imputations and providing intention-to-treat estimates are presented in Table S4 for analyses considering all food products and Table S5 for analyses considering only labelled food items. Results using multiple imputations were consistent with the main analyses; however, the amplitude of differences between arms was lower and comparisons were no longer significant, except for calories for which the Nutri-Score also led to lower contents compared to the two other arms (Tables S4 and S5).

8. Table 1, N=1,1180, "n" needs to be in lowercase.

Done

9. Row 319-322. Due that authors are showing the Confidence Intervals, then the p values are not needed because are redundant.

We agree that providing the mean difference and 95% confidence intervals and p values could be seen as redundant. However, we believe that the information these provide are complementary. First, the P-value was provided through Tukey's multiple comparison tests which are somewhat different from the 95% confidence intervals of the mean. Second, while 95% confidence intervals allow for a binary evaluation of significance at the 5% threshold, p values provide exact information, somewhat complementary in terms of the magnitude of the differences observed beyond this threshold. We therefore elected to maintain both estimates, to allow readers to have more complete information on our results.

10. Table 2. N values, "n" needs to be in lowercase.

Done

10. In table 1 the results (mean± SD) are shown with the symbol ± , and in table 2 the SDs are shown with parenthesis. Please unify criteria in all tables.

Done

11. Table 2. If you are showing Confidence Intervals, then the p value is redundant.

Please find response in response to comment #9

12. Please complete all the corresponding footnotes in all tables.

Done

13. Row 353. Delete "s" in "arms".

Done

14. Row 356-357. If you are showing Confidence Intervals, then the p value is redundant. Please find response to this comment in comment #9

15. Row 374-375. Please write "intention-to-be purchased" instead of "purchase", or something similar, but not "purchase".

This had been modified throughout the manuscript

16. Row 426-428. Please mention as a strength that intention-to-treat analysis was carried out (table S1).

Following this comment, the discussion section was modified, as follows:

This controlled experimental environment allowed assessing the effect of the Nutri-Score in standardized conditions and optimizing internal validity of the study. Finally, we provided intention-to-treat analyses of the participants (Table S1) and intention-to-treat estimates through multiple imputation methods.

17. Row 431-432. "increase in variance" means a change in variance (before and after), and authors do not carried out a pre-and-post design. A high or wide variance is correct.

We thank the reviewer for this comment. The term 'increase in variance' referred to the modification observed in variance between the analysis without multiple imputation and with multiple imputation. For clarity, we have modified our wording, as follows:

Moreover, it is important to notice that analyses with multiple imputations led to similar trends but with non-significant differences given the increase of wide variance in the sample.

18. Please update some references since the most updated are for 2015.

According to this comment, references were updated in the text

VERSION 2 – REVIEW

REVIEWER	Renteria-Mexia, Ana Instituto Tecnológico de Sonora, Biotechnology and Food Science
REVIEW RETURNED	15-Jun-2022
GENERAL COMMENTS	The authors did an excellent work with the revisions. There are only two minor typos, one is on page 47 line 79, it seems there is a typo, it says "satty" and should say "fatty". The subtitle Competing interests is repetitive on page 68 and page 69