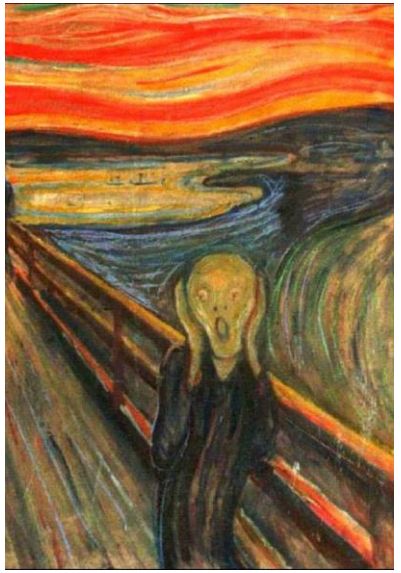
NEW AIRCRAFT NOISE LIMITS ? FAKE NEWS !

Truls Gjestland

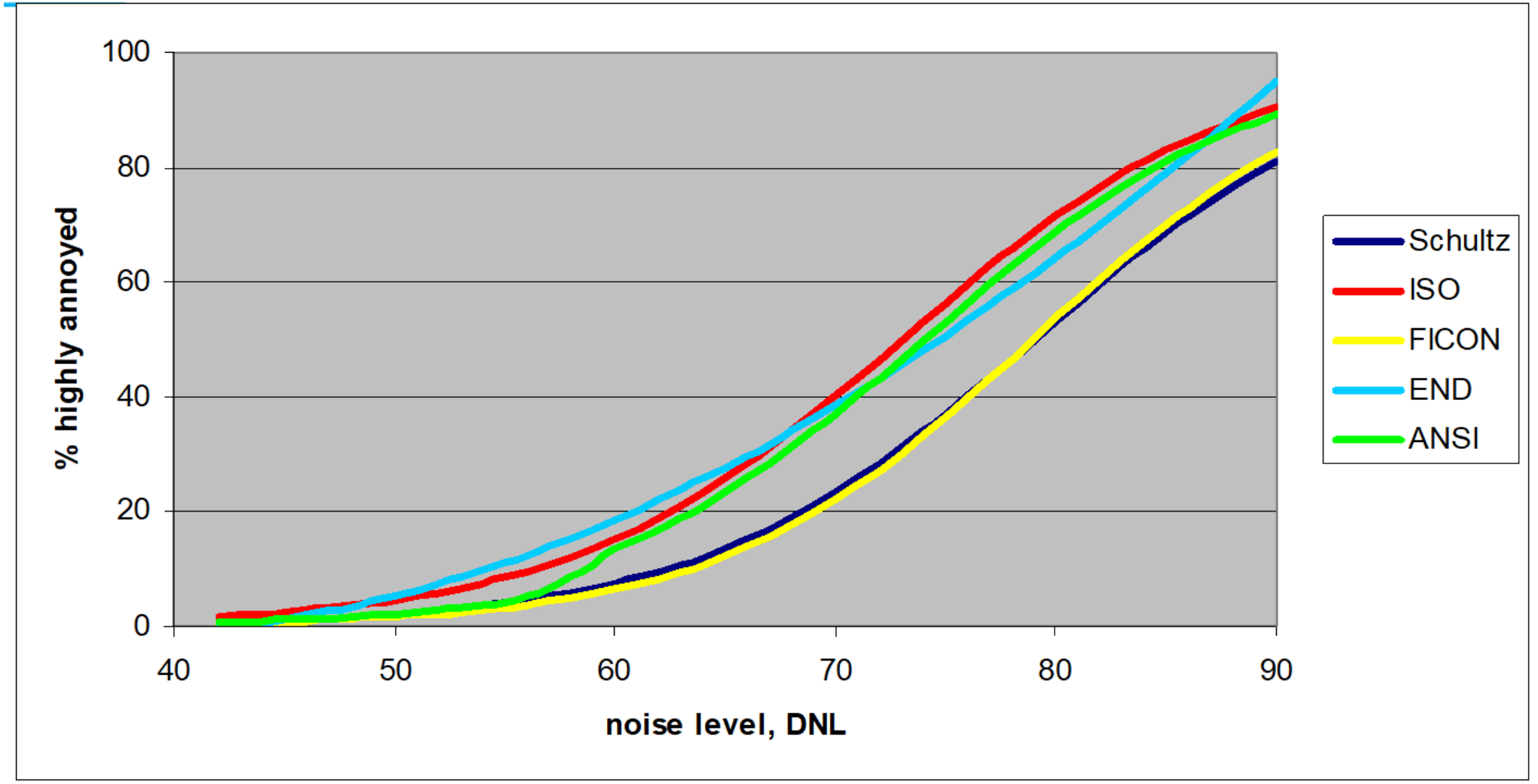
SINTEF DIGITAL

Exposure-response functions

- The basis for all regulatory activities
- "What is the relationship between noise exposure and annoyance?"
- "When is annoyance un-healthy?"
- "How much annoyance can we tolerate?"



Various "official" exposure-response functions



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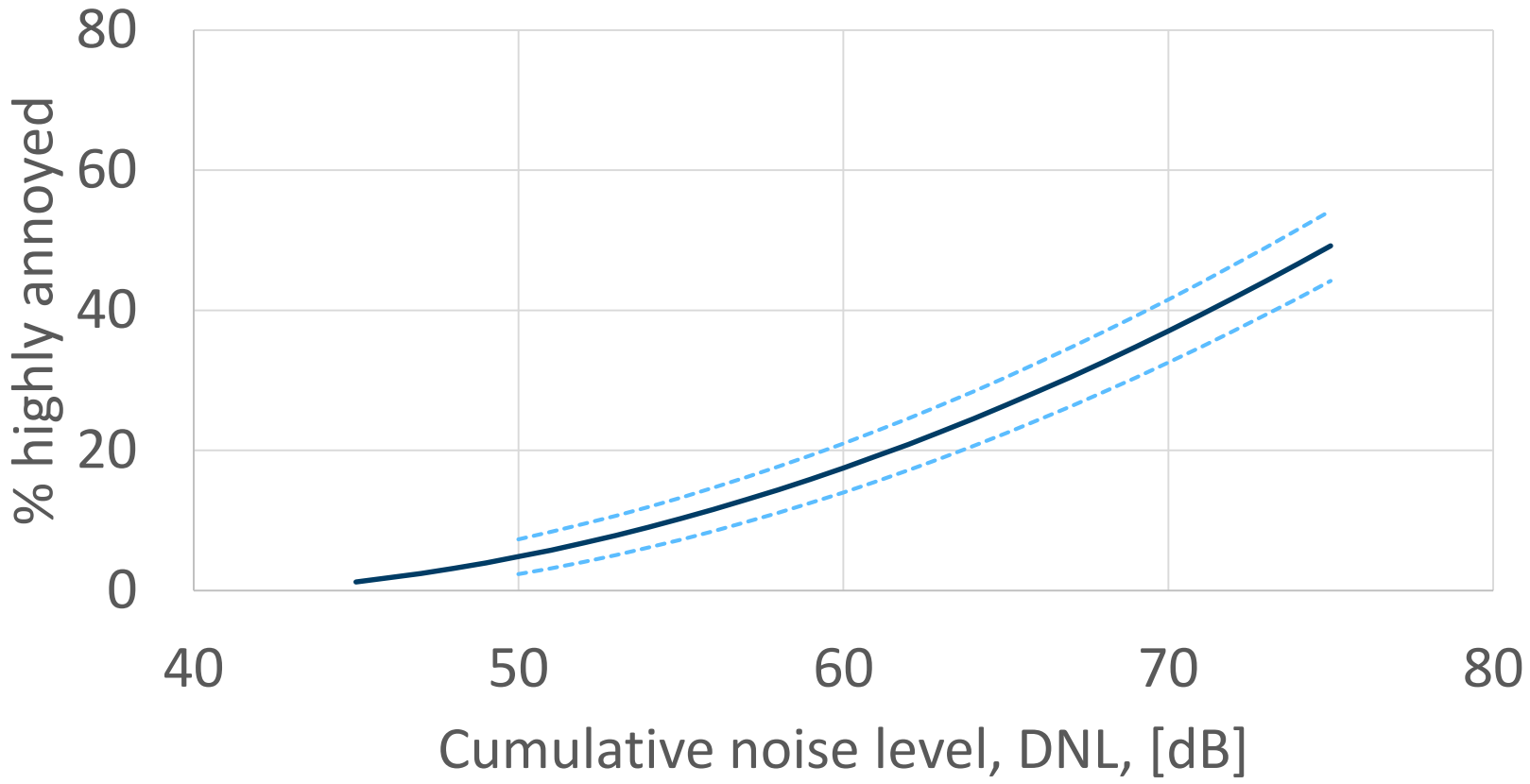
EU reference curve for aircraft noise

20 surveys, Miedema & Vos, (1998)



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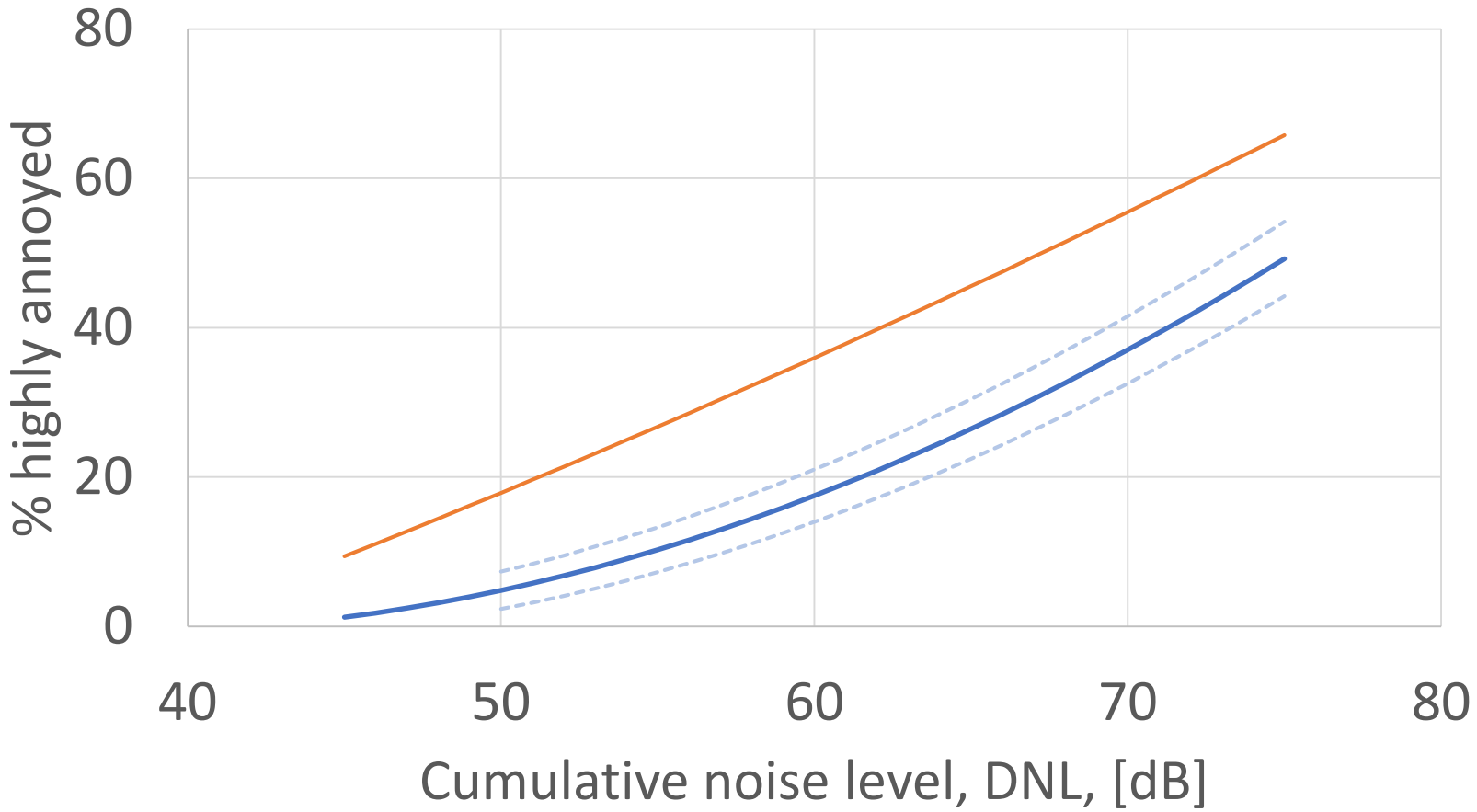
New WHO recommendation (!)



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New WHO recommendations

Noise Guidelines for the European Region

For average noise exposure, the WHO strongly recommends reducing noise levels produced by aircraft below **45 dB *L*den**, as aircraft noise above this level is associated with adverse health effects.

Limit is set at 10 % highly annoyed

WHO Regional Office for Europe

- Data analysis by Guski, Schreckenberg and Schümer
- Based on 12 surveys conducted 2001 – 2014
- About 17,000 respondents
- Half of surveys did not follow ISO/TS 15666 recommendations

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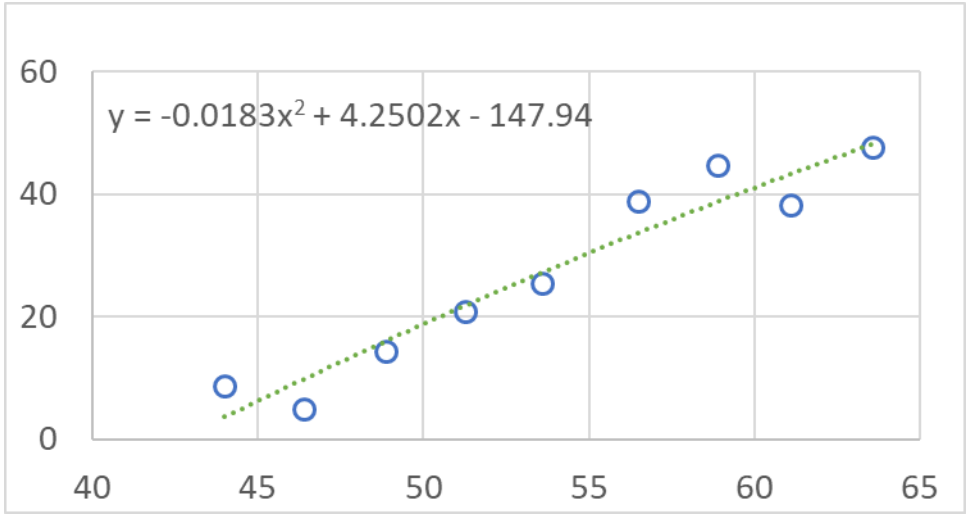
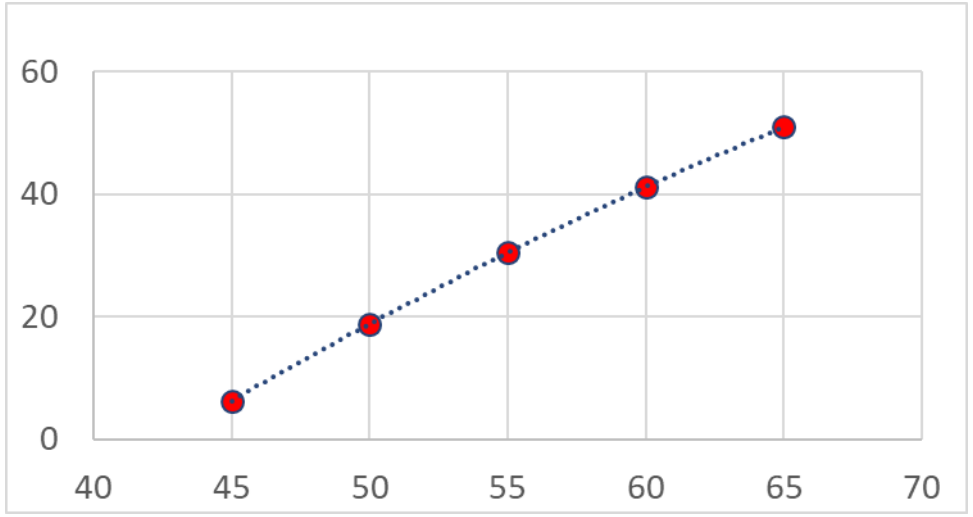
Observations replaced by calculated response



Original survey data

Calculated response



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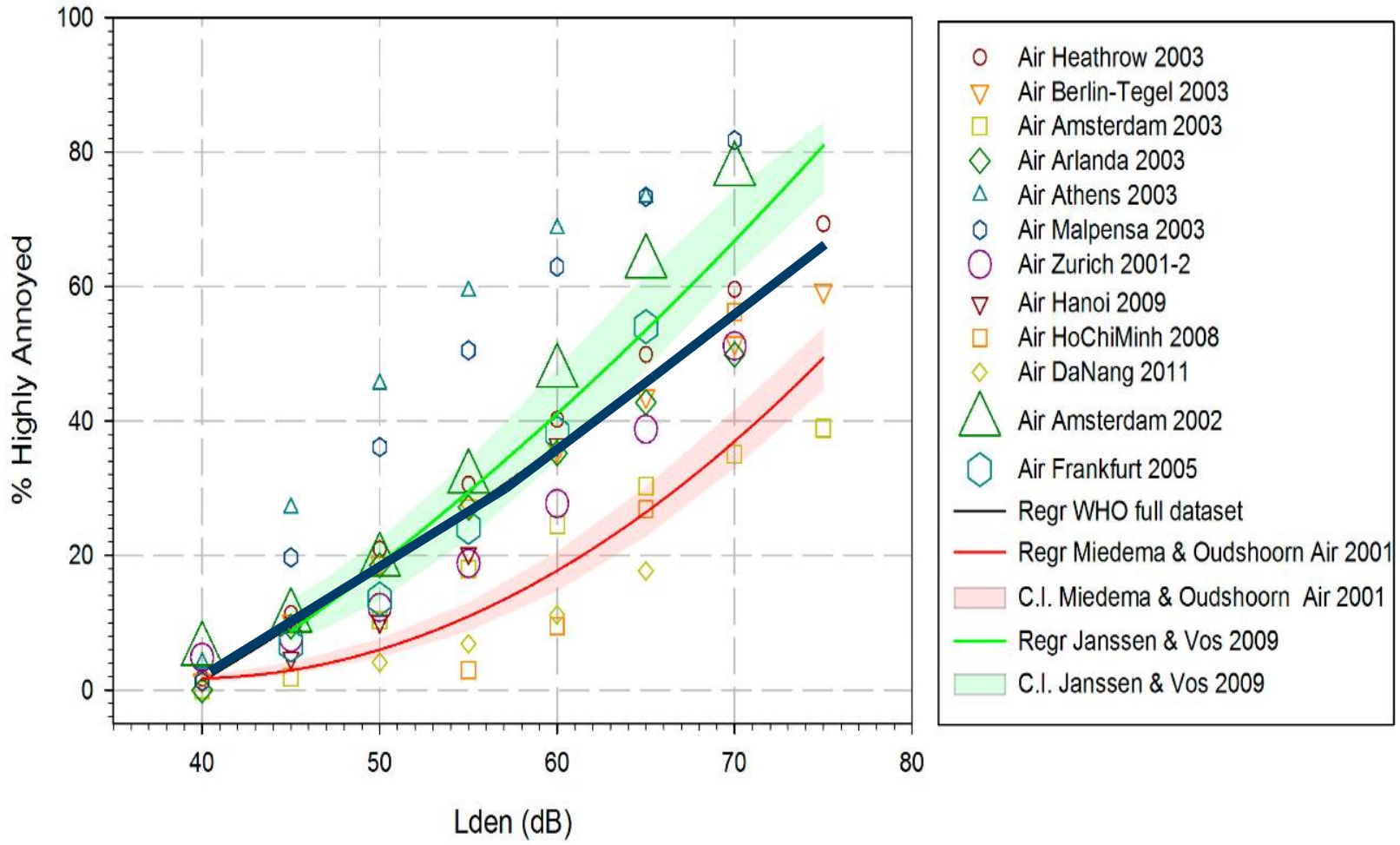
WHO full dataset



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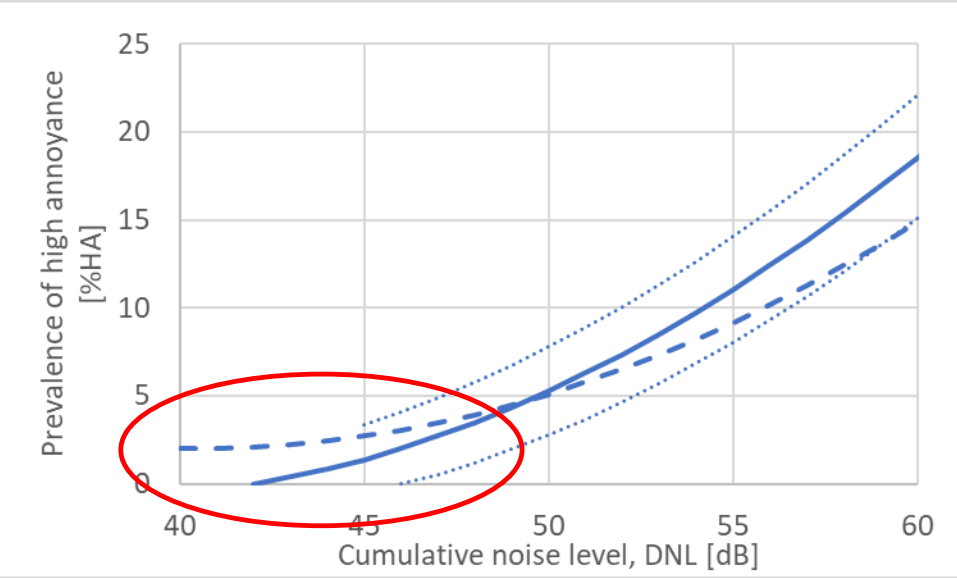
"Guski method" over-estimates annoyance at low exposure levels

- Miedema & Vos (1998) ERF adopted by the European Union
- "Guski method" applied to Miedema & Vos dataset (20 surveys)



Miedema & Vos forced the ERF to zero at an exposure level Ldn = 42 dB based on survey results

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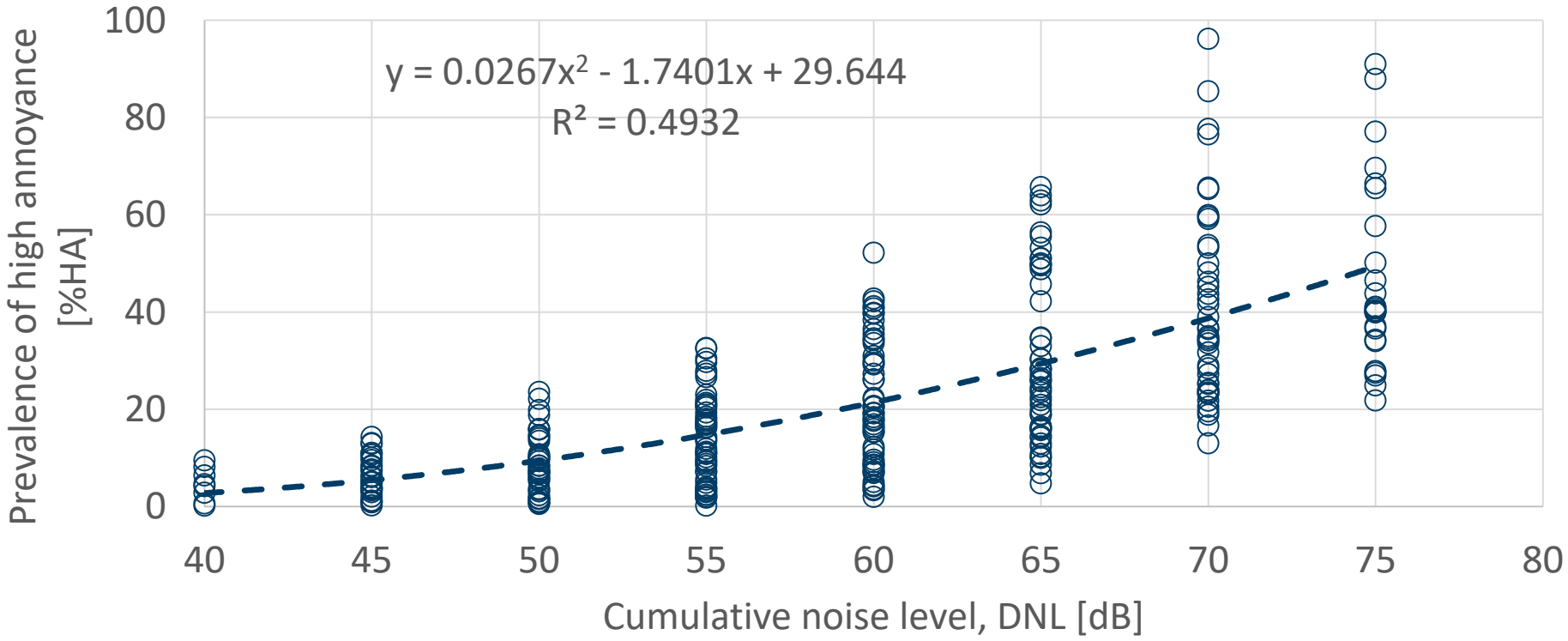
Alternative survey data 1961-2015

- 65 surveys (Europe, US, Asia and Australia)
- About 93,000 respondents
- Conducted according to ISO standards
- Analyzed with "Guski method"

ERF for 65 surveys 1961-2015



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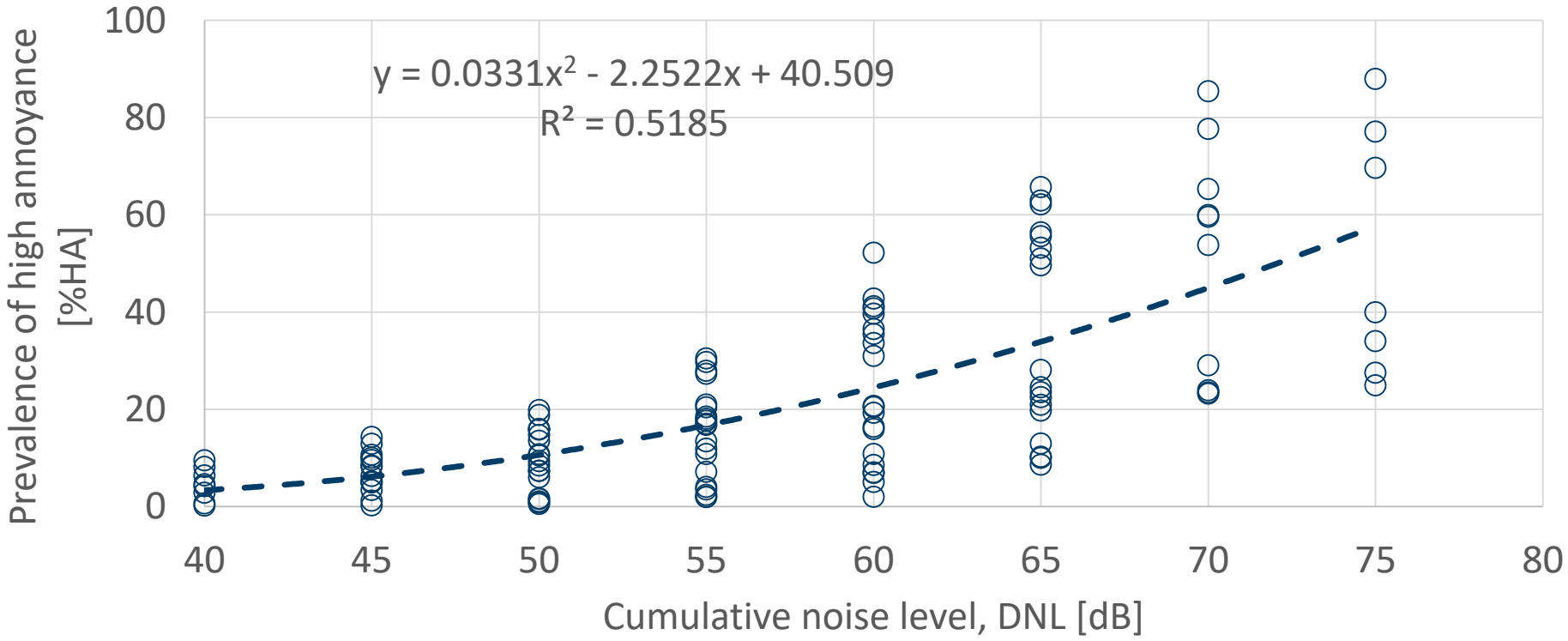
ERF for 22 post-2000 surveys



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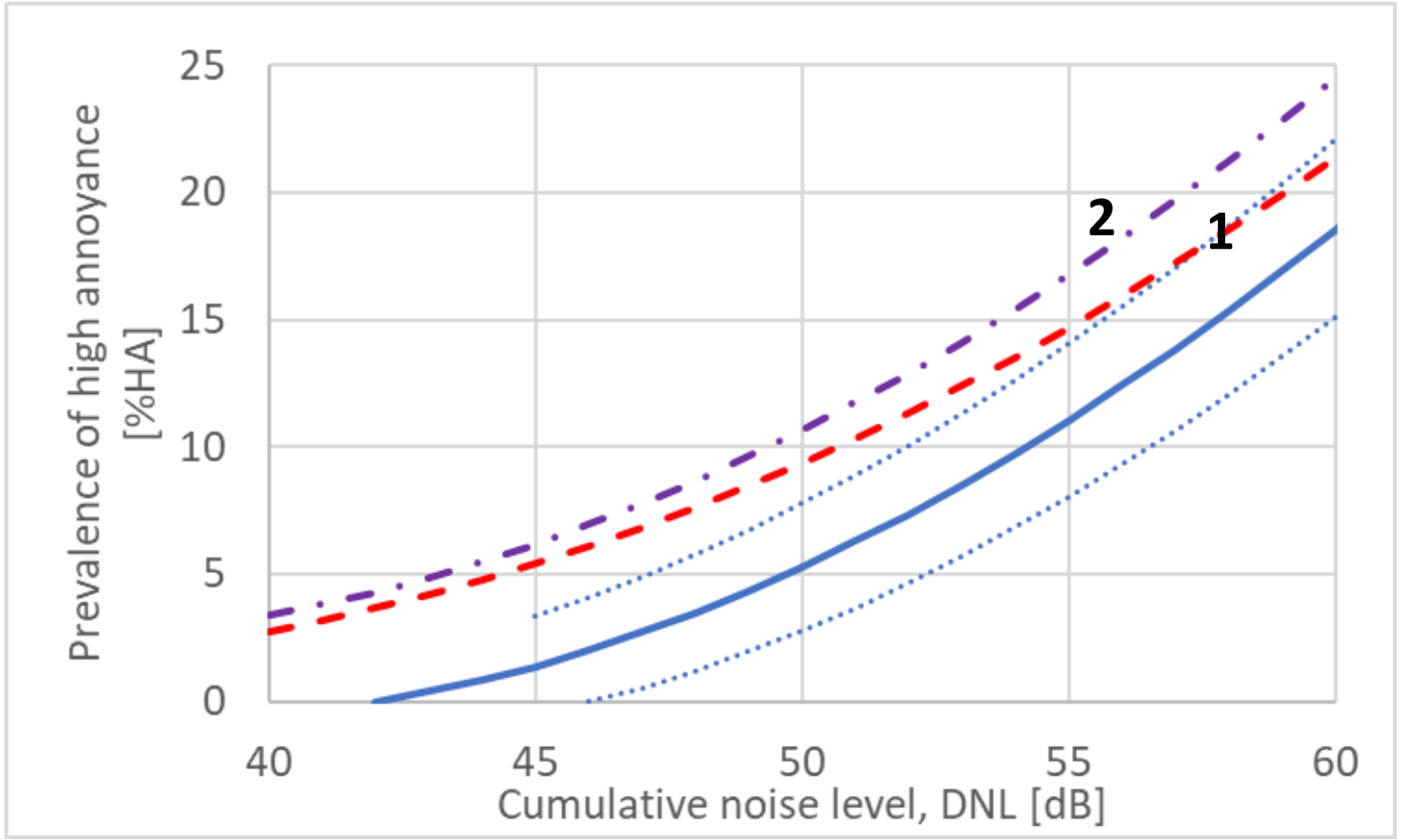
No meaningful change in annoyance response over the past half century



M & V
95% conf.
1961-2015
2000-2015

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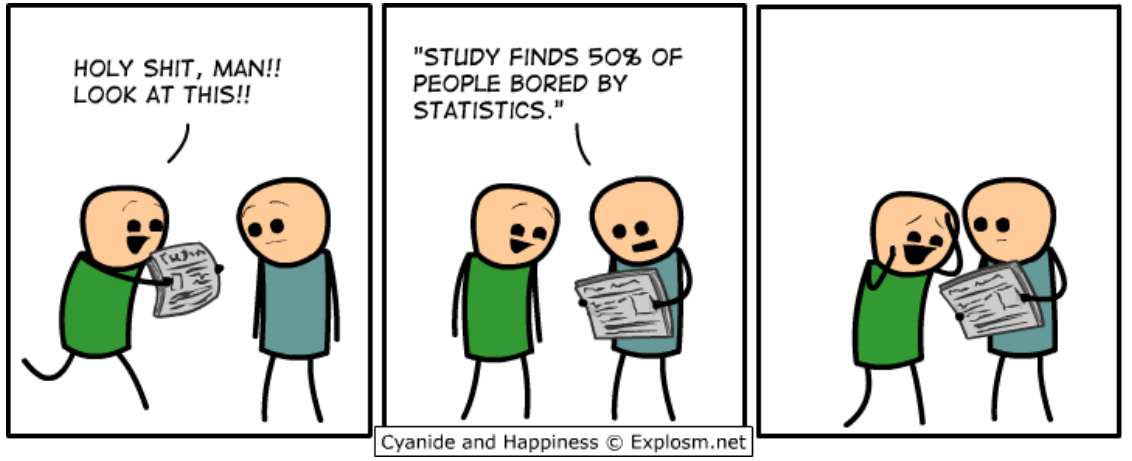
Temporal trend ?

- Calculate exposure level for 10 % HA for individual surveys
- Plot data as function of survey year



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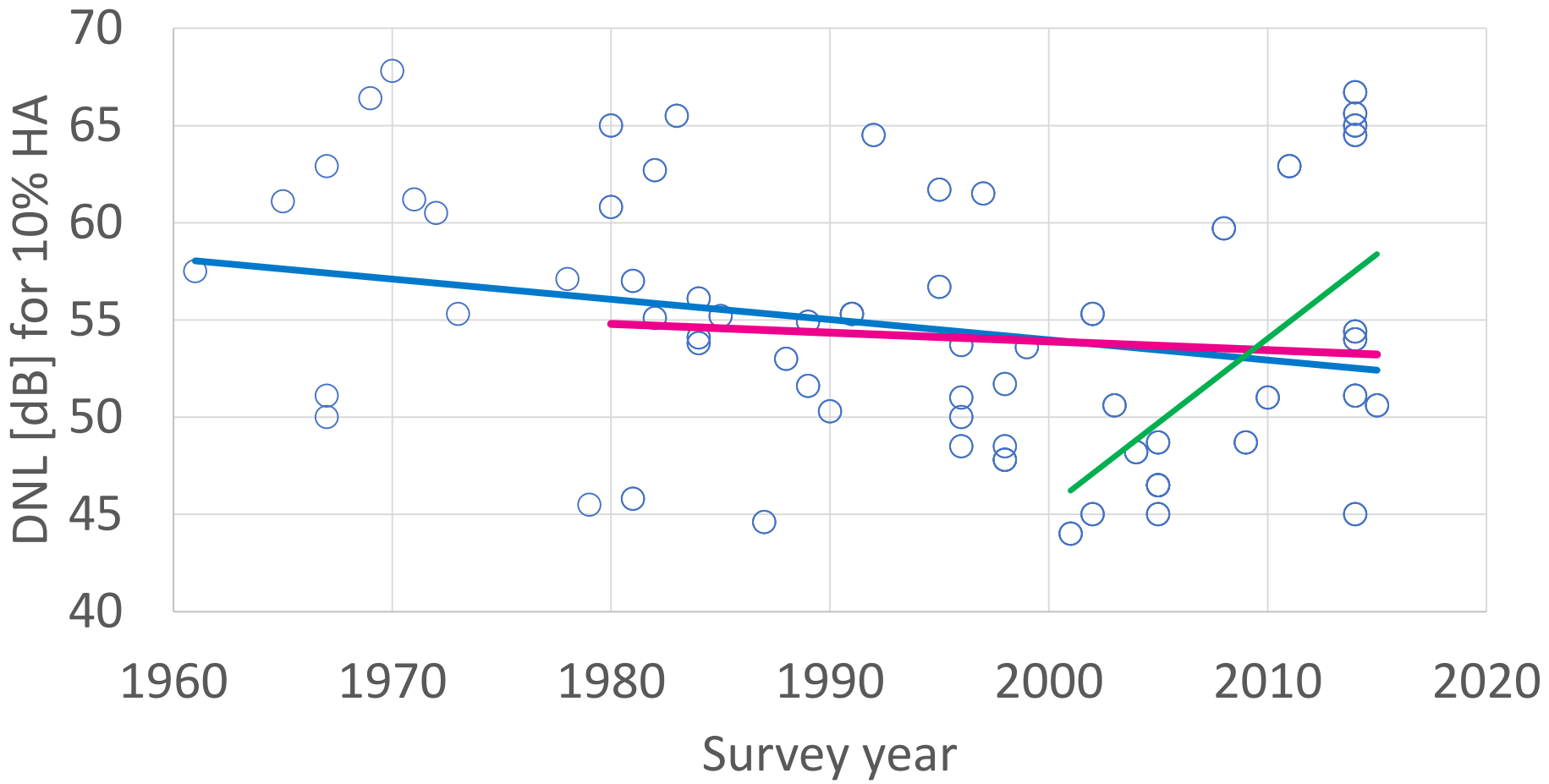
70
65
60
55
50
45
40
DNL [dB] for 10% HA
1960
1970
1980
1990
2000
2010
2020
Survey year

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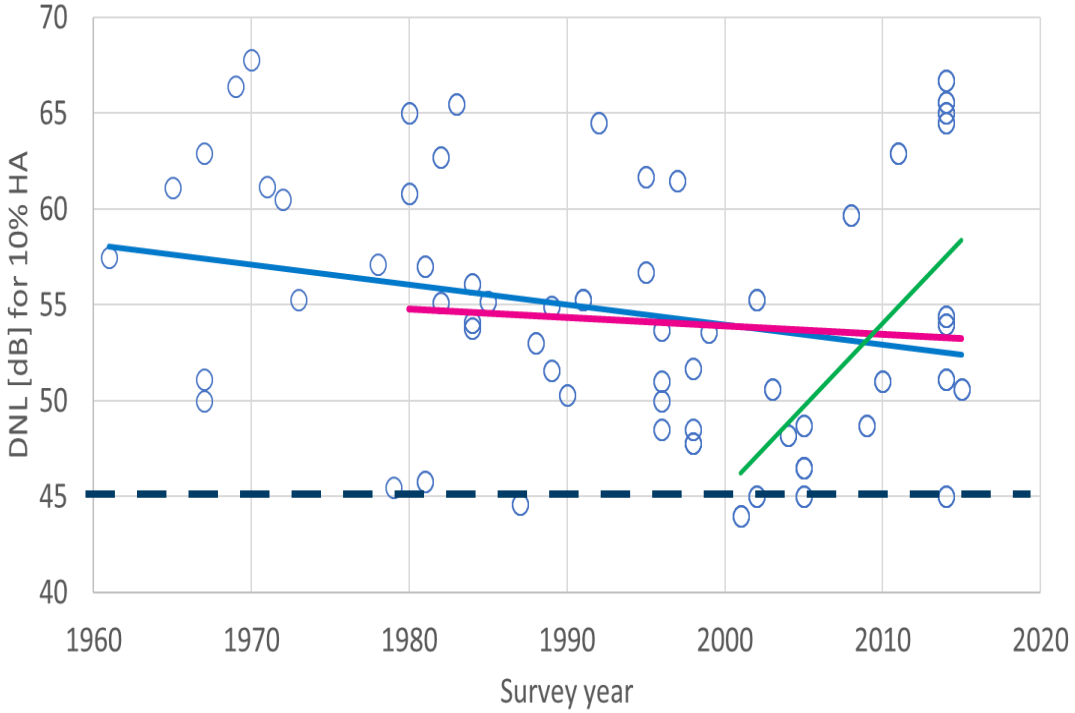
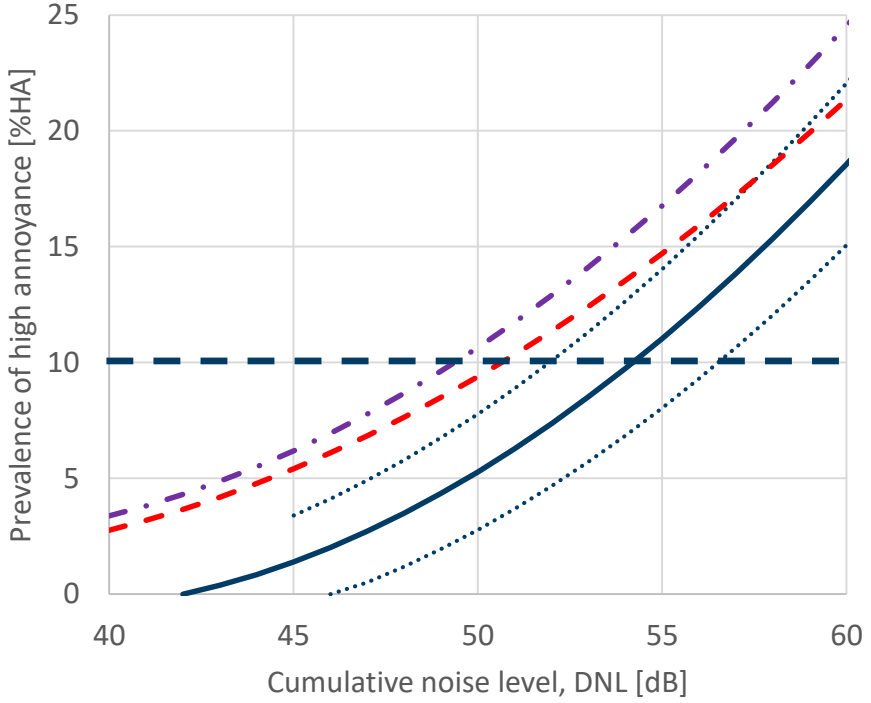
WHO: 10 % HA ➡ adverse health effect





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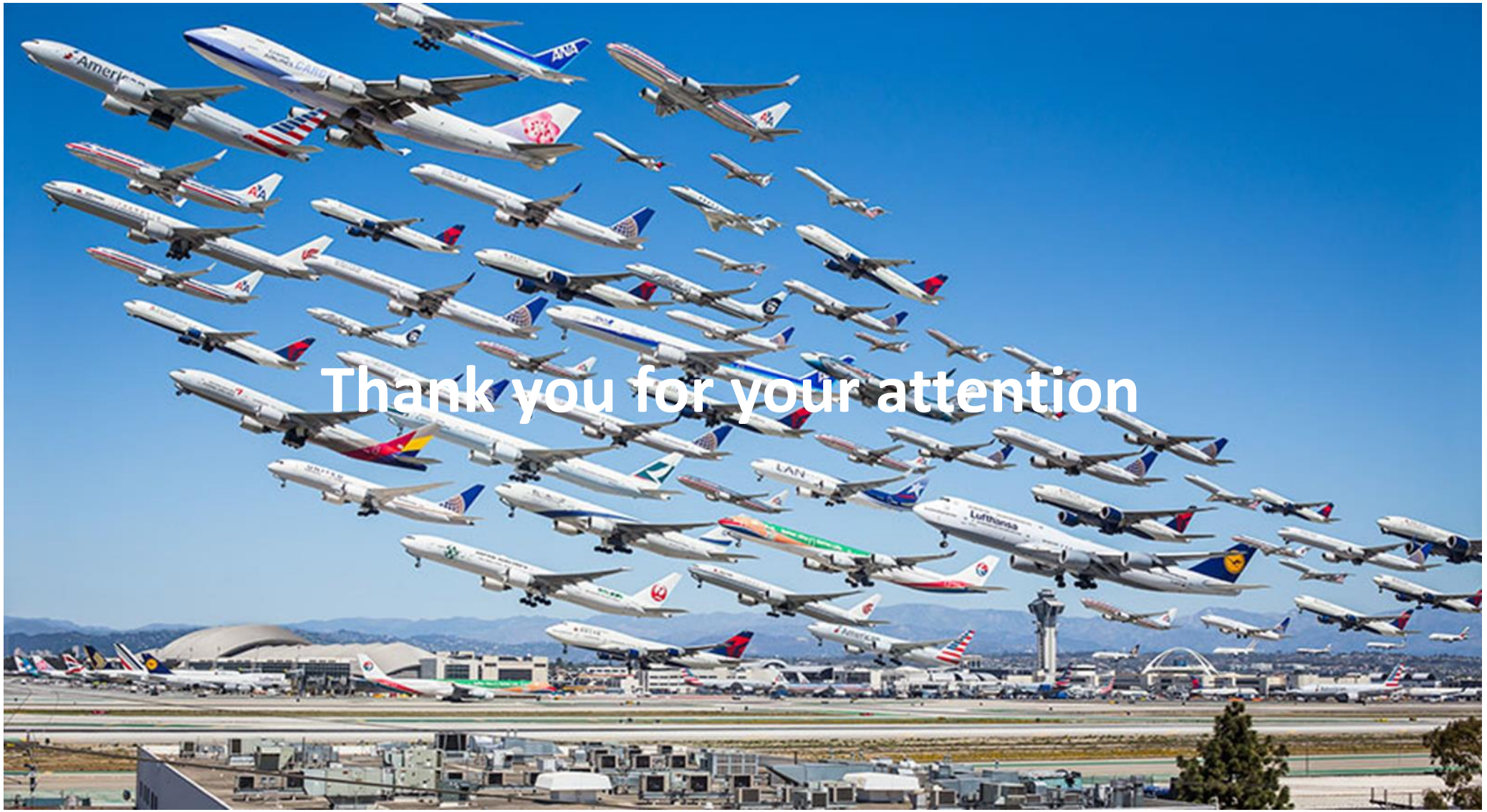
Limits for adverse health effect

- Only 5 of 65 surveys with 10 % HA for $L_{dn} \leq 45$ dB
- Not below $L_{dn} = 50$ dB with "Guski analysis method"
- "Guski method" over-estimates low annoyance
- No temporal change over the past five decades
- Miedema & Vos' detailed analysis still best choice
- 10 % HA for $L_{dn} = 54$ dB


Thank you for your attention

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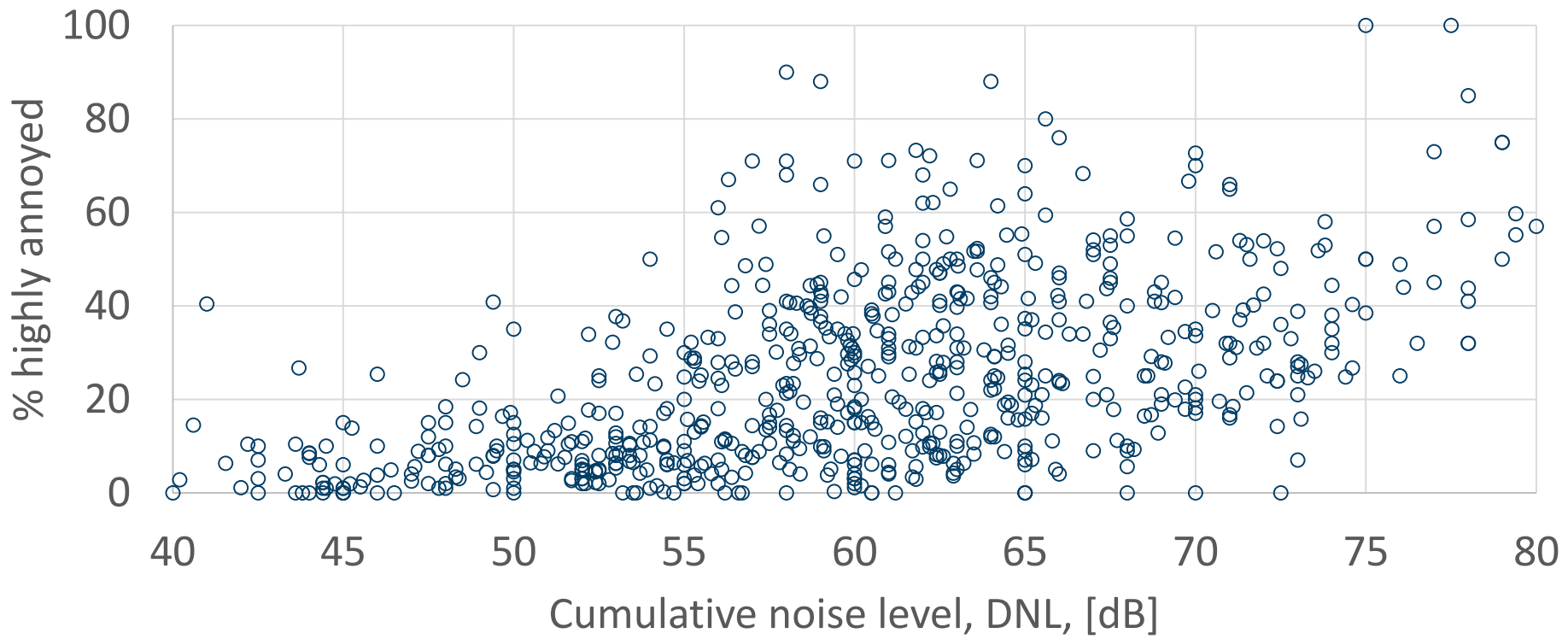
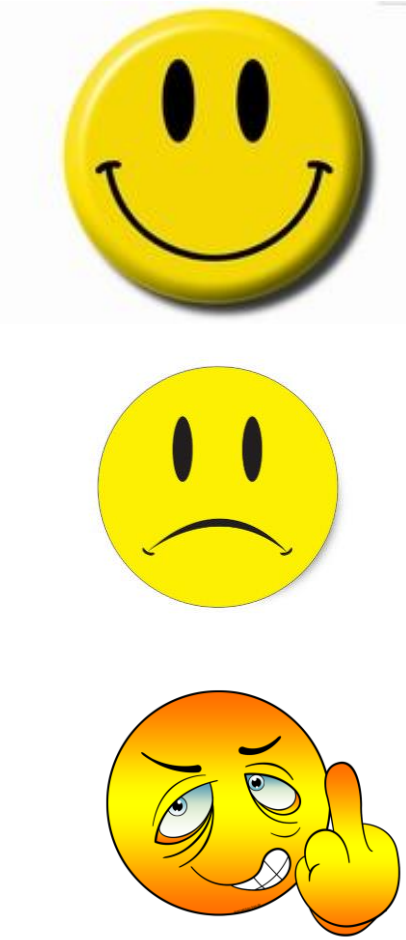
Teknologi for et bedre samfunn

65 surveys, 93 000+ respondents, 700+ datapoints





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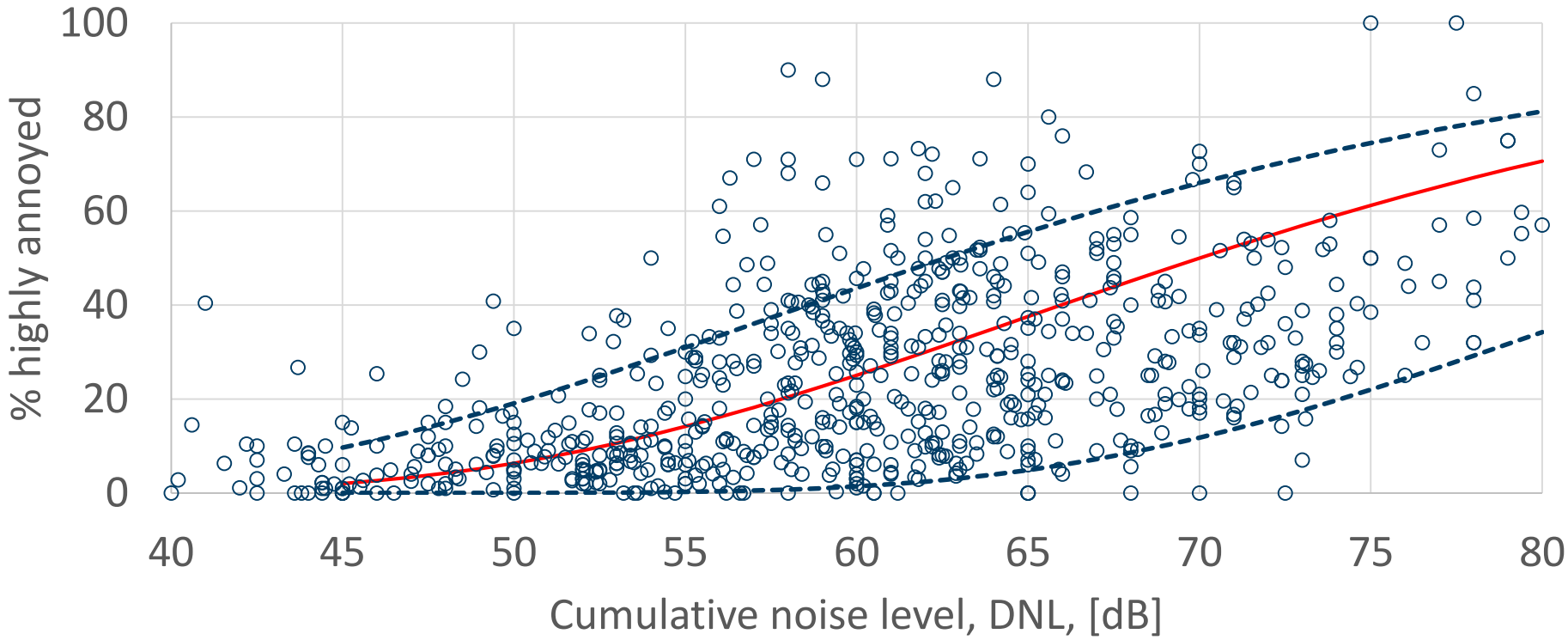
Range for individual ERFs



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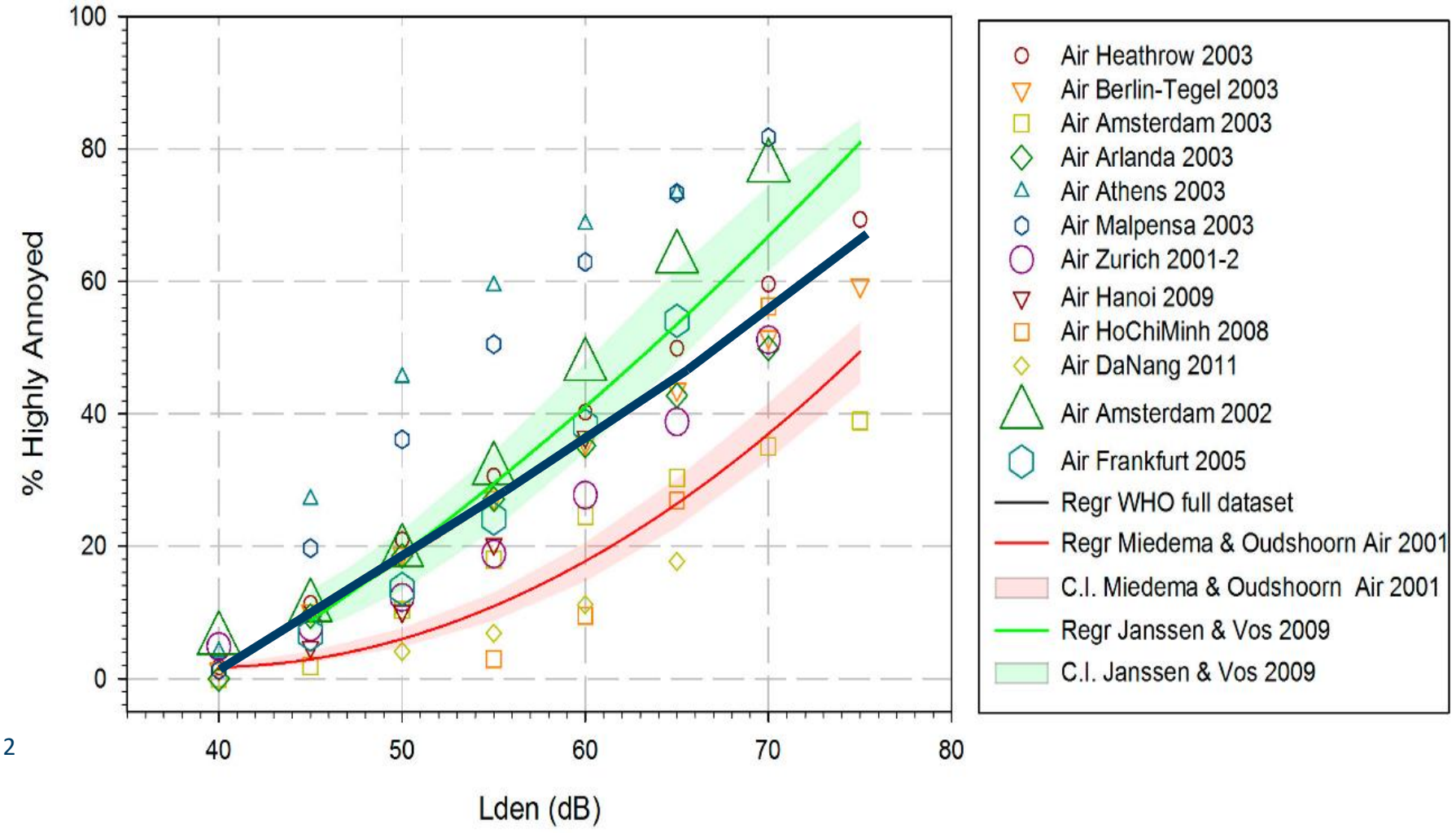
Basis for WHO recommendations

- Data search and analysis by Guski *et al.*
- Only surveys conducted after 2000
- Identified 8 surveys conducted according to standard procedures
- Discarded 2 – due to ignorance regarding CTL method (ISO 1996)
- Included 6 non-standardized surveys – the HYENA study

WHO full dataset, 6 + 6 surveys

12 airports, 17 000 respondents



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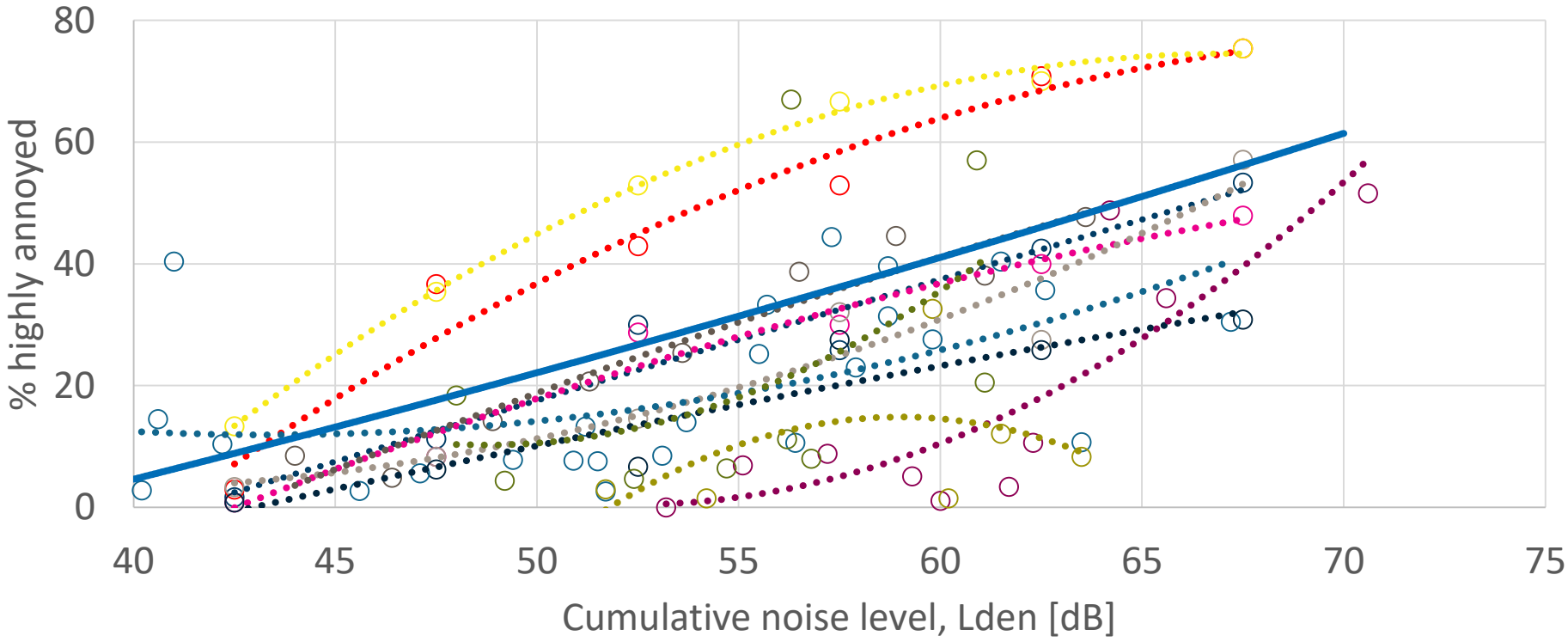
WHO dataset with individual regression functions



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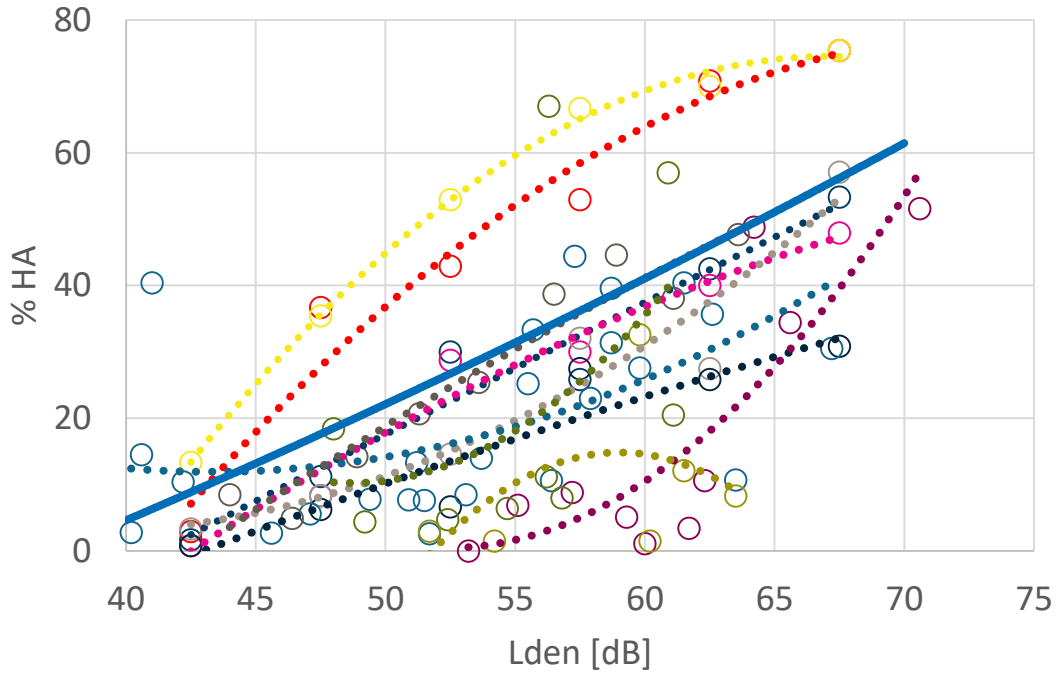
New WHO dose-response curve

- Very poor predictor for most airports
- Overestimates the annoyance for most airports
- Two studies with exceptionally high annoyance



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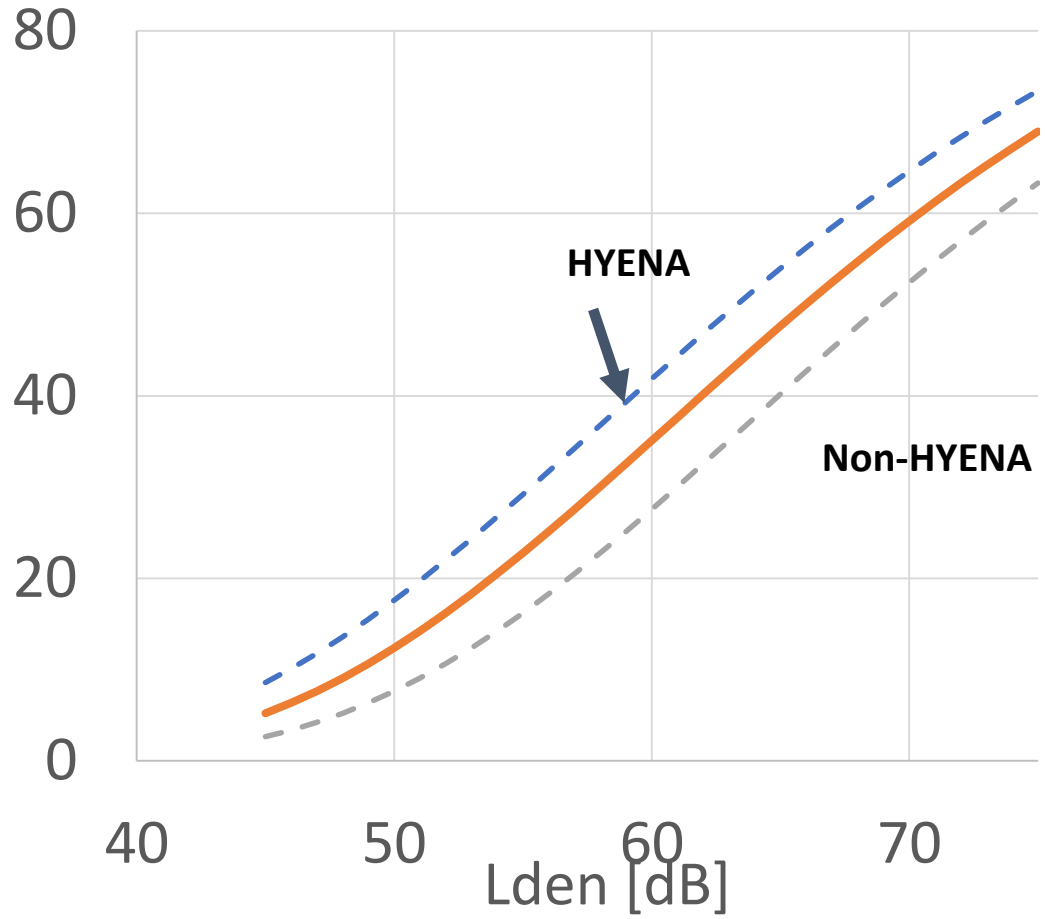
6 non-standardized surveys – HYENA study

- Designed to study hypertension among airport residents
- Addressed a limited age group
- Used non-standardized questionnaire
- Issues with random selection of respondents
- Ignored recommendations to exclude survey results
- Uncertain noise data

The HYENA study

- Limited age group, 45 – 70 years
- Known to be exceptionally noise sensitive
  - Van Gerven *et al.* (JASA, 2009)
  - Miedema and Vos (JASA, 1999)
  - SoNA survey (2018)
- Equivalent to 4 – 6 dB shift in exposure
- The issue is recognized but dismissed by Guski *et al.*



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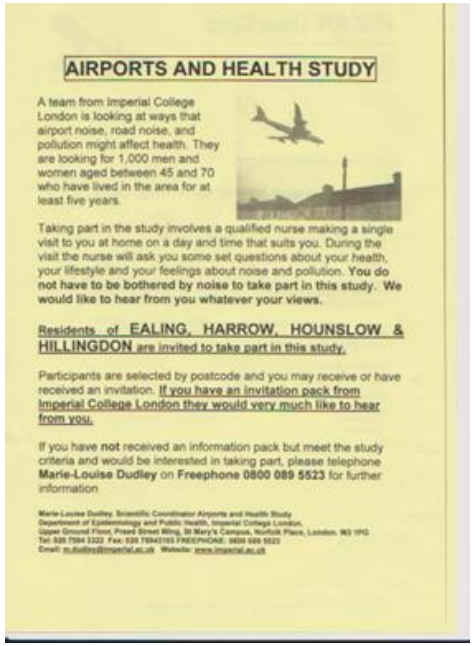
The HYENA study

- Non-standardized questionnaire
- How annoyed are you **during the day** by aircraft noise
- How annoyed are you **in general** by aircraft noise
- Unsupported claim that the responses are identical

The HYENA study

- Random selection of respondents ?
- At least at one airport a special noise protest group was urged to participate in the study
- Likely to bias the selection



AIRPORTS AND HEALTH STUDY

A team from Imperial College London is looking at ways that airport noise, road noise, and pollution might affect health. They are looking for 1,000 men and women aged between 45 and 70 who have lived in the area for at least five years.

Taking part in the study involves a qualified nurse making a single visit to you at home on a day and time that suits you. During the visit the nurse will ask you some set questions about your health, your lifestyle and your feelings about noise and pollution. **You do not have to be bothered by noise to take part in this study. We would like to hear from you whatever your views.**

Residents of EALING, HARROW, HOUNSLOW & HILLINGDON are invited to take part in this study.

Participants are selected by postcode and you may receive or have received an invitation. **If you have an invitation pack from Imperial College London they would very much like to hear from you.**

If you have **not** received an information pack but meet the study criteria and would be interested in taking part, please telephone **Marie-Louise Dudley** on **Freephone 0800 089 5523** for further information

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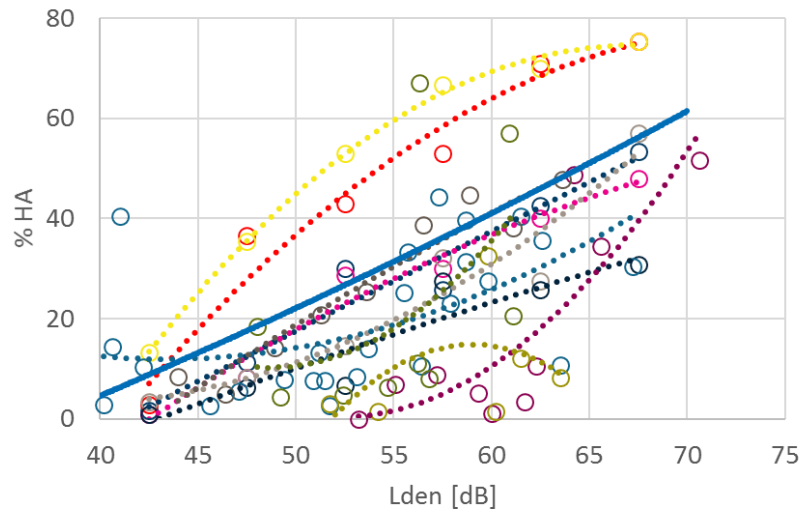
The HYENA study

- Guski *et al*. ignored recommendations from the HYENA study
- HYENA researchers **excluded** the results from two airports in their pooled analysis due to large operational changes
- Guski *et al.* did not share their opinion



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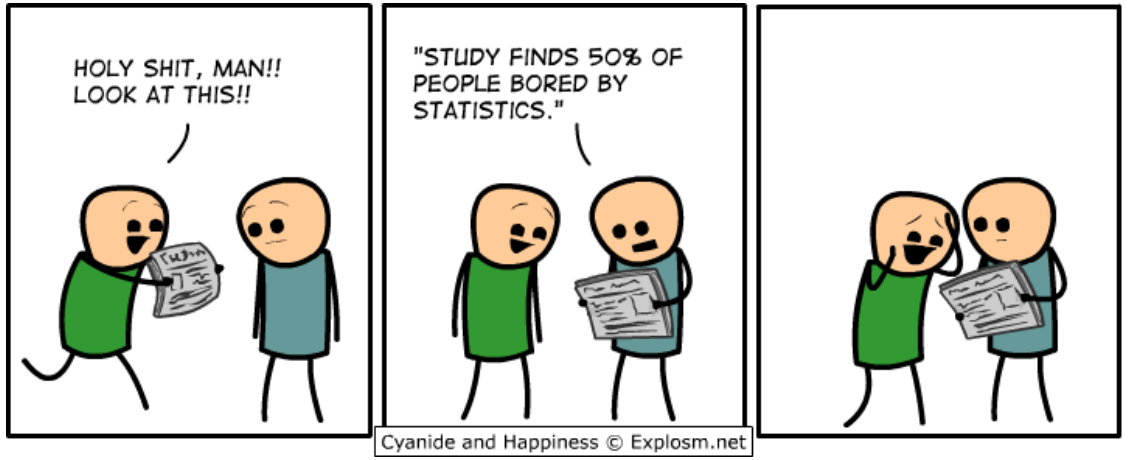
The HYENA study

- Questionable noise data
- Reports of calculated noise levels as low as L_{A24h} = 11 dB
- No prediction programs yields reliable data at these levels

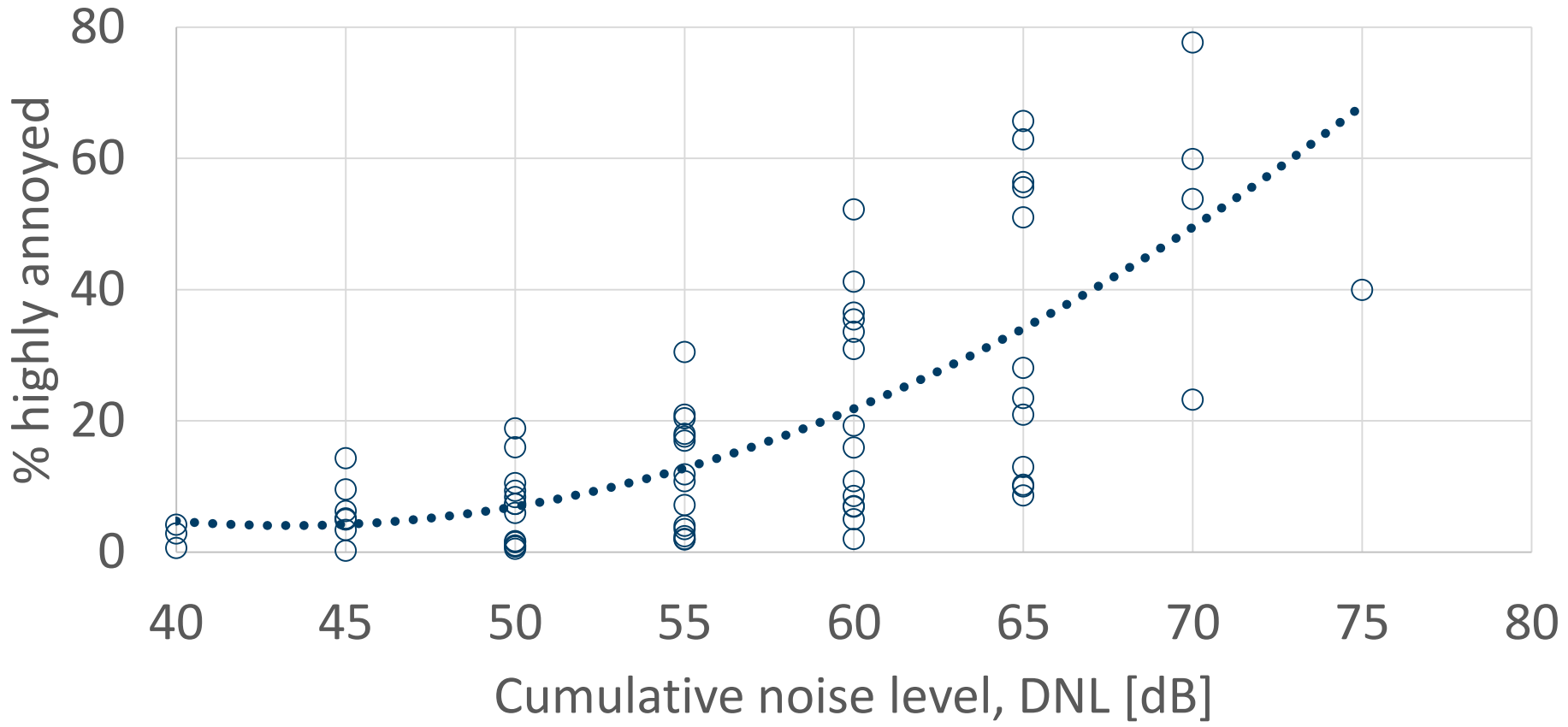


Alternative post-2000 dataset

- 22 surveys; 14 Europe, 2 US, 6 Asia
- 33 000 respondents
- 230 paired observations of noise exposure and prevalence of HA

- WHO dataset: 12 surveys, 17 000 respondents

ERF for alternative dataset



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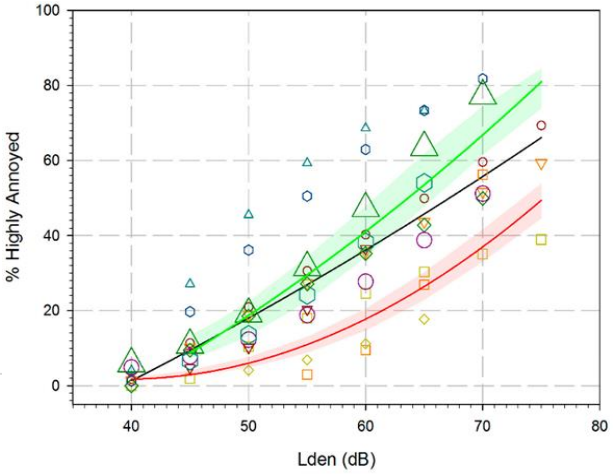
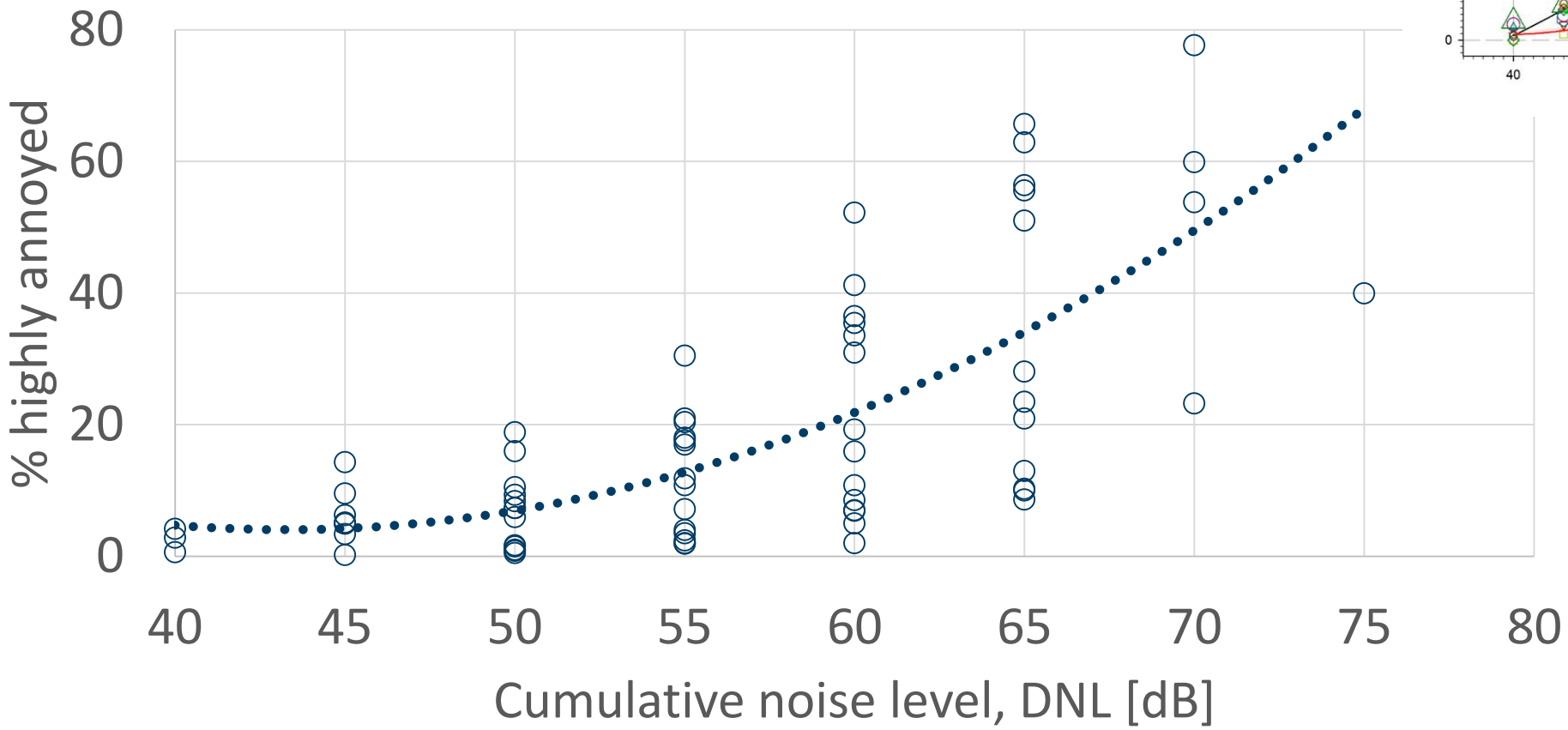
ERF for alternative dataset





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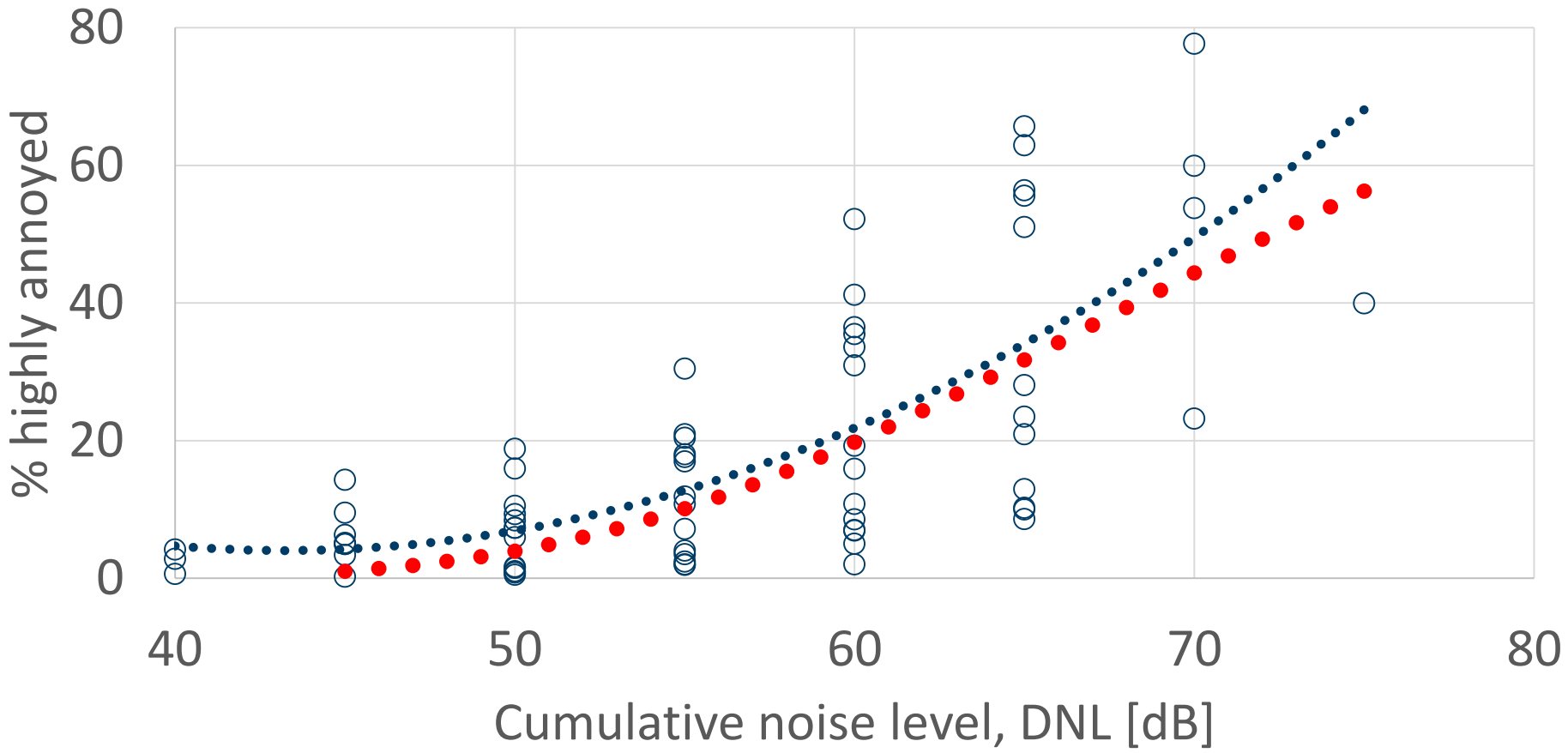
ERF for alternative dataset



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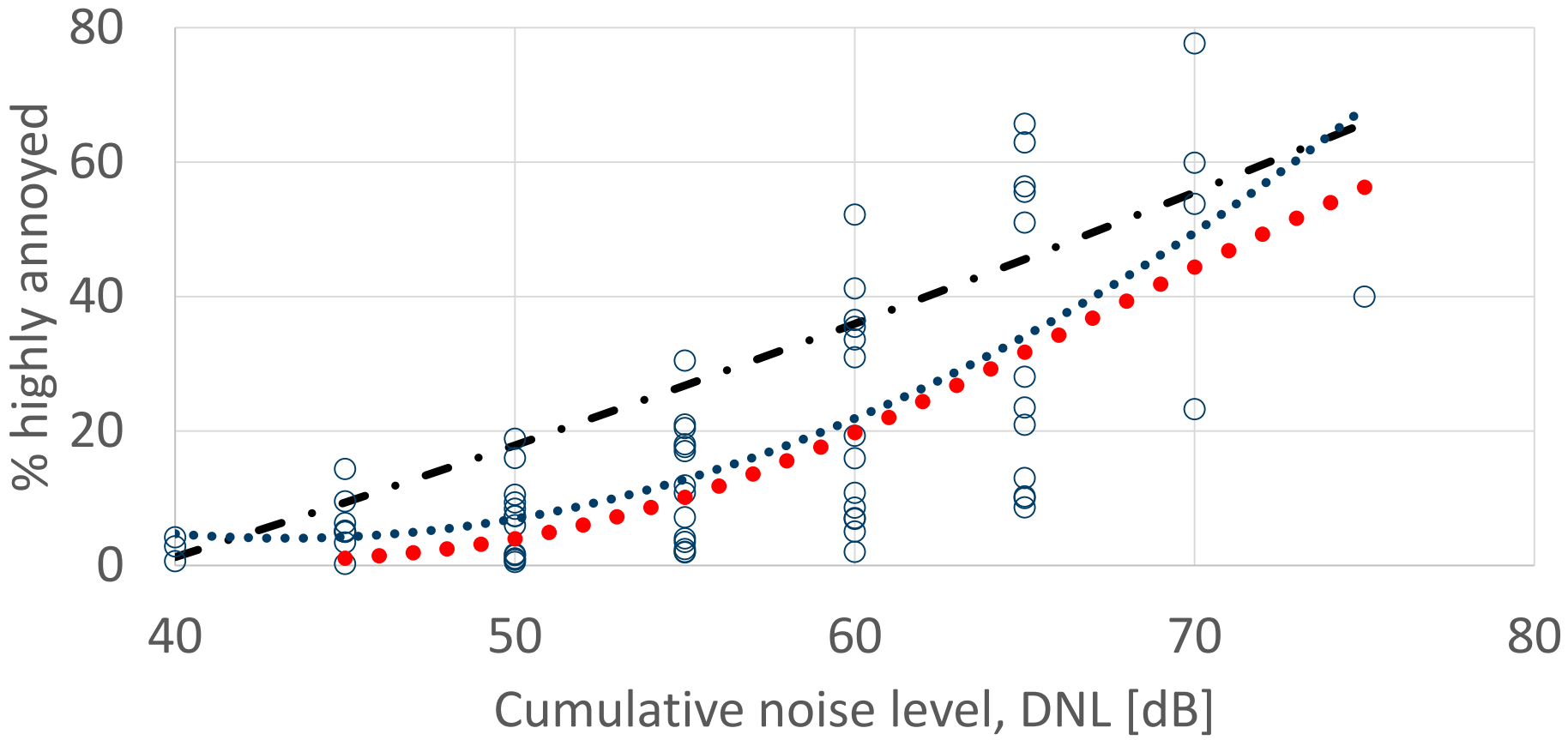

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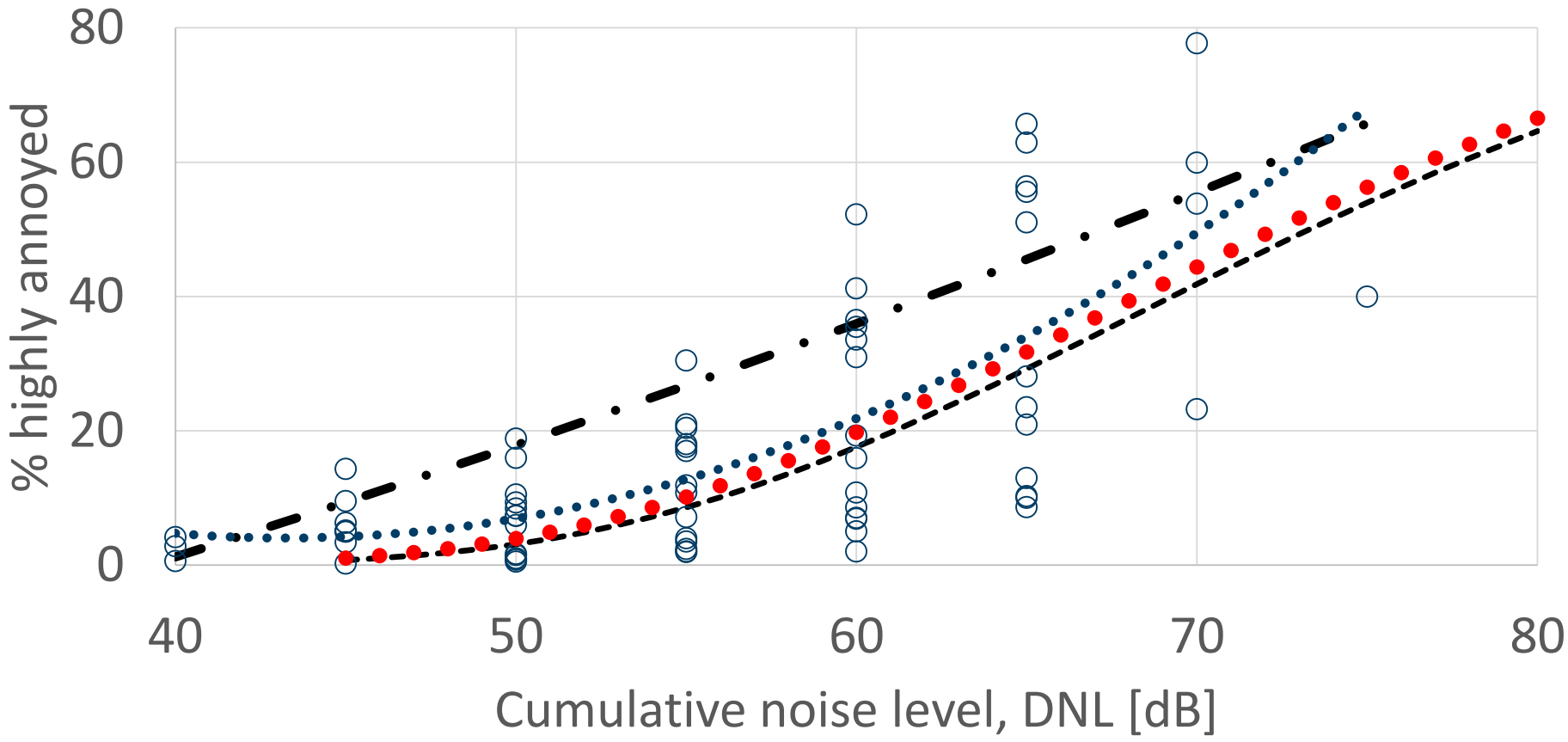

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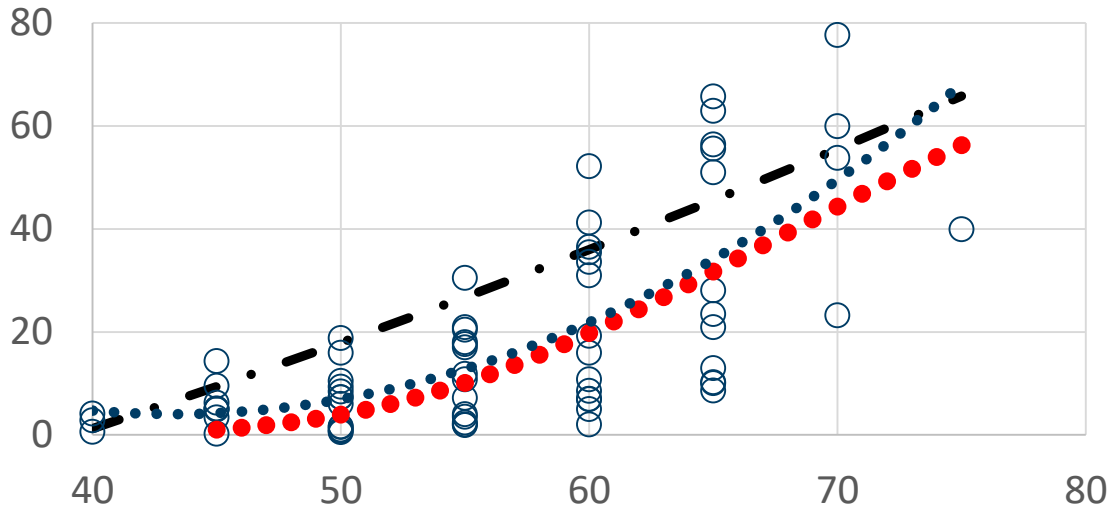
Conclusions



- WHO definition:
- 10 % highly annoyed ⟹ "adverse health effect"

- WHO dataset: L_{dn} **= 45 dB** (12 surveys, 17 000 respondents)
- Alternative dataset: L_{dn} **= 55 dB** (22 surveys, 33 000 respondents)

- New WHO recommendation for limiting aircraft noise is NOT supported by existing evidence

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