

Diesel engine exhaust

Health-based recommended occupational exposure limit

Dutch Expert Committee on Occupational Safety (DECOS)

NVT-CGC afternoon symposium
March 21, 2019, Jolanda Rijnkels

Health Council of the Netherlands



The Health Council



Independent scientific advisory body

Advises ministers and Parliament

Public health and health(care) research

Healthy working conditions

Prevention

Healthy nutrition

Optimum healthcare

Environmental health

Innovation and knowledge infrastructure

Recommending health-based occupational exposure limits

- 1) Evaluating scientific data on exposure-related adverse health effects

- 2) Deriving health-based OELs
 - threshold-based, or
 - risk-based (no threshold): stochastic genotoxic carcinogens

Advice diesel engine exhaust



Part I Evaluation scientific data on adverse health risks

Co-production with the Nordic Expert Group

Published in **2016** (Arbete och Hälsa criteria documentation series)

Part II Recommendation by the DECOS

Health-based calculated occupational cancer risk values (HBC-OCRVs)

Published in **2019** (The Health Council)

Diesel engine exhaust



Exhaust from diesel engines powered by petroleum-diesel fuels

On- and off-road vehicles
Power supply (generators)



transport



scheepsvaart



landbouw

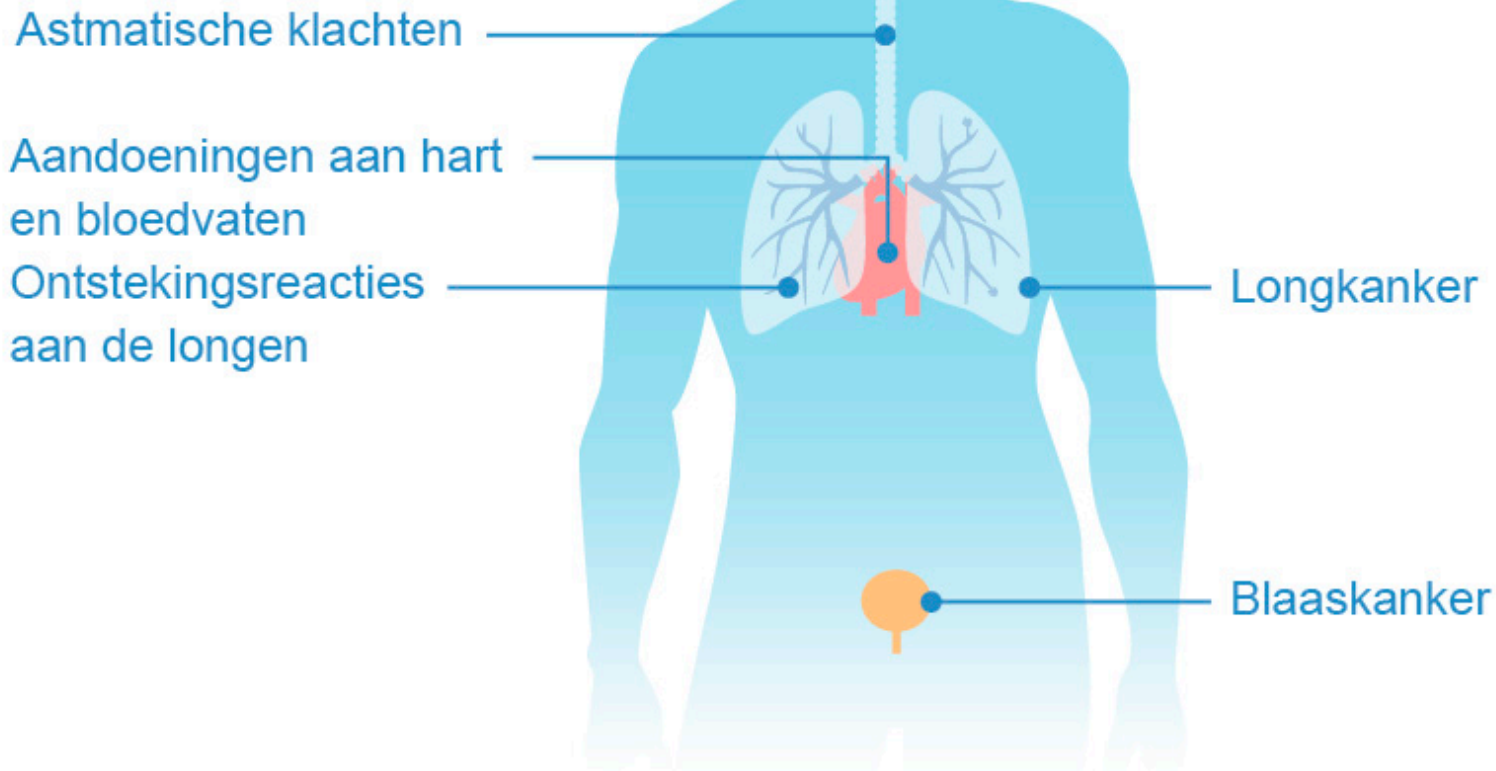


bosbouw

Adverse health effects

Asthma
 Cardiovascular diseases
 Inflammatory reactions in the lungs

Lung cancer
 Bladder cancer



Mortality due to cancer (1)



CMR-List (Ministry Social Affairs and Employment)
Classified as a carcinogenic substance for humans

IARC

- Carcinogenic to humans (Group 1)
- Sufficient evidence in humans and in experimental animals
- Whole diesel exhaust particulate matter

Mortality due to cancer (2)



Particulate matter can cause cancer by stochastic genotoxic mechanism (damages DNA causing mutations)

It is not possible to identify an exposure level at which no cancer at all occurs – any exposure, however low, involves a certain risk of developing cancer

Advice should be risk-based

Risk based approach



Estimation of the concentration of a substance in the air, which corresponds to a predefined risk levels, set by the minister of Social Affairs and Employment

Four extra lung cancer deaths due to occupational exposure, which are added to the number of lung cancer deaths per 100,000 and 10,000 death cases in the general population

Target risk level 4 extra cancer deaths per 100,000

Prohibition risk level 4 extra cancer deaths per 10,000

Over 40 years of occupational exposure

8-Hour time weighted average concentration (8-h TWA)

Key studies (1)



Preferences

Human data above animal experiments

Selection criteria

Data on exposure-response relationship

Quality assessment

Uncertainties on actual historical exposure
Smoking habits
Co-exposure
Healthy worker effect
Former employment
Power of the study

Key studies (2)



Three epidemiological studies

USA

Transport (2) and mining industry (1)

Data on more than 69,000 professional drivers and 12,000 miners

Exposure period 1949 – 2006

Workers divided in exposure groups

Lung cancer death

Meta-analysis?



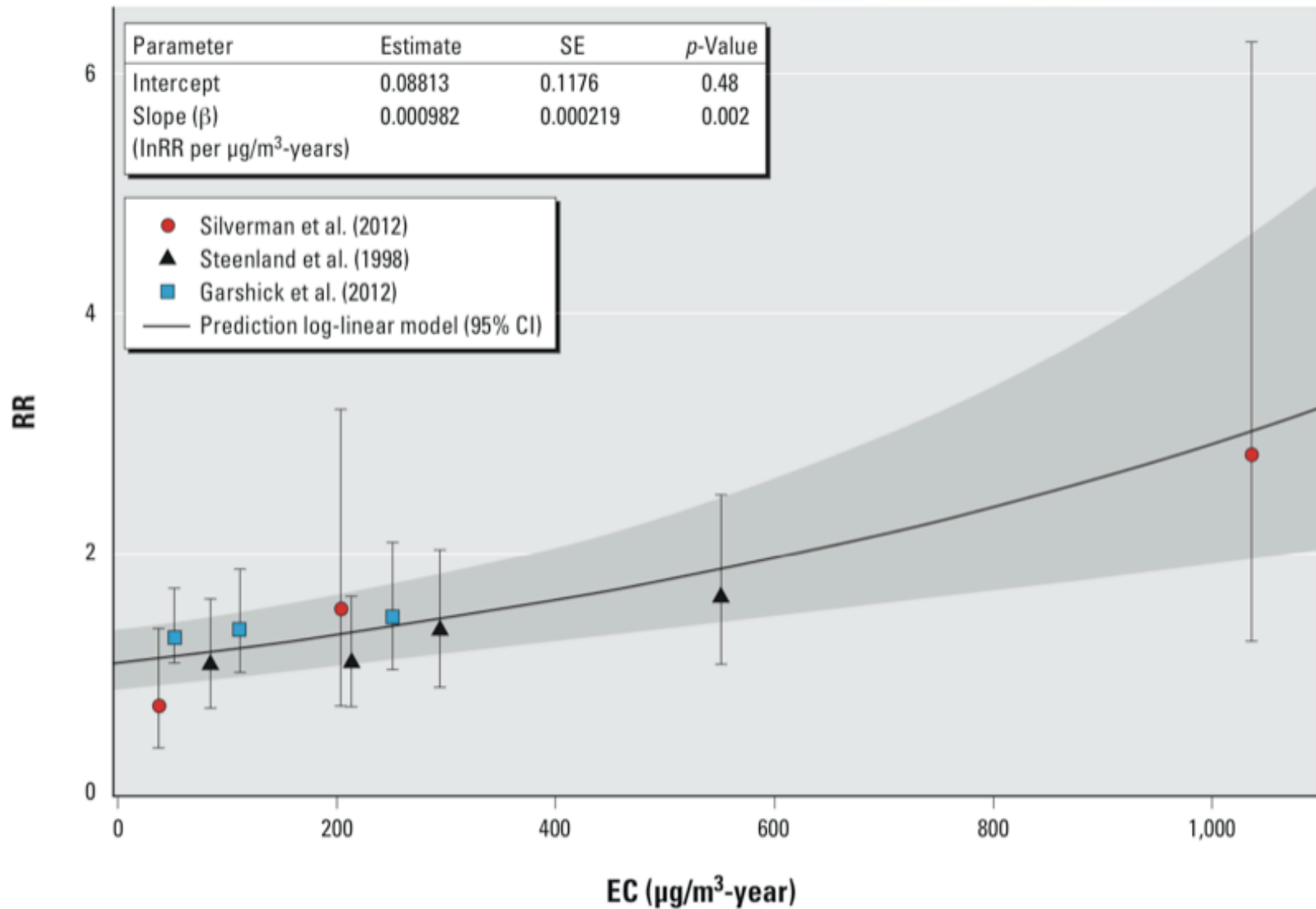
Combining data from different studies in one analysis to obtain a more reliable outcome

Selection Inclusion three selected epidemiological studies
Sensitivity analyses on uncertainties

Choice Meta-analysis by Vermeulen et al. (2014)

Includes the three selected epidemiological studies
Uses data as presented in the original publications

Meta-analysis by Vermeulen et al. (2014)



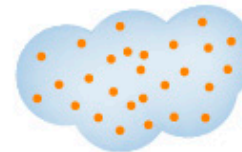
Recommendation

The DECOS estimated that the concentration of *respirable elemental carbon* in the air, which serves as parameter for exposure to exhaust from diesel engines powered by petroleum-based fuels, as follows:

✘ Verbodsrisoniveau
4 per 1.000



*komt overeen
met*



1,03 microgram
per kubieke meter

⊙ Streefrisoniveau
4 per 100.000



0,011 microgram
per kubieke meter

Respirable elemental carbon

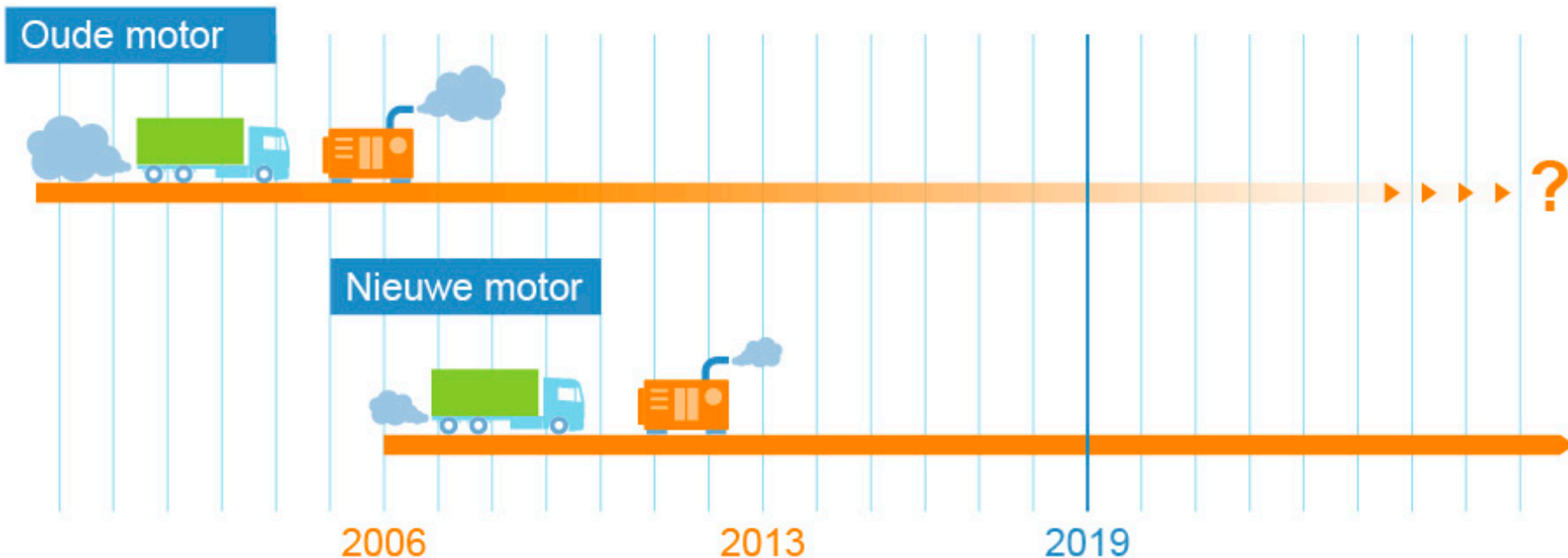


A specific and sensitive marker of exposure to particulate matter in diesel engine exhaust

Is not carcinogenic by itself

Mechanically generated elemental carbon from other sources can be efficiently separated by size-selective sampling techniques

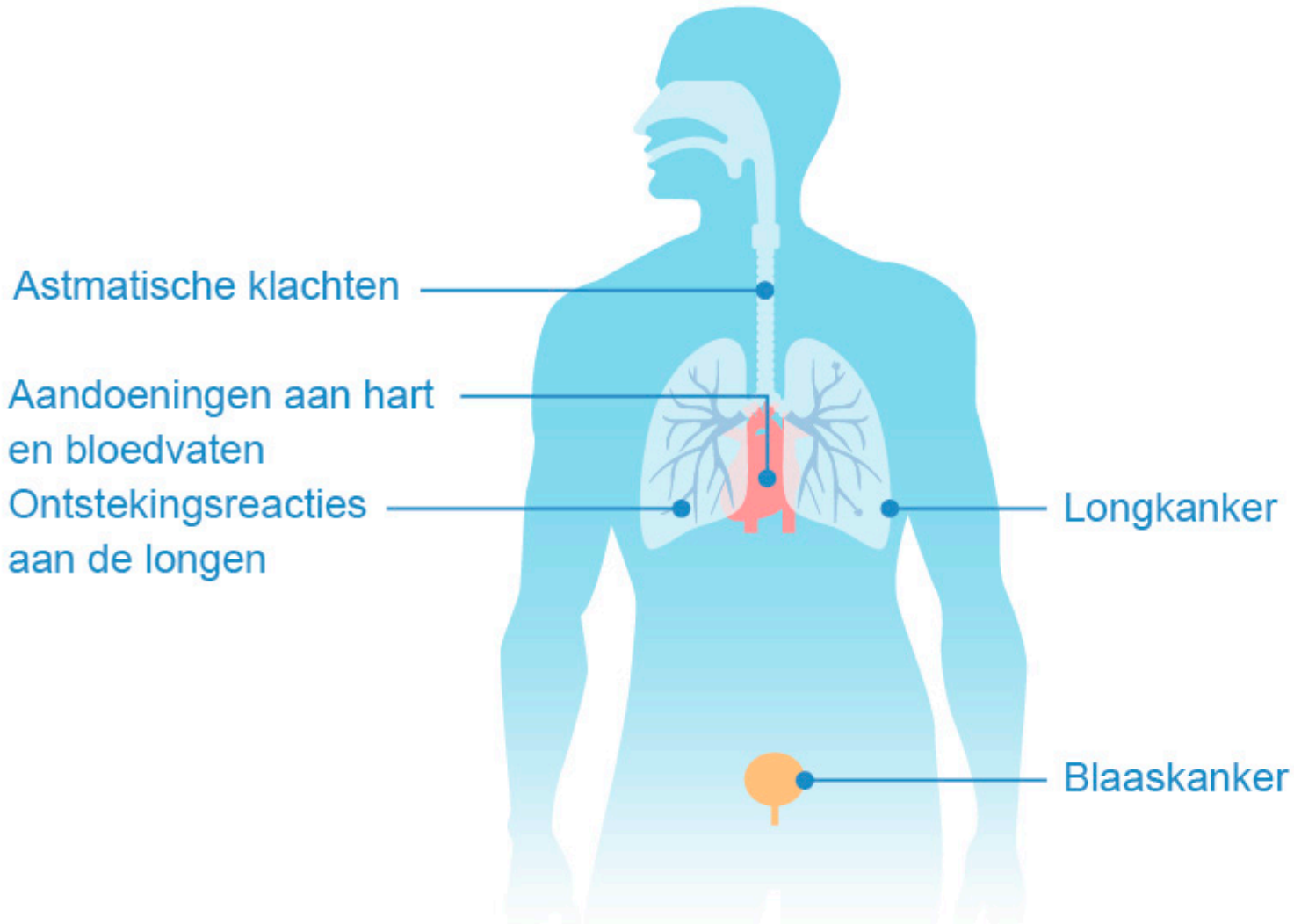
Old and new diesel powered engines?



Periode 2006-2013:

strengere emissienormen voor nieuwe motoren ingevoerd

Protection of other adverse health effects?



On the website of the Health Council



- Advice (in English)
- Summary (in Dutch and English)
- NEG*-DECOS evaluation document (2016) **Nordic Expert Group*
- Infographic
- Request for advice
- Letter of submission to the state secretary of Social Affairs and Employment
- Press announcement
- Comments received on a draft of the advisory report (public consultation)
- Replies by the DECOS on the publicly received comments
- Composition of the DECOS (last page of the advisory report)

www.gezondheidsraad.nl



Gezondheidsraad
Health Council of the Netherlands

www.healthcouncil.nl