Fats and oils

No. 2023/02Ee, The Hague, February 7, 2023

Background document to the advisory report:
Dutch dietary guidelines for people with atherosclerotic cardiovascular disease
No. 2023/02e, The Hague, February 7, 2023

Health Council of the Netherlands

Contents

1 Introduction

This background document belongs to the advisory report *Dutch dietary guidelines for people with atherosclerotic cardiovascular disease* (ASCVD).[1] It describes the methodology for the search, selection and evaluation of the literature regarding the relationship between fats and oils consumption and health outcomes in people with ASCVD. It also describes the scientific evidence on this topic and the conclusions that have been drawn by the council's Committee on Nutrition.

1.1 Definition of fats and oils

There are different types of fats and oils. Butter is a dairy product but is more similar to the fats discussed in this background document than to other dairy products. For this reason, butter (including margarine and halvarine) is considered as part of fats in this background document. There are many types of vegetable oils that differ in their fatty acid composition and production methods (e.g., degree of refinement). Oils considered in this background document are, among others, olive oil, sunflower oil, soy oil, canola oil, palm oil, and coconut oil. A detailed description of the different types of fats and oils and their (differences in) composition is included in the background document *Fats and oils* of the *Dutch dietary guidelines 2015* (available in Dutch only).[2]

1.2 Fats and oils recommendation and intake in the Netherlands

The Health Council of the Netherlands included a guideline for fats and oils consumption in the *Dutch dietary guidelines 2015*, which is as follows: 'Replace butter, hard margarines, and cooking fats by soft margarines, liquid cooking fats, and vegetable oils'.[3]

According to the most recent *Dutch National Food Consumption Survey,* the Dutch population consumes on average 22 g/day of fats and oils, and men consume on average more (26 g/day) than women (19 g/day).[4] Specifically, the Dutch population consumes on average 14.9 g/day of margarine and cooking fats, 2.2 g/day of butter, 3.5 g/day of vegetable oils, and 1.6 g/day of other fats and oils.[5]

2 Methodology

2.1 Questions

The Committee aimed to answer the following question: What is the relationship (effect or association) of consumption of fats and oils with health outcomes in people with ASCVD?

2.2 Target group

The target group of the current advisory report is people with ASCVD. The Committee defines this group as people with clinically established coronary heart disease (CHD, consisting of acute coronary syndromes [myocardial infarction and unstable angina], stable angina and revascularisation procedures such as percutaneous coronary intervention [PCI] and coronary artery bypass grafting [CABG]), peripheral arterial disease (PAD) or cerebrovascular disease (consisting of stroke and transient ischemic attack). In the target population, atherosclerosis in the coronary arteries, aorta, iliac and femoral arteries, and cerebral arteries is the main underlying pathological process. Groups with a high risk (but no manifestation) of ASCVD, such as people with hypertension or elevated LDL cholesterol levels, fall outside this definition. Also, the target group of this advice does not include people with heart failure (except when those people also suffer from ASCVD). A detailed description of the target group of this advisory report is provided in the background document *Methodology for the evaluation of the evidence*.[6]

In the present background document, the Committee also considered studies performed in people with cardiovascular disease (CVD) in general (not further specified), under the assumption that the majority of this population will have ASCVD.

2.3 Nutritional topics

The Committee searched for studies into the effects or associations of consumption of fats and oils on or with health outcomes. With respect to RCTs, the Committee followed the approach taken for the *Dutch dietary guidelines 2015* and limited its search to RCTs in which different sources of fat were compared with each other. Thus, in which the focus lies on the replacement of one fat source with another one. Such RCTs were evaluated by the Committee in case (1) there were at least two RCTs available that compared the same fats, and (2) the comparison of fats (food products) was the main goal. Prospective cohort studies were evaluated when there were at least two cohort studies per type of fat or oil.

Multiple RCTs examined the health effects of exposure to different types of fats and oils with the aim to compare types of fatty acids (such as saturated versus mono- or polyunsaturated) with each other or with carbohydrates. Such studies are discussed and evaluated in the background document *Saturated fat substitution.*[7] From such

studies, it is often difficult to abstract sufficient information on the food sources of the fatty acids and/or on the amounts of these food sources that were consumed. Therefore, such studies were not taken into consideration for the evaluation of fats and oils.
There are many RCTs published that aimed to investigate the effects of fish fatty acids on (risk factors for) cardiovascular diseases. Olive oil and sunflower oil are commonly provided to the control groups in such studies. These studies are less relevant when it comes to examining the effects of dietary consumption of olive oil and sunflower oil because the dosages (typically provided in the form of capsules) are usually quite low. Instead, such studies are included and evaluated in the background document *EPA and DHA.*[8]

2.4 Health outcomes

The Committee selected the following health outcomes for this advisory report (further explained in the background document *Methodology for the evaluation of the evidence*[6]):

- short-term surrogate outcomes:
  - body weight
  - systolic blood pressure
  - low-density lipoprotein (LDL) cholesterol
  - estimated glomerular filtration rate (eGFR)
  - glycated haemoglobin (HbA1c) and fasting blood glucose
- long-term health outcomes:
  - all-cause mortality
  - morbidity and/or mortality from total CVD, CHD, stroke (cerebrovascular disease), heart failure, atrial fibrillation, type 2 diabetes, chronic obstructive pulmonary diseases (COPD), total cancer, breast cancer, colorectal cancer, lung cancer, dementia, depression
  - subtypes of CHD, such as myocardial infarction, angina pectoris and revascularisation procedures (i.e., coronary artery bypass surgery and percutaneous coronary intervention)

For cohort studies, the Committee included only studies in the above-described category named long-term health outcomes.

2.5 Selection and evaluation of the literature and drawing conclusions

2.5.1 Search and selection of studies

A detailed description of the approach used by the Committee for selecting and evaluating the scientific literature is provided in the background document *Methodology*

for the evaluation of the evidence.[6] In short, the Committee aimed to base its evaluation of scientific literature on systematic reviews (SRs), including meta-analyses (MAs) and pooled analyses, of randomised controlled trials (RCTs) and/or prospective cohort studies examining the relationship between intake of fats and oils and the above-mentioned health outcomes in people with ASCVD. To identify such publications, the Committee searched PubMed and Scopus in February 2022. This did not yield any publications of use for the Committee's evaluation. Therefore, PubMed and Scopus were additionally searched for individual cohort studies and RCTs in April 2022. The search strategy and steps taken in the selection of the studies are presented in Annex A. In total, 9 RCTs and 4 cohort studies were considered eligible from these searches. Of these, two RCTs were included in the Committees evaluation since these addressed the same oil replacement (refined oil vs (extra) virgin olive oil) and same outcome (LDL cholesterol).[9,10] The remaining RCTs studied canola vs. sunflower oil, coconut oil vs. sunflower oil, corn oil vs. olive oil, fish oil vs. olive oil, Mediterranean diet rich in extra-virgin olive oil vs. low-fat diet, sunflower oil vs. olive oil, and rice bran oil vs. sunflower oil, and were not evaluated by the Committee since there was only one RCT for each comparison.[11-17] Three prospective cohort studies addressed the same oil (olive oil) and were therefore be included in the Committee's evaluation.[18-20] The remaining prospective cohort study addressed palm oil vs. soybean oil and was not included since there was only one prospective cohort study for this comparison.[21]

2.5.2 Drawing conclusions

A detailed description of the approach used for drawing conclusions is provided in the background document *Methodology for the evaluation of the evidence*.[6] In short, the Committee drew conclusions on (the certainty of) the evidence regarding the associations of fats and oils intake with risk of health outcomes in people with (prior) ASCVD, based on the number of studies, number of participants and number of cases that contributed to the evaluation. Also, it took the quality of the studies, in particular the risk of bias, and the heterogeneity between studies into account. The Committee used the decision tree (presented in the background document *Methodology for the evaluation of the evidence*[6]) as a tool to support consistency in drawing conclusions.

3 Effects and associations of fats and oils consumption

In this chapter, the Committee describes the scientific evidence for effects and associations of consumption of fats and oils on and with health outcomes in people with ASCVD.

3.1 RCTs

Table 1 summarises the results and characteristics of individual RCTs that provided evidence regarding the effects of (extra)virgin olive oil vs. refined olive oil consumption on short-term surrogate outcomes in people with ASCVD.

Table 1 Summary of effects of (extra)virgin olive oil versus refined olive oil consumption on short-term surrogate outcomes in people with atherosclerotic cardiovascular disease: RCTs

Aspect	Fitó et al. 2005[9]	Ramirez-Tortosa et al. 1999[10]
Study duration	8 weeks	9 months
Primary disease	CHD	PVD
Number of participants	40	24
Study design	Randomised crossover trial	Randomised crossover trial
Diet of intervention (i) and control (c) group	i: 50 mL/day of VOO c: 50 mL/day of ROO	i: EVOO (for free use) c: ROO (for free use)
Mean difference between i and c (95%CI) and/or p-value for difference between i and c group	For VOO vs ROO: LDL CHOLESTEROL: Mean difference 0.033 mmol/L (95%CI -0.076, 0.142) SYSTOLIC BLOOD PRESSURE[a]: Mean difference -2.53 mmHg (95%CI -3.78, -1.27)	LDL CHOLESTEROL : Mean ± SD in EVOO group: 4.82 ± 0.19 mmol/L Mean ± SD in ROO group: 5.03 ± 0.21 mmol/L P-value >0.05 for difference between i and c group
Study population	People with stable CHD; BMI[c]: 27.5 ±3 kg/m^2; medication use: aspirin (100%), statins (83%), ACE inhibitors (50%), β-blockers (65%), long-acting nitrates (28%), calcium channel antagonists (28%); men (100%); Europe (Spain)	People with PVD; BMI[c]: 24.8 ±1.1 kg/m^2; medication use: NR; men (100%); Europe (Spain)

Abbreviations: ACE: angiotensin converting enzyme; BMI: body mass index; c: control; CI: confidence interval; CHD: coronary heart disease; EVOO: extra-virgin olive oil; i: intervention; LDL: low-density lipoprotein; NR: not reported; PVD: peripheral vascular disease; RCT: randomised controlled trial; ROO:

refined olive oil; SD: standard deviation; VOO: virgin olive oil.
[a] Systolic blood pressure was only assessed in participants with hypertension (n=19)

Conclusion:
There is too little evidence to draw conclusions regarding the effects of replacement of refined olive oil intake with (extra) virgin olive oil intake on LDL cholesterol and systolic blood pressure in people with ASCVD.

The following considerations were made by the Committee, following the steps of the decision tree, to come to this conclusion: There are no MAs of RCTs that addressed the effect of fats and oils consumption on short-term surrogate outcomes. There are two RCTs that reported on the effects of replacement of refined olive oil with (extra) virgin olive oil on LDL cholesterol, and one on systolic blood pressure. These two studies provide too little evidence to draw conclusions on the effects on LDL cholesterol and systolic blood pressure.

Explanation:
Two RCTs were found on replacement of refined with (extra)virgin olive oil, and these provided too little evidence to draw a conclusion. Therefore, these are only described in short.
The study by Fitó et al. (2005)[9] aimed at evaluating the effect of virgin olive oil (VOO) versus refined olive oil (ROO) with differences in their phenolic content (PC) on oxidative stress, blood pressure and lipid profile in 40 males with stable coronary heart disease (CHD). A raw daily dose of 50 mL of VOO (PC: 161 mg/kg) and ROO (PC: 14.67 mg/kg) were sequentially administered over two periods of 3 weeks, preceded by 2-week washout periods in which ROO was used. ROO was provided to the participants. The source of ROO, or whether VOO was also provided to participants, was not mentioned by the authors. There was no significant difference in change in LDL cholesterol between the interventions. In the group of men with hypertension (n=19), systolic blood pressure decreased after VOO intervention (p=0.001) versus ROO. interaction with medical treatments was observed. No notable funding sources of the study were reported. Conflicts of interest of the authors were not reported.

The study by Ramirez-Tortosa et al. (1999)[10] aimed at evaluating the effects of extra-virgin olive oil (EVOO) and refined olive oil (ROO) on plasma lipid and lipoprotein composition and on LDL oxidation susceptibility in 24 men with peripheral vascular disease (PVD). The EVOO and ROO differed in their antioxidant profile (α-tocopherol: 300 vs. 200 mg/kg and phenolic compounds: 800 vs. 60 mg/kg) but not in their fatty acid composition. Both interventions were given for three months, with a three-month wash-out period in between. There was no statistically significant difference in effect on

LDL cholesterol between the two oils. No notable funding sources of the study were reported. Conflicts of interest of the authors were not reported.

3.2 Prospective cohort studies

Table 2 summarises the results and characteristics of prospective cohort studies that provided evidence regarding the associations of olive oil consumption with long-term health outcomes in people with ASCVD.

Table 2 The associations of olive oil consumption with long-term health outcomes in people with ASCVD: prospective cohort studies

Aspect	Barzi et al. 2003[18]	Kouvari et al. 2016[19]	Mozaffarian et al. 2007[20]
Study duration	Max 3.5 years	Max 10 years	Mean 3.2 years
Primary disease	CHD	CHD	CHD
Study design	Individual cohort study (RCT by origin)	Individual cohort study	Individual cohort study (RCT by origin)
Cohort name	GISSI-Prevenzione	GREECS	GISSI-Prevenzione
Exposure	Olive oil consumption. Categorised into never; sometimes; often; regularly.	Olive oil consumption. Categorised into exclusive oil consumption and olive oil and other added fats (olive oil, butter, margarine and vegetable seed oils) consumption.	Olive oil consumption. Categorised into high and low quartiles of intake.
Dietary assessment method	Simple dietary frequency questionnaire at baseline, 6 months, 18 months and 42 months and olive oil intake calculated by cumulative average	Semi-quantitative food frequency questionnaire	Simple dietary frequency questionnaire at baseline, 6 months and 18 months and olive oil intake calculated by cumulative average
Number of participants; number of cases	11246 participants; All-cause mortality: 1660	1918 participants; Acute coronary syndrome[c]: 811	8291 participants; New-onset diabetes: 998

Strength of the association: OR (95%CI) or HR (95%CI)	ALL-CAUSE MORTALITY: Compared to never or sometimes[a]: Often: OR 0.77 (0.63, 0.95) Regularly: OR 0.76 (0.64, 0.91) *P*- linear trend =0.01	ACUTE CORONARY SYNDROME[c]: Non-exclusive olive oil intake vs exclusive olive oil intake[d]: OR 1.40 (1.05, 1.86)	NEW-ONSET DIABETES: High quartiles vs low quartiles of intake: HR 0.78 (0.51, 1.21)
Study population	People who survived a recent (≤3 months) MI; BMI[b]: 26.5 ±3.7 kg/m^2; medication: aspirin (80%), anti-platelet therapy (92%), ACE-inhibitors (47%), β-blockers (44%); men (85%) and women (15%); Europe (Italy)	People with ACS (i.e., AMI or unstable angina); BMI[b]: 27.8 ±5.7 kg/m^2; medication: NR; men (76%) and women (24%); Europe (Greece)	People who survived a recent (≤3 months) MI; BMI[b]: 26.3 ±3.4 kg/m^2; medication: ACE-inhibitors (45%), β-blockers (47%), diuretics (8%), cholesterol-lowering medication (increased from 5% at start of the study to 45% at 3.5 years); men (87%) and women (13%); Europe (Italy)

Abbreviations: ACE: angiotensin converting enzyme; ACS: acute coronary syndrome; AMI: acute myocardial infarction; BMI: body mass index; CHD: coronary heart disease; CI: confidence interval; HR: hazard ratio; MI: myocardial infarction; NR: not reported; OR: odds ratio; RCT: randomised controlled trial.

[a] The reference group was defined as never or sometimes instead of never because there were too few participants in the group never consumers for olive oil.

[b] Mean ± standard deviation.

[c] The endpoint ACS referred to fatal and non-fatal ACS events, including the development of new AMI, angina pectoris, other identified forms of ischemia, heart failure of different types and chronic arrhythmias.

[d] Non-exclusive olive oil intake includes the intake of other added fats such as butter, margarines, and vegetable seed oils.

Conclusion:

There is too little evidence to draw conclusions from cohort studies regarding the associations of olive oil consumption with the risk of all-cause mortality, acute coronary syndrome, and diabetes in people with ASCVD.

The following considerations were made by the Committee, following the steps of the decision tree, to come to this conclusion: There are three prospective cohort studies that addressed the association between olive oil intake and long-term health outcomes in people with ASCVD. Each prospective cohort study addressed a different long-term health outcome, namely all-cause mortality, acute coronary syndrome (ACS), and diabetes. One prospective cohort study per outcome provides too little evidence to draw a conclusion per outcome.

Explanation:
Three prospective cohort studies were found on the association between olive oil and the long-term health outcomes all-cause mortality, ACS, and diabetes, and these provided too little evidence to draw a conclusion for each health outcome. Therefore, these are only described in short, since the three studies provide too little evidence to base conclusions.

Both the studies by Barzi et al. 2003[18] and Mozaffarian et al. 2007[20] performed observational cohort analyses using data from the GISSI-Prevention trial. The studies looked into the associations between olive oil consumption and the incidence of all-cause mortality and new-onset diabetes, respectively. People divided over 172 different centres in Italy were included in the trial when they recently (3 months or less) survived a MI and were followed up for a maximum period of 3.5 years. Dietary information was obtained at baseline and at 6 and 18 months of follow-up in both studies. In the study by Barzi et al. dietary information was additionally obtained at 42 months of follow-up. Olive oil consumption was calculated by a cumulative average, and therefore likely reflects the habitual intake to a large extent (outside the acute phase of the disease). However, the questionnaire used to estimate olive oil consumption was a very concise, non-validated questionnaire into the frequency of consumption of a selection of food items related to the Mediterranean diet. Adjustment for energy intake in the data-analyses was therefore not possible. Adjustments for other potential confounders were considered, including treatment allocation of the original RCT. The study by Barzi et al. showed that consuming olive oil often or regularly compared to no or some intake was associated with a reduced risk of all-cause mortality. The study by Mozaffarian et al. found that people in the high intake quartiles of olive oil of vs. low intake quartiles had a 22% lower risk of new-onset diabetes incidence. However, this association was not statistically significant. No notable funding sources of the study were reported. Conflicts of interest of the authors were not reported.

The study by Kouvari et al. 2016[19] showed that non-exclusive olive oil consumption, relative to exclusive olive oil consumption, was associated with a 40% higher risk of recurrent acute coronary syndrome (ACS) events in people with ACS (i.e., acute myocardial infarction (AMI), or unstable angina). The endpoint recurrent ACS events referred to fatal and non-fatal ACS events, including the development of a new AMI, angina pectoris, other identified forms of ischaemia, heart failure of different types, and arrhythmias. A total of 2172 people were included in the study, of which 1647 reported exclusive olive oil consumption, and 525 reported consumption of olive oil and other added fats (including butter, margarine, and vegetable seed oils used in cooking and/or food preparation). The participants were followed-up for a maximum of 10 years. A validated, semi-quantitative food frequency questionnaire (FFQ) was used to assess usual dietary intake over the year preceding enrolment. The analyses included

adjustments for potential confounding factors, including dietary factors and the presence or family history of several diseases. The authors declared no funding and no conflicts of interest.

3.3 Summary of conclusions

The Committee's conclusions regarding effects and associations of the consumption of fats and oils with health outcomes in people with ASCVD are summarised in Table 3.

Table 3 Overview of conclusions regarding the effects and associations of fats and oils consumption with health outcomes in people with ASCVD

Type of fat/oil	Health outcomes[a]	Type of studies	Conclusion
Replacement of refined olive oil intake with (extra) virgin olive oil	LDL cholesterol, systolic blood pressure	RCTs	Too little research
Olive oil	All-cause mortality, acute coronary syndrome, and diabetes	Cohort studies	Too little research

Abbreviations: LDL: Low-density lipoprotein; RCTs: randomised controlled trials.

[a] The table contains the health outcomes for which (relevant) studies were found. For the health outcomes that are not listed in the table, no (relevant) studies were found.

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Annexes

Annex A Search strategy and study selection

A.1 Search MAs, SRs, pooled studies

PubMed

(“Coronary disease” [MeSH] OR “Acute coronary syndrome” [MeSH] OR “Angina pectoris” [MeSH] OR “Coronary artery disease” [MeSH] OR “Myocardial infarction” [MeSH] OR “Peripheral arterial disease” [MeSH] OR “Intermittent claudication” [MeSH] OR “Stroke” [MeSH] OR “Brain ischemia” [MeSH] OR “Cerebrovascular disorders” [MeSH] OR “Percutaneous coronary intervention” [MeSH] OR “Coronary artery bypass” [MeSH] OR “Coronary disease” [TIAB] OR “Coronary heart disease” [TIAB] OR “Acute coronary syndrome” [TIAB] OR “Angina pectoris” [TIAB] OR “Angina” [TIAB] OR “Ischemic heart disease” [TIAB] OR Ischaemic heart disease [TIAB] OR Coronary artery disease [TIAB] OR “Coronary Arteriosclerosis” [TIAB] OR “Myocardial infarction” [TIAB] OR “Heart attack” [TIAB] OR “Peripheral arterial disease” [TIAB] OR “Peripheral vascular disease” [TIAB] OR “Intermittent claudication” [TIAB] OR “Stroke” [TIAB] OR “Acute stroke” [TIAB] OR “Cerebrovascular Apoplexy” [TIAB] OR “Apoplexy” [TIAB] OR “Ischemic stroke” [TIAB] OR “Ischaemic stroke” [TIAB] OR “Hemorrhagic stroke” [TIAB] OR “Haemorrhagic stroke” [TIAB] OR “Cerebrovascular accident” [TIAB] OR “Acute cerebrovascular accident” [TIAB] OR “Cerebrovascular stroke” [TIAB] OR “Brain vascular accident” [TIAB] OR “Brain ischemia” [TIAB] OR “Cerebral ischemia” [TIAB] OR “Cerebral stroke” [TIAB] OR “Brain accident” [TIAB] OR “Brain infarction” [TIAB] OR “Cerebral infarction” [TIAB] OR “Transient ischemic attack” [TIAB] OR “TIA” [TIAB] OR “Cerebrovascular*” [TIAB] OR “Subarachnoid haemorrhage” [TIAB] OR “Intracerebral hemorrhage” [TIAB] OR “Intracranial hemorrhages” [TIAB] OR “Coronary revascularization” [TIAB] OR “Percutaneous coronary intervention” [TIAB] OR “Coronary artery bypass graft surgery” [TIAB] OR “Percutaneous transluminal coronary angioplasty” [TIAB] OR “Percutaneous transluminal angioplasty” [TIAB] OR “Coronary angioplasty” [TIAB] OR “Atherosclerotic cardiovascular disease” [TIAB] OR “Carotid artery disease” [TIAB] OR “CHD” [TIAB] OR “ACS” [TIAB] OR “IHD” [TIAB] OR “CAD” [TIAB] OR “MI” [TIAB] OR “AMI” [TIAB] OR “PAD” [TIAB] OR “CVA” [TIAB] OR “CVAs” [TIAB] OR “TIA” [TIAB] OR “PCI” [TIAB] OR “CABG” [TIAB] OR “PTCA” [TIAB] OR “PTA” [TIAB] OR “ASCVD” [TIAB])

AND

("Plant Oils"[Mesh] OR "Butter"[Mesh] OR “plant oil*”[tiab] OR butter[tiab] OR margarine[tiab] OR “olive oil”[tiab] OR “palm oil”[tiab] OR “soybean oil”[tiab] OR lard[tiab] OR sunflower[tiab])

AND

(“Systematic review”[publication type] OR “Meta-analysis”[publication type] OR “Review Literature as Topic”[MeSH] OR “review”[TIAB] OR "meta-analysis"[TIAB] OR “meta analysis”[TIAB] OR “metaanalysis”[TIAB] OR “quantitative review”[TIAB] OR “quantitative overview”[TIAB] OR “Systematic Reviews as Topic”[MeSH] OR “systematic review”[TIAB] OR “systematic overview”[TIAB] OR “methodologic review”[TIAB] OR “methodologic overview”[TIAB] OR “individual participant data”[TIAB] OR “individual patient data”[TIAB] OR “IPD”[TIAB] OR “individual-level data”[TIAB] OR “pooled analysis”[TIAB] OR “pooled analyses”[TIAB] OR “multi-center study”[TIAB] OR “multi-cohort study”[TIAB])

From: 2000

Scopus

TITLE-ABS("Coronary disease") OR TITLE-ABS("Acute coronary syndrome") OR TITLE-ABS("Angina pectoris") OR TITLE-ABS("Coronary artery disease") OR TITLE-ABS("Myocardial infarction") OR TITLE-ABS("Peripheral arterial disease") OR TITLE-ABS("Intermittent claudication") OR TITLE-ABS(Stroke) OR TITLE-ABS("Brain ischemia") OR TITLE-ABS("Cerebrovascular disorders") OR TITLE-ABS("Percutaneous coronary intervention") OR TITLE-ABS("Coronary artery bypass") OR TITLE-ABS("Coronary heart disease") OR TITLE-ABS(Angina) OR TITLE-ABS("Ischemic heart disease") OR TITLE-ABS("Ischaemic heart disease") OR TITLE-ABS("Coronary Arteriosclerosis") OR TITLE-ABS("Heart attack") OR TITLE-ABS("Peripheral vascular disease") OR TITLE-ABS("Acute stroke") OR TITLE-ABS("Cerebrovascular Apoplexy") OR TITLE-ABS(Apoplexy) OR TITLE-ABS("Ischemic stroke") OR TITLE-ABS("Ischaemic stroke") OR TITLE-ABS("Hemorrhagic stroke") OR TITLE-ABS("Haemorrhagic stroke") OR TITLE-ABS("Cerebrovascular accident") OR TITLE-ABS("Acute cerebrovascular accident") OR TITLE-ABS("Cerebrovascular stroke") OR TITLE-ABS("Brain vascular accident") OR TITLE-ABS("Brain ischemia") OR TITLE-ABS("Cerebral ischemia") OR TITLE-ABS("Cerebral stroke") OR TITLE-ABS("Brain accident") OR TITLE-ABS("Brain infarction") OR TITLE-ABS("Cerebral infarction") OR TITLE-ABS("Transient ischemic attack") OR TITLE-ABS(TIA) OR TITLE-ABS(Cerebrovascular*) OR TITLE-ABS("Subarachnoid haemorrhage") OR TITLE-ABS("Intracerebral hemorrhage") OR TITLE-ABS("Intracranial hemorrhages") OR TITLE-ABS("Coronary revascularization") OR TITLE-ABS("Percutaneous coronary intervention") OR TITLE-ABS("Coronary artery bypass graft surgery") OR TITLE-ABS("Percutaneous transluminal coronary angioplasty") OR TITLE-ABS("Percutaneous transluminal angioplasty") OR TITLE-ABS("Coronary angioplasty") OR TITLE-ABS("Atherosclerotic cardiovascular disease") OR TITLE-ABS("Carotid artery disease") OR TITLE-ABS(CHD) OR TITLE-ABS(ACS) OR TITLE-ABS(IHD) OR TITLE-ABS(CAD) OR TITLE-ABS(MI) OR TITLE-ABS(AMI)

OR TITLE-ABS(PAD) OR TITLE-ABS(CVA) OR TITLE-ABS(CVAs) OR TITLE-ABS(TIA) OR TITLE-ABS(PCI) OR TITLE-ABS(CABG) OR TITLE-ABS(PTCA) OR TITLE-ABS(PTA) OR TITLE-ABS(ASCVD)

AND

TITLE-ABS(“plant oil”) OR TITLE-ABS(“plant oils”) OR TITLE-ABS(butter) OR TITLE-ABS(margarine) OR TITLE-ABS(margarines) OR TITLE-ABS(“olive oil”) OR TITLE-ABS(“palm oil”) OR TITLE-ABS(“soybeen oil”) OR TITLE-ABS(lard) OR TITLE-ABS(sunflower)

AND

TITLE-ABS("Systematic Review") OR TITLE-ABS(Review) OR TITLE-ABS(Meta-Analysis) OR TITLE-ABS("Meta Analysis") OR TITLE-ABS(metaanalysis) OR TITLE-ABS("quantitative review") OR TITLE-ABS("quantitative overview") OR TITLE-ABS("methodologic review") OR TITLE-ABS("methodologic overview") OR TITLE-ABS("individual participant data") OR TITLE-ABS("individual patient data") OR TITLE-ABS(IPD) OR TITLE-ABS("individual-level data") OR TITLE-ABS("pooled analysis") OR TITLE-ABS("Pooled analyses") OR TITLE-ABS("multi-center study") OR TITLE-ABS("multi-cohort study")

From: 2000

A.2 Search individual RCTs

PubMed
(“Coronary disease” [MeSH] OR “Acute coronary syndrome” [MeSH] OR “Angina pectoris” [MeSH] OR “Coronary artery disease” [MeSH] OR “Myocardial infarction” [MeSH] OR “Peripheral arterial disease” [MeSH] OR “Intermittent claudication” [MeSH] OR “Stroke” [MeSH] OR “Brain ischemia” [MeSH] OR “Cerebrovascular disorders” [MeSH] OR “Percutaneous coronary intervention” [MeSH] OR “Coronary artery bypass” [MeSH] OR “Coronary disease” [TIAB] OR “Coronary heart disease” [TIAB] OR “Acute coronary syndrome” [TIAB] OR “Angina pectoris” [TIAB] OR “Angina” [TIAB] OR “Ischemic heart disease” [TIAB] OR Ischaemic heart disease [TIAB] OR Coronary artery disease [TIAB] OR “Coronary Arteriosclerosis” [TIAB] OR “Myocardial infarction” [TIAB] OR “Heart attack” [TIAB] OR “Peripheral arterial disease” [TIAB] OR “Peripheral vascular disease” [TIAB] OR “Intermittent claudication” [TIAB] OR “Stroke” [TIAB] OR “Acute stroke” [TIAB] OR “Cerebrovascular Apoplexy” [TIAB] OR “Apoplexy” [TIAB] OR “Ischemic stroke” [TIAB] OR “Ischaemic stroke” [TIAB] OR “Hemorrhagic stroke” [TIAB] OR “Haemorrhagic stroke” [TIAB] OR “Cerebrovascular accident” [TIAB] OR “Acute

cerebrovascular accident” [TIAB] OR “Cerebrovascular stroke” [TIAB] OR “Brain vascular accident” [TIAB] OR “Brain ischemia” [TIAB] OR “Cerebral ischemia” [TIAB] OR “Cerebral stroke” [TIAB] OR “Brain accident” [TIAB] OR “Brain infarction” [TIAB] OR “Cerebral infarction” [TIAB] OR “Transient ischemic attack” [TIAB] OR “TIA” [TIAB] OR “Cerebrovascular*” [TIAB] OR “Subarachnoid haemorrhage” [TIAB] OR “Intracerebral hemorrhage” [TIAB] OR “Intracranial hemorrhages” [TIAB] OR “Coronary revascularization” [TIAB] OR “Percutaneous coronary intervention” [TIAB] OR “Coronary artery bypass graft surgery” [TIAB] OR “Percutaneous transluminal coronary angioplasty” [TIAB] OR “Percutaneous transluminal angioplasty” [TIAB] OR “Coronary angioplasty” [TIAB] OR “Atherosclerotic cardiovascular disease” [TIAB] OR “Carotid artery disease” [TIAB] OR “CHD” [TIAB] OR “ACS” [TIAB] OR “IHD” [TIAB] OR “CAD” [TIAB] OR “MI” [TIAB] OR “AMI” [TIAB] OR “PAD” [TIAB] OR “CVA” [TIAB] OR “CVAs” [TIAB] OR “TIA” [TIAB] OR “PCI” [TIAB] OR “CABG” [TIAB] OR “PTCA” [TIAB] OR “PTA” [TIAB] OR “ASCVD” [TIAB])

AND

("Plant Oils"[Mesh] OR "Butter"[Mesh] OR “plant oil*”[tiab] OR butter[tiab] OR margarine[tiab] OR “olive oil”[tiab] OR “palm oil”[tiab] OR “soybean oil”[tiab] OR lard[tiab] OR sunflower[tiab] OR “canola oil” [tiab] OR “rapeseed oil” [tiab] OR “coconut oil” [tiab])

AND

(“Observational study”[publication type] OR "Clinical Trials as Topic"[Mesh] OR "Clinical Trial" [publication type] OR "Cross-Over Studies"[Mesh] OR "Double-Blind Method"[Mesh] OR "Single-Blind Method"[Mesh] OR "Controlled Before-After Studies"[Mesh] OR "Historically Controlled Study"[Mesh] OR randomized[tiab] OR randomised[tiab] OR RCT[tiab] OR controlled*[tiab] OR placebo[tiab] OR clinical trial[tiab] OR trial[tiab] OR intervention[tiab] NOT (cohort studies[MeSH] OR cohort stud*[TIAB] OR longitudinal studies[MeSH] OR longitudinal stud*[TiAB] OR prospective studies[MeSH] OR prospective stud*[TIAB] OR "Systematic Review" [Publication Type] OR "Systematic Reviews as Topic"[Mesh] OR “Review”[Publication Type] OR "Meta-Analysis" [Publication Type] OR "Meta-Analysis as Topic"[Mesh] OR "Network Meta-Analysis"[Mesh] OR "Primary Prevention"[Mesh]))

From: 2014

Scopus

TITLE-ABS("Coronary disease") OR TITLE-ABS("Acute coronary syndrome") OR TITLE-ABS("Angina pectoris") OR TITLE-ABS("Coronary artery disease") OR TITLE-

ABS("Myocardial infarction") OR TITLE-ABS("Peripheral arterial disease") OR TITLE-ABS("Intermittent claudication") OR TITLE-ABS(Stroke) OR TITLE-ABS("Brain ischemia") OR TITLE-ABS("Cerebrovascular disorders") OR TITLE-ABS("Percutaneous coronary intervention") OR TITLE-ABS("Coronary artery bypass") OR TITLE-ABS("Coronary heart disease") OR TITLE-ABS(Angina) OR TITLE-ABS("Ischemic heart disease") OR TITLE-ABS("Ischaemic heart disease") OR TITLE-ABS("Coronary Arteriosclerosis") OR TITLE-ABS("Heart attack") OR TITLE-ABS("Peripheral vascular disease") OR TITLE-ABS("Acute stroke") OR TITLE-ABS("Cerebrovascular Apoplexy") OR TITLE-ABS(Apoplexy) OR TITLE-ABS("Ischemic stroke") OR TITLE-ABS("Ischaemic stroke") OR TITLE-ABS("Hemorrhagic stroke") OR TITLE-ABS("Haemorrhagic stroke") OR TITLE-ABS("Cerebrovascular accident") OR TITLE-ABS("Acute cerebrovascular accident") OR TITLE-ABS("Cerebrovascular stroke") OR TITLE-ABS("Brain vascular accident") OR TITLE-ABS("Brain ischemia") OR TITLE-ABS("Cerebral ischemia") OR TITLE-ABS("Cerebral stroke") OR TITLE-ABS("Brain accident") OR TITLE-ABS("Brain infarction") OR TITLE-ABS("Cerebral infarction") OR TITLE-ABS("Transient ischemic attack") OR TITLE-ABS(TIA) OR TITLE-ABS(Cerebrovascular*) OR TITLE-ABS("Subarachnoid haemorrhage") OR TITLE-ABS("Intracerebral hemorrhage") OR TITLE-ABS("Intracranial hemorrhages") OR TITLE-ABS("Coronary revascularization") OR TITLE-ABS("Percutaneous coronary intervention") OR TITLE-ABS("Coronary artery bypass graft surgery") OR TITLE-ABS("Percutaneous transluminal coronary angioplasty") OR TITLE-ABS("Percutaneous transluminal angioplasty") OR TITLE-ABS("Coronary angioplasty") OR TITLE-ABS("Atherosclerotic cardiovascular disease") OR TITLE-ABS("Carotid artery disease") OR TITLE-ABS(CHD) OR TITLE-ABS(ACS) OR TITLE-ABS(IHD) OR TITLE-ABS(CAD) OR TITLE-ABS(MI) OR TITLE-ABS(AMI) OR TITLE-ABS(PAD) OR TITLE-ABS(CVA) OR TITLE-ABS(CVAs) OR TITLE-ABS(TIA) OR TITLE-ABS(PCI) OR TITLE-ABS(CABG) OR TITLE-ABS(PTCA) OR TITLE-ABS(PTA) OR TITLE-ABS(ASCVD)

AND

TITLE-ABS("Plant Oil*") OR TITLE-ABS(butter) OR TITLE-ABS(margarine) OR TITLE-ABS("olive oil") OR TITLE-ABS("palm oil") OR TITLE-ABS("soybean oil") OR TITLE-ABS(lard) OR TITLE-ABS(sunflower) OR TITLE-ABS("canola oil") OR TITLE-ABS("rapeseed oil") OR TITLE-ABS("coconut oil")

AND

TITLE-ABS-KEY ("Observational study") OR TITLE-ABS-KEY ("Observational studies") OR TITLE-ABS-KEY("Clinical Trial") OR TITLE-ABS-KEY("Cross-Over Studies") OR TITLE-ABS-KEY("Double-Blind Method") OR TITLE-ABS-KEY("Single-Blind Method")

OR TITLE-ABS-KEY("Controlled Before-After Studies") OR TITLE-ABS-KEY("Historically Controlled Study") OR TITLE-ABS(randomized) OR TITLE-ABS(randomised) OR TITLE-ABS(RCT) OR TITLE-ABS(controlled*) OR TITLE-ABS(placebo) OR TITLE-ABS("clinical trial") OR TITLE-ABS(trial) OR TITLE-ABS(intervention) AND NOT TITLE-ABS-KEY ("cohort studies") OR TITLE-ABS-KEY ("cohort study") OR TITLE-ABS-KEY ("longitudinal studies") OR TITLE-ABS-KEY ("longitudinal study") OR TITLE-ABS-KEY ("prospective studies") OR TITLE-ABS-KEY ("prospective study") OR TITLE-ABS-KEY("systematic review") OR TITLE-ABS-KEY(review) OR TITLE-ABS-KEY(Meta-analysis) OR TITLE-ABS-KEY("Network meta-analysis") OR TITLE-ABS-KEY("primary prevention")

From: 2014

A.3 Search individual cohort studies

PubMed

(“Coronary disease” [MeSH] OR “Acute coronary syndrome” [MeSH] OR “Angina pectoris” [MeSH] OR “Coronary artery disease” [MeSH] OR “Myocardial infarction” [MeSH] OR “Peripheral arterial disease” [MeSH] OR “Intermittent claudication” [MeSH] OR “Stroke” [MeSH] OR “Brain ischemia” [MeSH] OR “Cerebrovascular disorders” [MeSH] OR “Percutaneous coronary intervention” [MeSH] OR “Coronary artery bypass” [MeSH] OR “Coronary disease” [TIAB] OR “Coronary heart disease” [TIAB] OR “Acute coronary syndrome” [TIAB] OR “Angina pectoris” [TIAB] OR “Angina” [TIAB] OR “Ischemic heart disease” [TIAB] OR Ischaemic heart disease [TIAB] OR Coronary artery disease [TIAB] OR “Coronary Arteriosclerosis” [TIAB] OR “Myocardial infarction” [TIAB] OR “Heart attack” [TIAB] OR “Peripheral arterial disease” [TIAB] OR “Peripheral vascular disease” [TIAB] OR “Intermittent claudication” [TIAB] OR “Stroke” [TIAB] OR “Acute stroke” [TIAB] OR “Cerebrovascular Apoplexy” [TIAB] OR “Apoplexy” [TIAB] OR “Ischemic stroke” [TIAB] OR “Ischaemic stroke” [TIAB] OR “Hemorrhagic stroke” [TIAB] OR “Haemorrhagic stroke” [TIAB] OR “Cerebrovascular accident” [TIAB] OR “Acute cerebrovascular accident” [TIAB] OR “Cerebrovascular stroke” [TIAB] OR “Brain vascular accident” [TIAB] OR “Brain ischemia” [TIAB] OR “Cerebral ischemia” [TIAB] OR “Cerebral stroke” [TIAB] OR “Brain accident” [TIAB] OR “Brain infarction” [TIAB] OR “Cerebral infarction” [TIAB] OR “Transient ischemic attack” [TIAB] OR “TIA” [TIAB] OR “Cerebrovascular*” [TIAB] OR “Subarachnoid haemorrhage” [TIAB] OR “Intracerebral hemorrhage” [TIAB] OR “Intracranial hemorrhages” [TIAB] OR “Coronary revascularization” [TIAB] OR “Percutaneous coronary intervention” [TIAB] OR “Coronary artery bypass graft surgery” [TIAB] OR “Percutaneous transluminal coronary angioplasty” [TIAB] OR “Percutaneous transluminal angioplasty” [TIAB] OR “Coronary angioplasty” [TIAB] OR “Atherosclerotic cardiovascular disease” [TIAB] OR “Carotid artery disease” [TIAB] OR “CHD” [TIAB] OR “ACS” [TIAB] OR “IHD” [TIAB] OR “CAD”

[TIAB] OR “MI” [TIAB] OR “AMI” [TIAB] OR “PAD” [TIAB] OR “CVA” [TIAB] OR “CVAs” [TIAB] OR “TIA” [TIAB] OR “PCI” [TIAB] OR “CABG” [TIAB] OR “PTCA” [TIAB] OR “PTA” [TIAB] OR “ASCVD” [TIAB])

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AND

(cohort studies[MeSH] OR cohort stud*[TIAB] OR longitudinal studies[MeSH] OR longitudinal stud*[TiAB] OR prospective studies[MeSH] OR prospective stud*[TIAB] OR “Observational study”[publication type] NOT ("Clinical Trials as Topic"[Mesh] OR "Clinical Trial" [publication type] OR "Cross-Over Studies"[Mesh] OR "Double-Blind Method"[Mesh] OR "Single-Blind Method"[Mesh] OR "Controlled Before-After Studies"[Mesh] OR "Historically Controlled Study"[Mesh] OR randomized[tiab] OR randomised[tiab] OR RCT[tiab] OR controlled*[tiab] OR placebo[tiab] OR clinical trial[tiab] OR trial[tiab] OR intervention[tiab] OR "Systematic Review" [Publication Type] OR "Systematic Reviews as Topic"[Mesh] OR “Review”[Publication Type] OR "Meta-Analysis" [Publication Type] OR "Meta-Analysis as Topic"[Mesh] OR "Network Meta-Analysis"[Mesh] OR "Primary Prevention"[Mesh])

From: 2000

Scopus

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AND

TITLE-ABS("Plant Oil*") OR TITLE-ABS(butter) OR TITLE-ABS(margarine) OR TITLE-ABS("olive oil") OR TITLE-ABS("palm oil") OR TITLE-ABS("soybean oil") OR TITLE-ABS(lard) OR TITLE-ABS(sunflower) OR TITLE-ABS("canola oil") OR TITLE-ABS("rapeseed oil") OR TITLE-ABS("coconut oil")

AND

TITLE-ABS-KEY ("cohort studies") OR TITLE-ABS-KEY ("cohort study") OR TITLE-ABS-KEY ("longitudinal studies") OR TITLE-ABS-KEY ("longitudinal study") OR TITLE-ABS-KEY ("prospective studies") OR TITLE-ABS-KEY ("prospective study") OR TITLE-ABS-KEY ("Observational study") OR TITLE-ABS-KEY ("Observational studies") AND NOT TITLE-ABS-KEY("Clinical Trial") OR TITLE-ABS-KEY("Cross-Over Studies") OR TITLE-ABS-KEY("Double-Blind Method") OR TITLE-ABS-KEY("Single-Blind Method") OR TITLE-ABS-KEY("Controlled Before-After Studies") OR TITLE-ABS-KEY("Historically Controlled Study") OR TITLE-ABS(randomized) OR TITLE-ABS(randomised) OR TITLE-ABS(RCT) OR TITLE-ABS(controlled*) OR TITLE-ABS(placebo) OR TITLE-ABS("clinical trial") OR TITLE-ABS(trial) OR TITLE-ABS(intervention) OR TITLE-ABS-KEY("systematic review") OR TITLE-ABS-KEY(review) OR TITLE-ABS-KEY(Meta-analysis) OR TITLE-ABS-KEY("Network meta-analysis") OR TITLE-ABS-KEY("primary prevention")

From: 2000

A.4 Selection of individual RCTs and cohort studies

Step 1. Identification
312 records retrieved:

- PubMed: 150
- Scopus: 125
- Other sources: 37

82 duplicates excluded

Step 2. Screening
230 records screened,
217 records excluded after first selection

Step 3. Eligibility
13 full-texts assessed,
8 records excluded after second selection due to:

- Insufficient number of studies on the same comparison between fats and/or oils: 7
- Different study design: 1

Step 4. Inclusion
5 records included

The Health Council of the Netherlands, established in 1902, is an independent scientific advisory body. Its remit is “to advise the government and Parliament on the current level of knowledge with respect to public health issues and health (services) research...” (Section 22, Health Act).
The Health Council receives most requests for advice from the Ministers of Health, Welfare and Sport, Infrastructure and Water Management, Social Affairs and Employment, and Agriculture, Nature and Food Quality. The Council can publish advisory reports on its own initiative. It usually does this in order to ask attention for developments or trends that are thought to be relevant to government policy.
Most Health Council reports are prepared by multidisciplinary committees of Dutch or, sometimes, foreign experts, appointed in a personal capacity. The reports are available to the public.

This publication can be downloaded from www.healthcouncil.nl.

Preferred citation:
Health Council of the Netherlands. Fats and oils. Background document to Dutch dietary guidelines for people with atherosclerotic cardiovascular disease.
The Hague: Health Council of the Netherlands, 2023; publication no. 2023/02Ee.