

The potential of nuts and peanut butter in the prevention of cancer

Citation for published version (APA):

Nieuwenhuis, L. (2021). *The potential of nuts and peanut butter in the prevention of cancer: an epidemiological approach*. [Doctoral Thesis, Maastricht University]. Maastricht University. <https://doi.org/10.26481/dis.20210120ln>

Document status and date:

Published: 01/01/2021

DOI:

[10.26481/dis.20210120ln](https://doi.org/10.26481/dis.20210120ln)

Document Version:

Publisher's PDF, also known as Version of record

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.umlib.nl/taverne-license

Take down policy

If you believe that this document breaches copyright please contact us at:

repository@maastrichtuniversity.nl

providing details and we will investigate your claim.

Impact

Valorization, by definition, is the process of creating value and impact from knowledge, by making knowledge suitable and/or available for economic and societal utilization, and by translating knowledge into new products, services, processes, or business (1). By law, valorization constitutes the third core task of Dutch universities, in addition to research and education. In this addendum, the societal and economic relevance of the results presented in this thesis will be discussed.

From scientific to societal and economic value

Cancer is a huge public health problem worldwide, with approximately 18.1 million incident cancer cases and 9.6 million cancer deaths globally in 2018 (2). The global burden of cancer is expected to rise to 29.5 million new cancer cases and 16.4 million cancer-related deaths by 2040 due to the growth and ageing of the population (3). Because of the high number of cancer cases and deaths and because of the expected rise in these numbers, we cannot treat our way out of the cancer problem (4). Therefore, primary prevention of cancer is of great importance. It has been estimated that approximately 42-50% of all cancers can potentially be prevented by avoiding modifiable risk factors (4, 5). Moreover, in 2010, about 10% of all cancer diagnoses in the Netherlands could be attributed to a suboptimal diet (6). Consequently, society could benefit from nutritional research by incorporating this scientific knowledge into dietary guidelines. In the view of the above, the results presented in this thesis may have an impact in several ways.

In this thesis, we tested a novel hypothesis concerning the potential inverse relation between nut and peanut butter intake and cancer risk. Our study results showed that nut intake is significantly inversely associated with several cancer (sub)types, including esophageal squamous cell carcinoma, gastric non-cardia adenocarcinoma, rectal cancer, small cell lung carcinoma (in men), and ER-negative and ER-negative/PR-negative postmenopausal breast cancer (in women). Most of these cancer types have a poor prognosis, which makes preventive strategies even more important. As described in the Discussion (Chapter 10), the literature on nut and peanut butter consumption in relation to cancer risk is still rather limited. However, the beneficial effects of nut consumption seem to extend beyond their potential cancer-preventive properties and the evidence for an inverse relation between nut consumption and cardiovascular diseases is much stronger. Thus, together with previous and future research findings, our study results could thus jointly result in e.g. dietary recommendations and guidelines.

An example of such dietary guidelines is the World Cancer Research Fund (WCRF) Continuous Update Project (CUP), in which literature on diet and other lifestyle factors in relation to cancer risk and mortality is systematically reviewed. In the third expert report, nuts were mainly included in the category of foods containing dietary fiber (7). In future expert reports of the WCRF CUP, our study results might support recommendations for nut intake as food item. The recommendations in the WCRF CUP enable everyone, from members of the public

to policy makers, to have access to the most recent scientific knowledge on how to prevent cancer development.

Moreover, the Health Council of the Netherlands advises the Dutch authorities on health recommendations. In the Advisory report Dutch dietary guidelines 2015 it was recommended to eat at least 15 grams of unsalted nuts daily (8). This recommendation was based on studies that showed that nut consumption reduces LDL cholesterol and is associated with a reduced risk of coronary heart disease. In future health recommendations of the Health Council, the beneficial effects on cancer risk may be incorporated as well. Based on these dietary recommendations of the Health Council of the Netherlands, the Netherlands Nutrition Center (Voedingscentrum) developed and released their latest food pyramid, called 'the Wheel of Five' or 'De Schijf van Vijf' in Dutch, in 2020 (9). One of the seven recommendations in the Wheel of Five is to eat a handful (25 grams) of unsalted nuts daily. This food pyramid is an easy understandable tool for consumers to improve their eating habits.

Incorporating nuts as part of a healthy diet and lifestyle will hopefully eventually lead to a decrease in morbidity and mortality related to cancer. Decreasing the cancer morbidity and mortality will also lead to a lower economic burden of cancer related to health care costs and productivity losses. Because the beneficial effects of nut intake go beyond cancer and also include, amongst others cardiovascular, respiratory, neurodegenerative, infectious, and kidney diseases (10-15), the societal and economic impact of increasing nut consumption as part of a healthy lifestyle may be even more far-reaching.

Knowledge transfer

The scientific knowledge obtained in this research project has been shared with other experts in this field through publication of our study results in internationally renowned scientific journals. Most articles have been published open access in order to disseminate our results more rapidly and widely. Of the remaining articles that were not published open access, the postprints have been deposited in the open access UM repository PURE. In addition, our articles published until 2019 have been included in two recent meta-analyses (16, 17), which likely reach an even larger audience than the individual reports. Moreover, the results of this research project have been displayed and presented at the Dutch Epidemiological Conference (WEON) in Bilthoven in 2018 and in Groningen in 2019. The audience of this conference mainly consists of epidemiologists. In addition, our study results were also presented at the Society for Social Medicine and Population Health & International Epidemiology Association Joint Scientific Meeting in Cork, Ireland, in 2019. Unfortunately, presentations at congresses in 2020 were cancelled due to the coronavirus pandemic.

Conclusion

In this thesis, we investigated the associations between nut and peanut butter intake and the risk of several cancer (sub)types. The results could be used by researchers, policy

makers, and the public to decrease the risk of several chronic conditions, including several cancer (sub)types. This might be achieved by incorporating the knowledge obtained in this thesis jointly with previous and future studies into dietary guidelines. Eventually, this may also result in lower health care costs and productivity losses. In addition, our results provide new leads for future research that may also contribute to new insights in the field of cancer etiology. In conclusion, our results indicate that nut consumption as part of a healthy diet and lifestyle is a promising strategy in the prevention of several cancer (sub)types.

References

1. van Drooge L, Vandeberg R, Zuijdam F, Mostert B, van der Meulen B, Bruins E. Waardevol: Indicatoren voor Valorisatie Den Haag: Rathenau Instituut; 2011 [Available from: https://www.rathenau.nl/sites/default/files/Rapport_Waardevol_-_Indicatoren_voor_valorisatie.pdf]
2. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2018;68(6):394-424.
3. International Agency for Research on Cancer. Global Cancer Observatory: cancer tomorrow [Available from: <http://gco.iarc.fr/tomorrow/home>]
4. Wild CP, Bucher JR, de Jong BW, Dillner J, von Gertten C, Groopman JD, et al. Translational cancer research: balancing prevention and treatment to combat cancer globally. *J Natl Cancer Inst.* 2015;107(1):353.
5. Islami F, Goding Sauer A, Miller KD, Siegel RL, Fedewa SA, Jacobs EJ, et al. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. *CA Cancer J Clin.* 2018;68(1):31-54.
6. Lanting CI, de Vroome EM, Elias SG, van den Brandt PA, van Leeuwen FE, Kampman E, et al. [Contribution of lifestyle factors to cancer: secondary analysis of Dutch data over 2010 and a projection for 2020]. *Ned Tijdschr Geneeskd.* 2014;159:A8085.
7. World Cancer Research Fund/American Institute for Cancer Research. Continuous Update Project Expert Report 2018. Wholegrains, vegetables, and fruit and the risk of cancers.
8. Health Council of the Netherlands. Dutch dietary guidelines 2015. The Hague: Health Council of the Netherlands; 2015. Report No.: 2015/24E.
9. Brink E, van Rossum C, Postma-Smeets A, Stafleu A, Wolvers D, van Dooren C, et al. Development of healthy and sustainable food-based dietary guidelines for the Netherlands. *Public health nutrition.* 2019;22(13):2419-35.
10. Aune D, Keum N, Giovannucci E, Fadnes LT, Boffetta P, Greenwood DC, et al. Nut consumption and risk of cardiovascular disease, total cancer, all-cause and cause-specific mortality: a systematic review and dose-response meta-analysis of prospective studies. *BMC Med.* 2016;14(1):207.
11. Chen GC, Zhang R, Martinez-Gonzalez MA, Zhang ZL, Bonaccio M, van Dam RM, et al. Nut consumption in relation to all-cause and cause-specific mortality: a meta-analysis 18 prospective studies. *Food Funct.* 2017;8(11):3893-905.
12. Grosso G, Yang J, Marventano S, Micek A, Galvano F, Kales SN. Nut consumption on all-cause, cardiovascular, and cancer mortality risk: a systematic review and meta-analysis of epidemiologic studies. *Am J Clin Nutr.* 2015;101(4):783-93.
13. van den Brandt PA, Schouten LJ. Relationship of tree nut, peanut and peanut butter intake with total and cause-specific mortality: a cohort study and meta-analysis. *Int J Epidemiol.* 2015;44(3):1038-49.
14. Grosso G, Estruch R. Nut consumption and age-related disease. *Maturitas.* 2016;84:11-6.
15. Sabate J, Ang Y. Nuts and health outcomes: new epidemiologic evidence. *Am J Clin Nutr.* 2009;89(5):1643S-8S.
16. Long J, Ji Z, Yuan P, Long T, Liu K, Li J, et al. Nut Consumption and Risk of Cancer: A Meta-analysis of Prospective Studies. *Cancer Epidemiol Biomarkers Prev.* 2020;29(3):565-73.
17. Zhang D, Dai C, Zhou L, Li Y, Liu K, Deng YJ, et al. Meta-analysis of the association between nut consumption and the risks of cancer incidence and cancer-specific mortality. *Aging (Albany NY).* 2020;12.