

# Health effects of road traffic noise

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Senior researcher

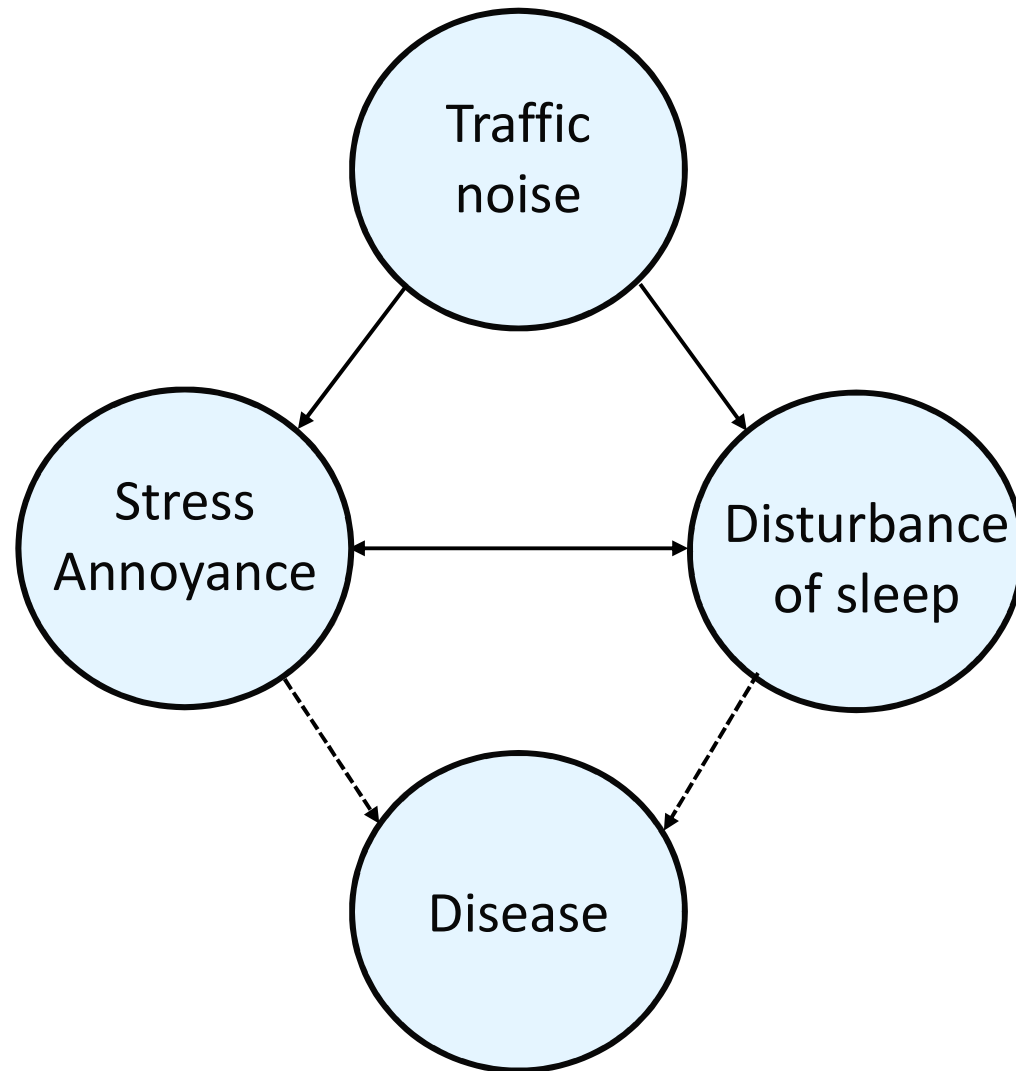
Diet, Genes and Environment

Danish Cancer Society Research Center

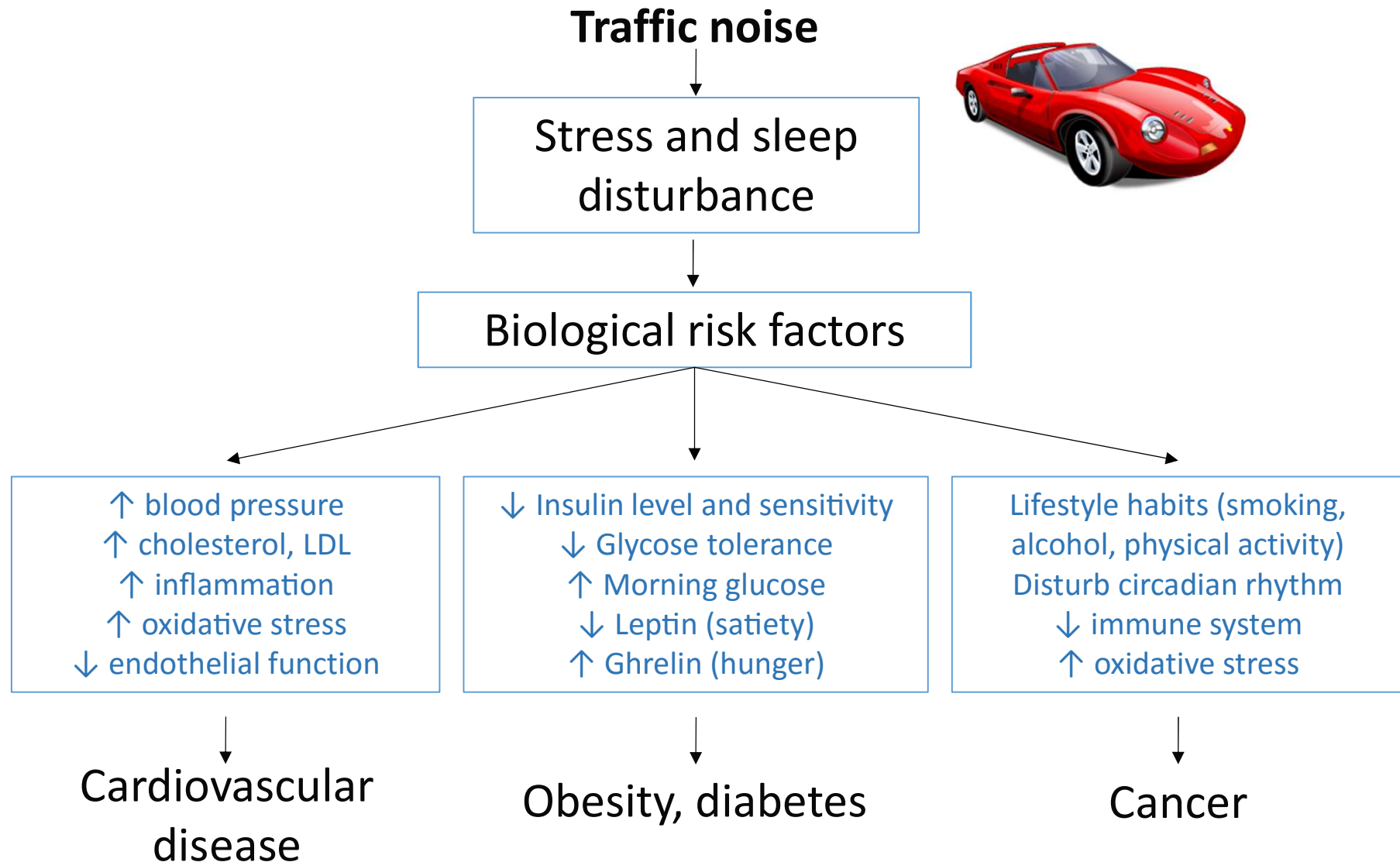
Denmark

# How can noise affect health?

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# Which diseases?



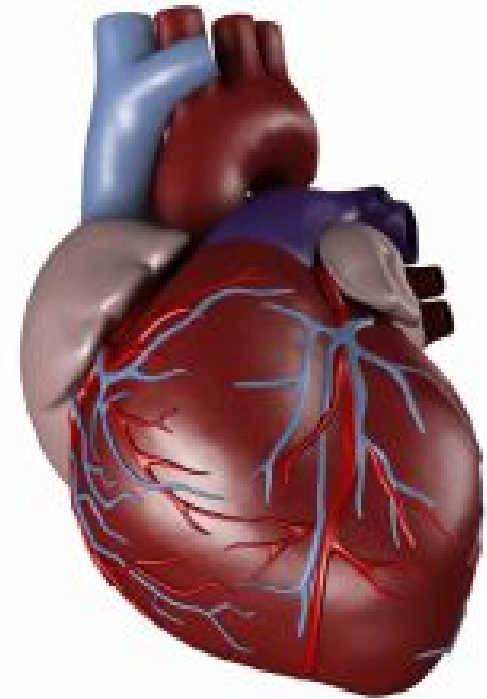
# Traffic noise and CVD

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**Coronary heart disease**

**Hypertension**

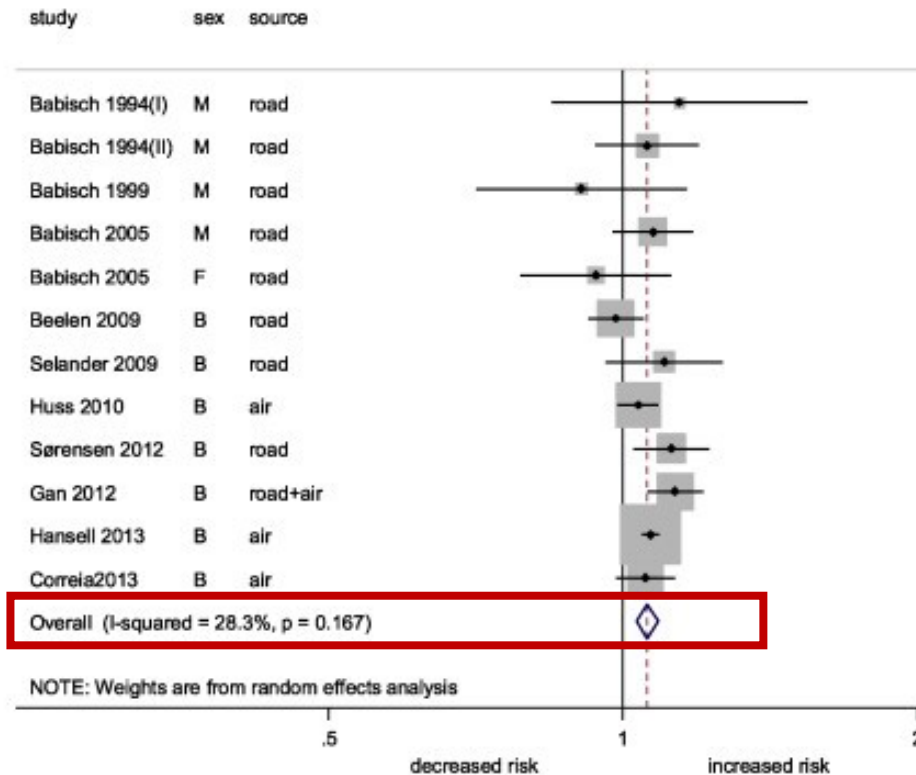
- Many studies
- Evidence is good



# Coronary heart disease

- 10 dB increase ->  
6% increase in risk
- Babisch, road traffic  
noise:  
10 dB increase ->  
8% increase in risk

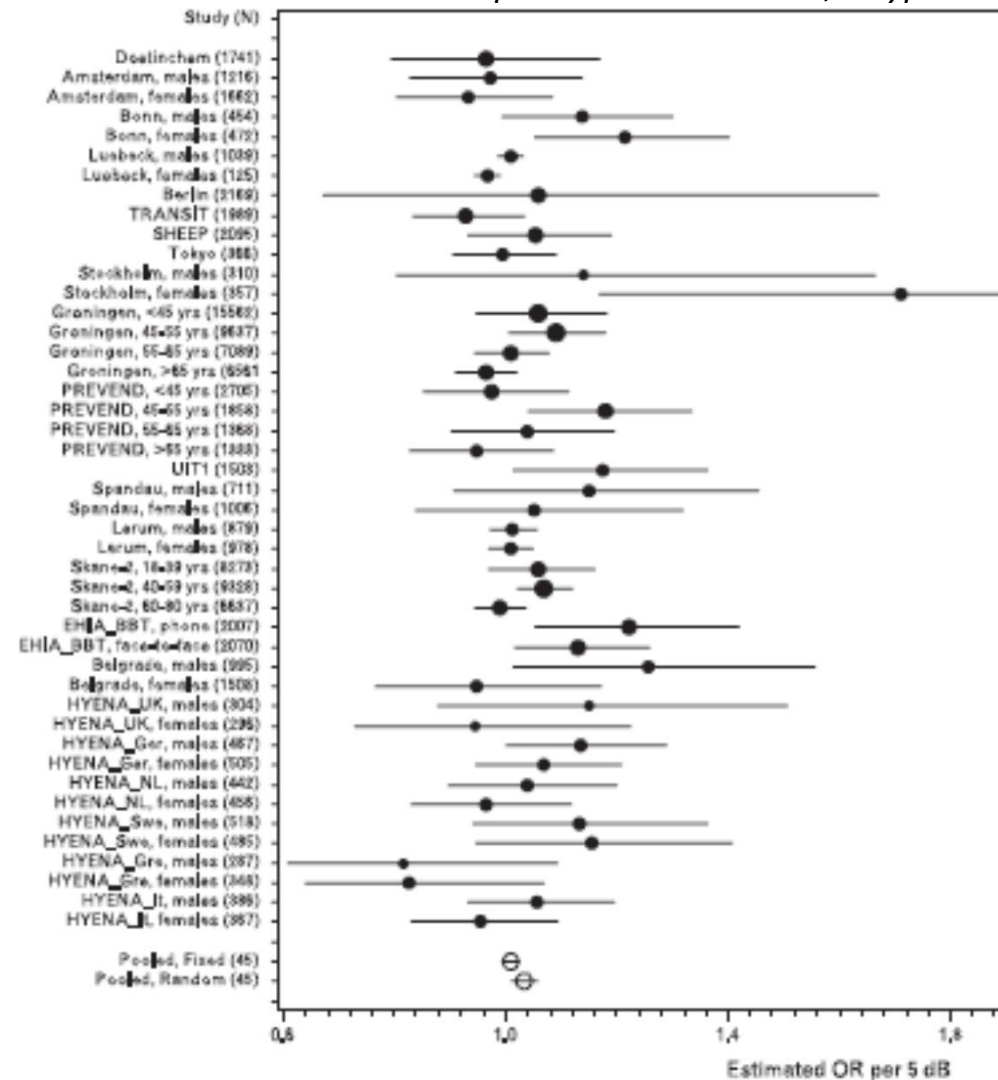
*Vienneau et al, 2015, Environ Res*



# Hypertension

5 dB increase in road  
traffic noise ->  
3.4 % increase in risk

Van Kempen and Babisch 2012, J Hyperten



# Traffic noise and health

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- Coronary heart disease
- Hypertension
- Stroke
- Obesity
- Diabetes
- Cancer



# Study population

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## **Diet, Cancer and Health cohort**

- Enrolment in 1993-1997
- 57,053 persons aged 50-64 years
- Copenhagen and Aarhus
- Questionnaire
  - Lifestyle: e.g. diet, smoking, alcohol
  - SES: e.g. education
- Weight, height and waist circumference measured



# National registries

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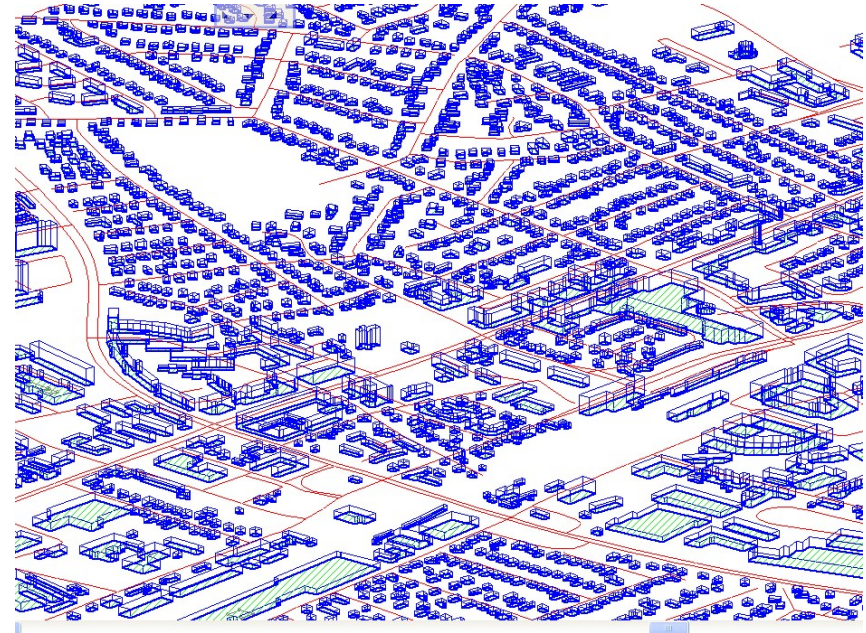
- Central Population Registry (1971)
  - all present and historical addresses from 1987-2011
- The National Patient Registry (1977) - all hospital submissions
- The National Diabetes Registry (1995)
- The Cancer Registry (1942)

# Estimation, road traffic noise

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## SoundPLAN – the Nordic Prediction Method

- Geocode and height (floor) for each address (1987-2011)
- Building polygons
- **All road lines** with > 1000 vehicles
  - Traffic composition (heavy/light)
  - Yearly average daily traffic
  - Traffic speed



*AirGIS – dispersion model for estimation of air pollution*

# Study design

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## **For each disease**

- Estimate traffic noise for cases, e.g. mean 5-years before disease
- Compare with all person without disease

## **Include a number of variables that may blur results**

- Gender
- Socioeconomic status
- Lifestyle (smoking, alcohol, diet)
- Air pollution, other noise sources

# Traffic noise and stroke

*Sørensen et al, 2011*

- 57,000 / 1,881 strokes
- 10 dB rise in road traffic noise -> 11 % increase in risk for stroke (1.04-1.19)

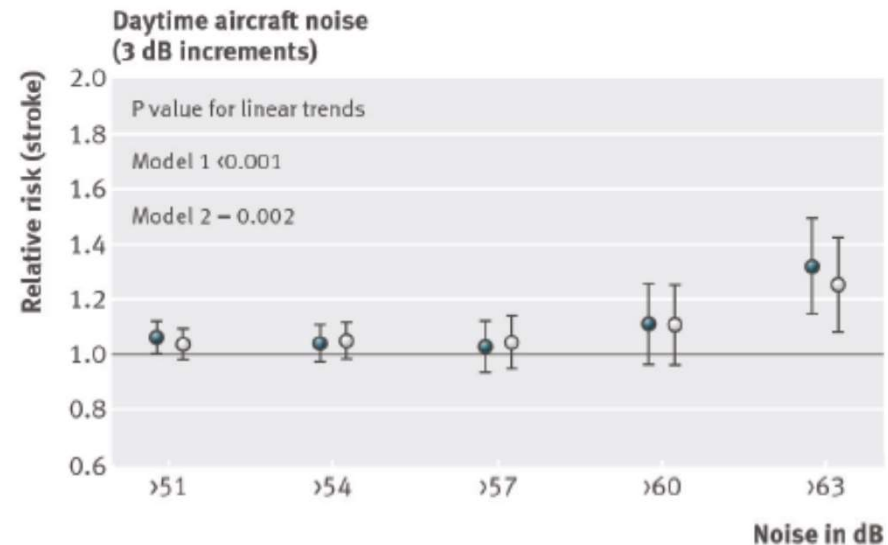
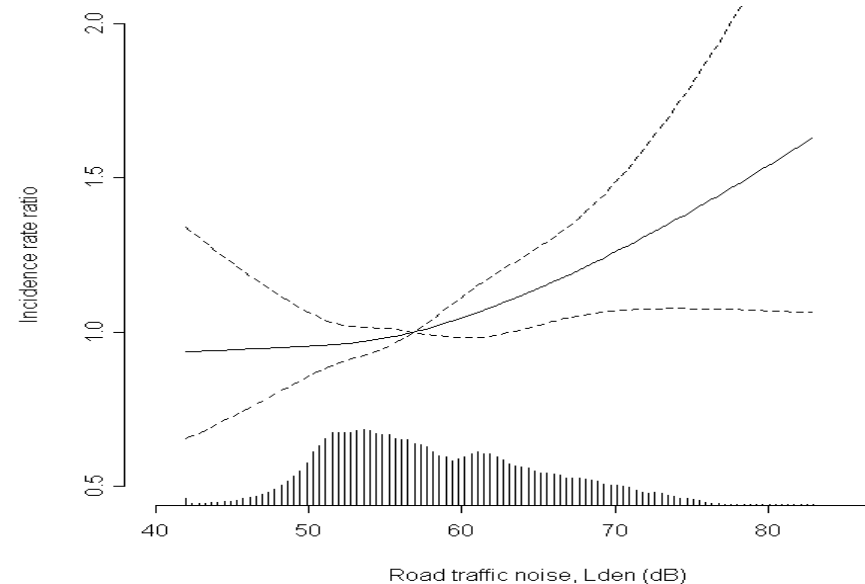
*Two studies from London*

Road: from < 55 decibel to > 60 decibel  
9% increase in risk among elderly

Aircraft: from low (<51) to high (>63)  
24 % increase in risk

*One Swiss study*

10 dB road -> 5 % increase in risk for stroke mortality

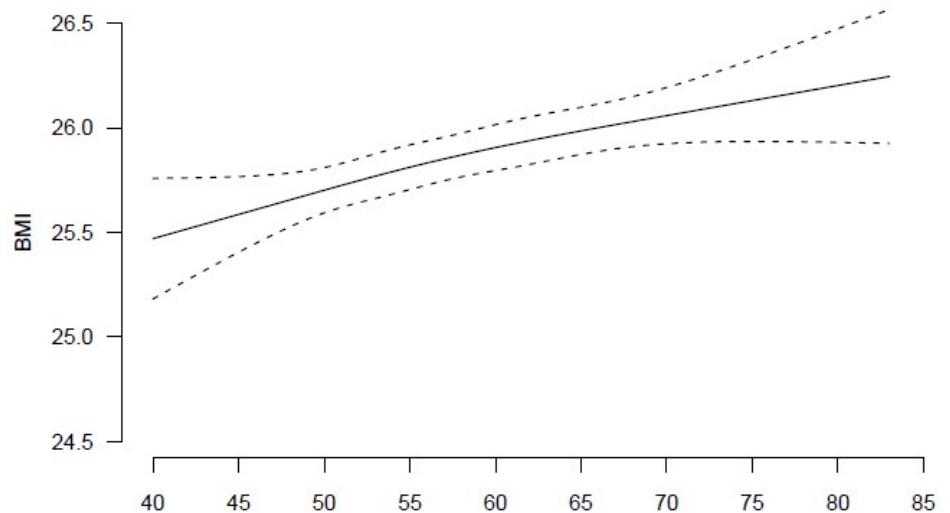


# Traffic noise and obesity

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## Danish studies

- association between traffic noise and obesity in adults
- association between traffic noise and obesity in children



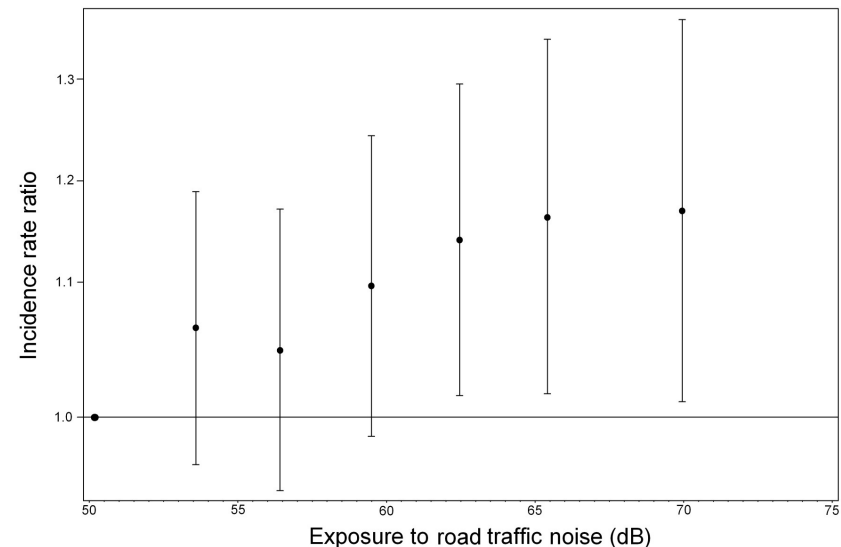
- Two Swedish studies: association between traffic noise (road and aircraft) and obesity (Pyko et al; Eriksson et al)
- One Norwegian study find no association (Ofstedal et al)

# Traffic noise and diabetes

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## Sørensen et al 2013

- 57,000 / 3,869 diabetes cases
- 10 dB rise in road traffic noise (5-years)
  - > 11 % increase in risk (IRR: 1.11 (1.05-1.18))



- New study from Switzerland found similar results (Eze et al, 2017); (10 dB increase risk by 35 %)

# Traffic noise and cancer

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## Breast cancer

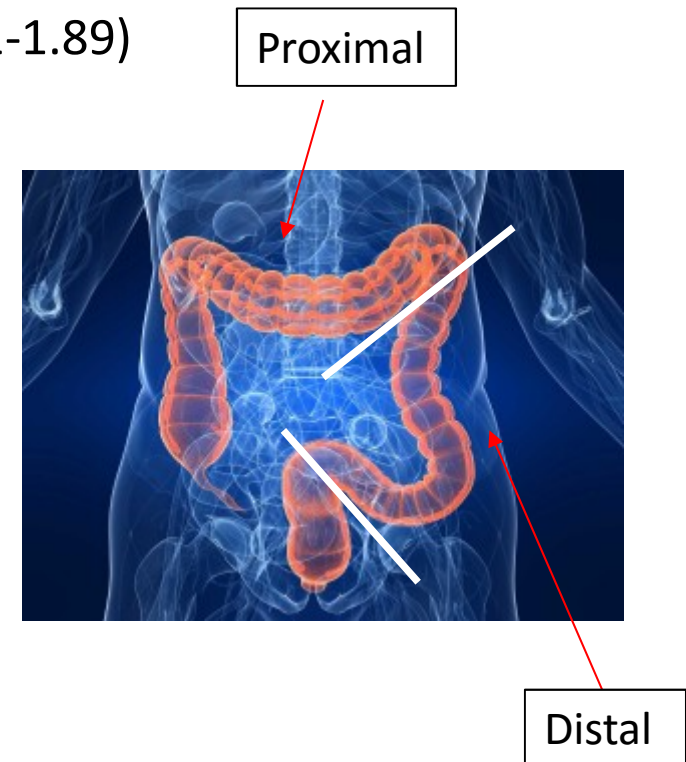
- Estrogen receptor positive: no association
- Estrogen receptor negative:
  - Road: 10 dB increase risk by 23 % (1.00-1.51)
  - Railway: 10 dB increase risk by 38 % (1.01-1.89)

## Colon cancer

- Proximal colon cancer: no association
- Distal colon cancer: 10 dB increases risk by 18 % (1.00-1.40)

## Non-Hodgkin's lymphoma

- Road traffic noise > 65 dB increases risk for NHL with 18 % (1.01-1.37)



# Conclusions

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## Cardiovascular disease

- Association with coronary heart disease
- Probably association with stroke

## Diabetes and obesity

- Possibly associated with diabetes
- Possibly associated with obesity

**MORE STUDIES ARE NEEDED**

Association with cancer uncertain due to very few studies



# European Environment Agency

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## Report: “Noise in Europe, 2014”

- Transportation noise causes each year:
  - at least 10 000 cases of premature death in Europe each year
  - over 900 000 cases of hypertension are caused by environmental noise each year
  - 43 000 hospital admissions in Europe per year



**Based on associations with hypertension, coronary heart disease and stroke**

# Questions?

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