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Annex

Association between transportation noise and cardio-metabolic diseases: an update of the WHO meta-analysis

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List of Annexes

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ANNEX 1: Search strings

Ischemic Heart Disease (IHD)
OVID search – adapted from van Kempen (2018):
1 ((rail* or aircraft or airport* or air traffic*) adj5 noise.tw. *(583)*
2 Aircraft/or Airports/or Railroads/ *(11556)*
3 *Transportation/ *(4897)*
4 (rail* or aircraft or airport* or air traffic.tw. *(12162)*
5 *Noise/ *(11848)*
6 Noise, transportation/ *(1308)*
7 Myocardial ischemia/ *(37143)*
8 exp Cardiovascular diseases/or exp Vascular diseases/or exp Heart diseases/ *(2249892)*
9 (isch?emic heart disease* or coronary heart disease* or angina pectoris or myocard* infarct*or Aircraft/or Airports/or Railroads/cardiovascular disease* or heart disease*).tw. *(155993)*
10 (1 or 2 or (3 and 4)) and (1 or 5 or 6) *(1194)*
11 10 and (7 or 8 or 9) *(95)*
12 11 not child*.ti. *(95)*
13 limit 12 to yr = 2014 || current)) *(31)*

PubMed search – from Vienneau (2015):
("noise exposure" [Title/Abstract] OR "traffic noise" [Title/Abstract] OR "community noise" [Title/Abstract] OR "traffic noise exposure" [Title/Abstract] OR "road traffic noise" [Text Word]   OR "road noise" [Text Word] OR "rail traffic noise" [Text Word] OR "rail noise" [Text Word] OR "rail traffic noise" [Text Word] OR "railway noise" [Text Word] OR "air traffic noise"[Text Word] OR "aircraft noise" [Text Word])
 AND
("etiology"[MeSH Subheading] OR "etiology"[Title/Abstract] OR "etiological"[Title/Abstract] OR "epidemiologic studies"[MeSH Terms] OR "risk factors"[MeSH Terms] OR "case control study"[Title/Abstract] OR "case-control" [Title/Abstract] OR "cohort study"[Title/Abstract] NOT "occupational" [Title/Abstract] NOT "industrial" [Title/Abstract])
 AND
("incidence" [Title/Abstract] OR "mortality" [Title/Abstract] OR "risk" [Title/Abstract] NOT "prevalence" [Title/Abstract])
AND
("myocardial infarction" [Title/Abstract] OR "MI" [Title/Abstract] OR "ischemic heart disease" [Title/Abstract] OR "IHD" [Title/Abstract] OR "cardiovascular" [Title/Abstract] OR "coronary heart disease" [Title/Abstract])

Diabetes
OVID Search – adapted from van Kempen (2018):
1 ((rail* or aircraft or airport* or road* or traffic* or automobile* or vehicle*) adj5 noise.tw. *(1476)*
2 exp *Transportation/ *(44457)*
3 Aircraft/or Airports/or Railroads/or Motor Vehicles/ *(15981)*
4 *Noise/ *(11918)*
5 Noise, transportation/ *(1326)*
6 (1 or 2 or 3) and (1 or 4 or 5) *(2356)*
7 exp Cerebrovascular disorders/ *(344314)*
8 exp Diabetes Mellitus/ *(399111)*
9 exp Obesity/or exp Overweight/or exp Body Mass Index/ *(269741)*
10 (stroke or cerebrovascular* or cva or brain vascular accident* or brain vascular disorder*).tw. *(220621)*
11 (diabetes or obesit* or overweight or bmi or body mass index).tw. *(665216)*
12 7 or 8 or 9 or 10 or 11 *(863313)*
13 6 and 12 *(97)*
14 13 not child*.ti. *(93)*
15 limit 14 to yr = 2014 || current)) *(55)*

ANNEX 2: Characteristics of the included studies

Location	Citation	Status	Noise source	Noise data	Original metric	Outcome	Age at baseline	Sex	design	Linear estimation derived	Adj. other noise sources	Adj. air pollution
IHD												
Berlin I, DE	Babisch 1994	in start MA	road	Map	Lday	MI	41-70	M	case control	yes	-	-
Berlin II, DE	Babisch 1994	in start MA	road	Map	Lday	MI	31-70	M	case control	yes	-	-
Caerphilly & Speedwell, UK	Babisch 1999	in start MA	road	Map+measures	Lday	IHD	45-63	M	cohort	yes	-	-
Berlin III, DE	Babisch 2005	in start MA	road	Model	Lday	MI	20-69	M+F	case control	yes	rail, air, occupation	-
Stockholm County, SE	Selander 2009	in start MA	road	Model	LAeq,24h	MI	45-70	B	case control	yes	occupation	NO2
London Heathrow	Hansell 2013	in start MA	air	Model	Lday	IHD	All ages	B	small area	yes	-	PM10
USA	Correia2013	in start MA	air	Model	Ldn	IHD	65+	B	small area	-	-	PM2.5
London, UK	Halonen 2015	new study	road	Model	Lnight	IHD	25+	B	small area	-	-	PM2.5
Skåne, SE	Boden 2016	new study	road	Model	Lden	MI (inc+mort)	18-80	B	cohort	-	-	NOx
Rhine-Main, DE	Seidler 2016	new study	road, air, rail	Model	LAeq,24h	MI (inc+mort)	40+	B	case control	-	-	-
Norway & UK	Cai 2018	new study	road	Model	Lden	IHD	52.9 (10.6)	B	cohort	-	-	NO2
Denmark	Roswall 2017	replacement	road, rail	Model	Lden	MI	57.5 mean	B	cohort	yes for rail	multipollutant	NO2
Athens, GR	Dimakopoulou 2017	new study	road, air	Model	LAeq,24h	MI	58 (9.1)	B	cohort	-	-	-
Stockholm, SE	Pyko 2019	new study	road, air, rail	Model	Lden	IHD	Adults	B	cohort	-	-	-
Diabetes												
Stockholm County, SE	Erikkson 2014	in start MA [a]	air	Model	Lden	T2 Diabetes	47 mean	B	case control	-	-	-
British Columbia, CA	Clark 2017	in start MA	road	Model	Lden	Diabetes	45-85	B	cohort	-	-	NO
Athens, GR	Dimakopoulou 2017	new study	road, air	Model	LAeq,24h	Diabetes	58 (9.1)	B	cohort	-	-	-
Switzerland	Eze 2017	in start MA	road, air, rail	Model	Lden	Diabetes	59.2 (13.1)	B	cohort	-	multipollutant	NO2
Denmark	Roswall 2018	replacement [a]	road, rail	Model	Lden	Diabetes	56.2 mean	B	cohort	-	multipollutant	NOx
Ruhr Area, DE	Ohlwein 2019	replacement	road	Model	Lden	T2 Diabetes	45-74	B	cohort	-	-	NO2

a. Studies on diabetes incidence that were originally included in the WHO guideline process and associated publication (7)

ANNEX 3: Risk of Bias (RoB) assessment for included studies

Risk of Bias tool (replicated and adapted from RIVM report pg. 53-54 (8))

Characteristic/ domain	Score (risk of bias)	Description/value label
Information bias/ bias due to exposure assessment	Low	Noise level is expressed in LDEN, Lnight, or components AND, (a) is based on modelled equivalent noise levels from noise models that used the actual traffic volume, composition, and speed per 24 hrs per road/railway/airport as input in which case the modelled noise levels are subsequently linked with the home and/or school address of the participant; OR, (b) is based on measurements at the façade of the participant's home and/or school for a minimum of 1 week by qualified staff, and adjusted for data under point (a) as well as meteorological conditions when necessary; OR, (c) is based on a noise map reported in a separate publication but which fulfils conditions (a) or (b).
	High	Noise level is not expressed in LDEN, Lnight, or components, OR (a) is based on modelled noise levels from noise models that did not use the actual traffic volume, composition, and speed per 24 hrs per road/railway/airport as input in which case the modelled noise levels are linked with the area (e.g. postal code area, town, output area) in which the participant lives or attends school; OR (b) is based on measurements of less than 1 week and the measured noise levels are linked with the area (e.g. postal code area, town, neighbourhood) in which the participant lives or attends school OR not adjusted for data under point (a) or meteorological conditions when necessary OR by unqualified staff; OR (c) is based on a noise map reported in a separate publication but which does not fulfil conditions (a) or (b).
	Unclear	If not enough information is available to judge the above
Bias due to confounding	Low	All important confounders are taken into account either through matching or, restriction or in the analysis. For hypertension and blood pressure an effect estimate should at least be adjusted for age and gender; for IHD, stroke, type 2 diabetes, and obesity an effect estimate should at least be adjusted for age, gender and smoking
	High	Only 1 or no confounder is taken into account; OR subjects in exposed and unexposed groups differ for one or more important confounders and there is no adjustment in the analysis
	Unclear	Less then all to > 1 important confounders taken into account, OR Insufficient information to decide on one of the above.
Bias due to selection of participants [a]	Low	Participants randomly sampled from a known population, AND response rate higher than 60% (cross-sectional studies) Participants sampled from a known population, AND attrition rate / loss to follow-up <40% in follow-up studies (cohort studies).
	High	No random sampling OR response rate less than 60% (cross-sectional studies) No random sampling OR attrition rate / loss to follow-up higher than 40%.
	Unclear	No information to judge the above.
Bias due to health outcome assessment	Low	The health outcome of interest is objectively measured OR taken from medical records OR taken from questionnaire or interview using a known scale or validated assessment method.
	High	The health outcome of interest is self-reported and not assessed using a known scale or validated assessment method
	Unclear	Not sufficient information reported to assess the above.
Bias due to not blinded outcome assessment	Low	The health outcome of interest is assessed blind for exposure information in cohort and cross-sectional studies or exposure is assessed blind for being a case in case-control studies
	High	The health outcome and/or exposure assessment is not blinded.
	Unclear	Not sufficient information reported to assess the above.
Total risk of bias	Low	At least 4 at low risk of bias. One "high" or "unclear" out of five is allowed.
	High	Any other.

a. adapted to reflect exposure or outcome dependent loss to follow-up as main criteria in cohort studies

RoB evaluation: IHD studies

Location	Citation	Information bias/ bias due to exposure assessment	Bias due to confounding	Bias due to selection of participants	Bias due to health outcome assessment	Bias due to not blinded outcome assessment	Total risk of bias
Road traffic noise							
Berlin I, DE	Babisch 1994	low	low	low	low	low	low
Berlin II, DE	Babisch 1994	low	low	low	low	low	low
Caerphilly & Speedwell, UK	Babisch 1999	high	low	low	low	low	low
Berlin III, DE	Babisch 2005	low	low	low	low	low	low
Stockholm County, SE	Selander 2009	low	low	low	low	low	low
London, UK	Halonen 2015	high	unclear	low	low	low	high
Skåne, SE	Boden 2016	low	low	low	low	low	low
Rhine-Main, DE	Seidler 2016	low	unclear	low	low	low	low
Norway & UK	Cai 2018	low	low	low	low	low	low
Denmark	Roswall 2017	low	low	low	low	low	low
Athens, GR	Dimakopoulou 2017	low	low	high	high	high	high
Stockholm, SE	Pyko 2019	low	low	low	low	low	low
Aircraft noise							
London Heathrow	Hansell 2013	high	unclear	low	low	low	high
USA	Correia2013	high	high	low	low	low	high
Rhine-Main, DE	Seidler 2016	low	unclear	low	low	low	low
Athens, GR	Dimakopoulou 2017	low	low	high	high	high	high
Stockholm, SE	Pyko 2019	low	low	low	low	low	low
Railway noise							
Rhine-Main, DE	Seidler 2016	low	unclear	low	low	low	low
Denmark	Roswall 2017	low	low	low	low	low	low
Stockholm, SE	Pyko 2019	low	low	low	low	low	low

RoB evaluation: Diabetes studies

Location	Citation	Information bias/ bias due to exposure assessment	Bias due to confounding	Bias due to selection of participants	Bias due to health outcome assessment	Bias due to not blinded outcome assessment	Total risk of bias
Road traffic noise							
British Columbia, CA	Clark 2017	high	unclear	low	low	low	high
Athens, GR	Dimakopoulou 2017	low	low	high	high	high	high
Switzerland	Eze 2017	low	low	low	low [a]	low	low
Denmark	Roswall 2018	low	low	low	low	low	low
Ruhr Area, DE	Ohlwein 2019	low	low	low	low [a]	low	low
Aircraft noise							
Athens, GR	Dimakopoulou 2017	low	low	high	high	high	high
Stockholm County, SE	Erikkson 2014	low	low	low	low	high	low
Switzerland	Eze 2017	low	low	low	low [a]	low	low
Railway noise							
Switzerland	Eze 2017	low	low	low	low [a]	low	low
Denmark	Roswall 2018	low	low	low	low	low	low

[a] designated low because the study combined different diagnostic criteria (objective and self-reported measures) to limit outcome misclassification, despite the use of self-reported physician diagnosis or medication in the outcome definition.