

# Clear results for cardiac insufficiency



Doctors speak of cardiac insufficiency when the heart is no longer able to sufficiently supply the body with blood. This disease, commonly called a weak heart, may have many causes. In many patients, the coronary vessels and, as a consequence, the heart muscle, are damaged. High blood pressure also facilitates cardiac insufficiency. Even though the patients have a better survival chance than stroke or heart attack patients, cardiac insufficiency is the third-most frequent cause of death in Germany. 45,815 persons died of it in 2013.

## Connections with all three traffic noise types found

1. *The figure shows a linear risk increase (violet line) of 1.6 % per 10 decibel (statistically significant).*
2. *The figure shows a linear risk increase (violet line) of 2.4 % per 10 decibel (statistically significant).*
3. *The figure shows a linear risk increase (violet line) of 3.1 % per 10 decibel (statistically significant).*



Aviation noise, as well as railway and road noise, statistically significantly increases the risk of developing cardiac insufficiency.

- The connection is the clearest with railway noise: Per ten decibel, the risk of cardiac insufficiency increases by 3.1 percent.
- Road noise increases the risk of cardiac insufficiency by 2.4 percent when noise increases by ten decibel.
- At 1.6 percent per ten decibel, the risk increase under the influence of aviation noise is a little lower – but even this result is statistically significant.

Additionally, the aviation noise results tend to be less certain than the road and railway noise results, since aviation noise levels above 65 decibels did not exist in the area under examination. Additionally, the data suggests that the time of residence plays a role: According to this, the risk of cardiac insufficiency may increase in persons who lived in noisy areas for several years. This assumption is to be covered by further studies.

## **Survey to supplement health insurance data**

The scientists took things another step for cardiac insufficiency: They not only analysed the health insurance data, but also used an additional survey to collect more information on patients with cardiac insufficiency and analyse it. For this, the health insurances wrote to some of the persons insured by them. About 3,000 persons suffering from cardiac insufficiency and a high number of “control persons” not suffering from cardiac insufficiency reported to the collection office of the survey in Gießen and participated in a deeper survey subsequently.

The NORAH team could use data collected based on the deeper survey to ensure that the traffic noise risks found for cardiac insufficiency cannot be explained by further factors. This suggests that the increased disease risks are actually caused by traffic noise.

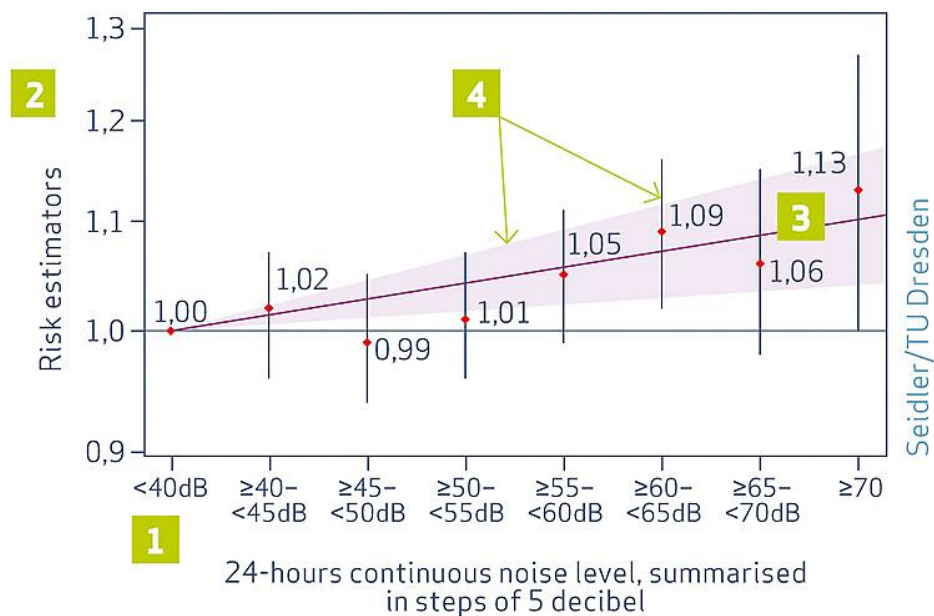
## **Noise within the apartment considered**

Additionally, the scientists could gain an insight thanks to the additional information: on how loud the apartments of the respondents actually were. For this, the participants reported, among others, how their bedrooms at home were set up and whether the bedroom window was preferably tipped open or closed at night. From this information, the NORAH team initially developed the noise level inside the apartment and then the cardiac insufficiency risk depending on the inner noise level.

The result: Generally, the risk estimators increase when the inner noise level is considered instead of the outer levels. This is true to aviation noise, road noise and railway noise. This result generally suggests that traffic noise can cause cardiac insufficiency.

## **A reading aid for this issue of NORAH Wissen**

## Heart attack and road noise



The study on health risks examines whether the risk of developing one of the five examined diseases increases when exposed to more traffic noise. The scientists present the results of their research in exposure-effect curves). Since you will find many of these curves on the following pages, we are providing a reading aid here:

### 1 | Continuous noise level

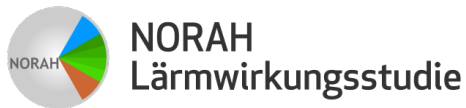
This axis shows the continuous noise level. The noise increases from the left to the right. For some calculations, the scientists also used "Noise level classes". If, e.g., the continuous noise level at the address of an insured person was at 63.7 decibel, his health data was included in the calculation for the noise level class " 60 dB – < 65 dB".

### 2 | Risk estimators

Risk estimators indicate how high the "relative illness risk" is. 1 corresponds to the "basic risk" of a person not subject to traffic noise. If the value is higher, this suggests that noise at this degree may contribute to the disease. Additional calculations must show whether an increased or reduced relative risk is statistically significant and thus with a high probability not coincidental.

### 3 | Exposure-effect-curve

The exposure-effect-curve shows how the health risk changes with increasing noise. In this example, the risk increases by 2.8 percent per ten decibel. Additional calculations show whether this increase is statistically significant.



#### 4 | Confidence intervals

The confidence interval is a statistically calculated trust range above or below the risk estimator. The smaller the confidence interval, the more reliable and indicative the risk estimator. It is usual to apply 95-percent confidence interval. Simplified, this means that the "actual" risk is within this range with a probability of 95 %. The figures show the 95-percent confidence intervals of the individual risk estimators (black vertical lines) as well as the 95-percent confidence interval above and below the exposureeffect curve (pink area).

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## Do you have any questions?

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