

# Health risk assessment for vehicle interior air pollution

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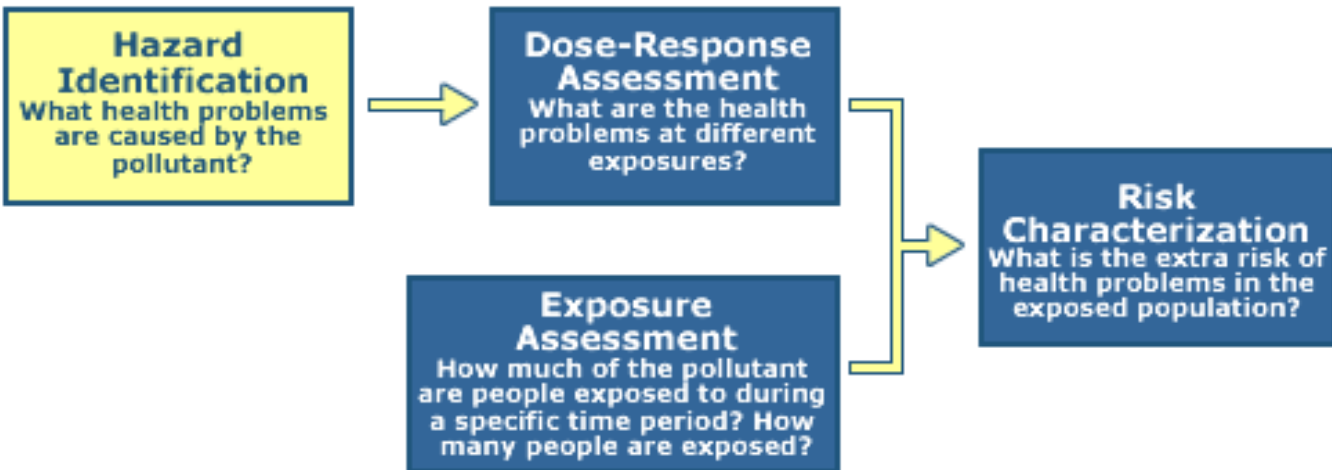
# Risk Assessment

for air pollutants

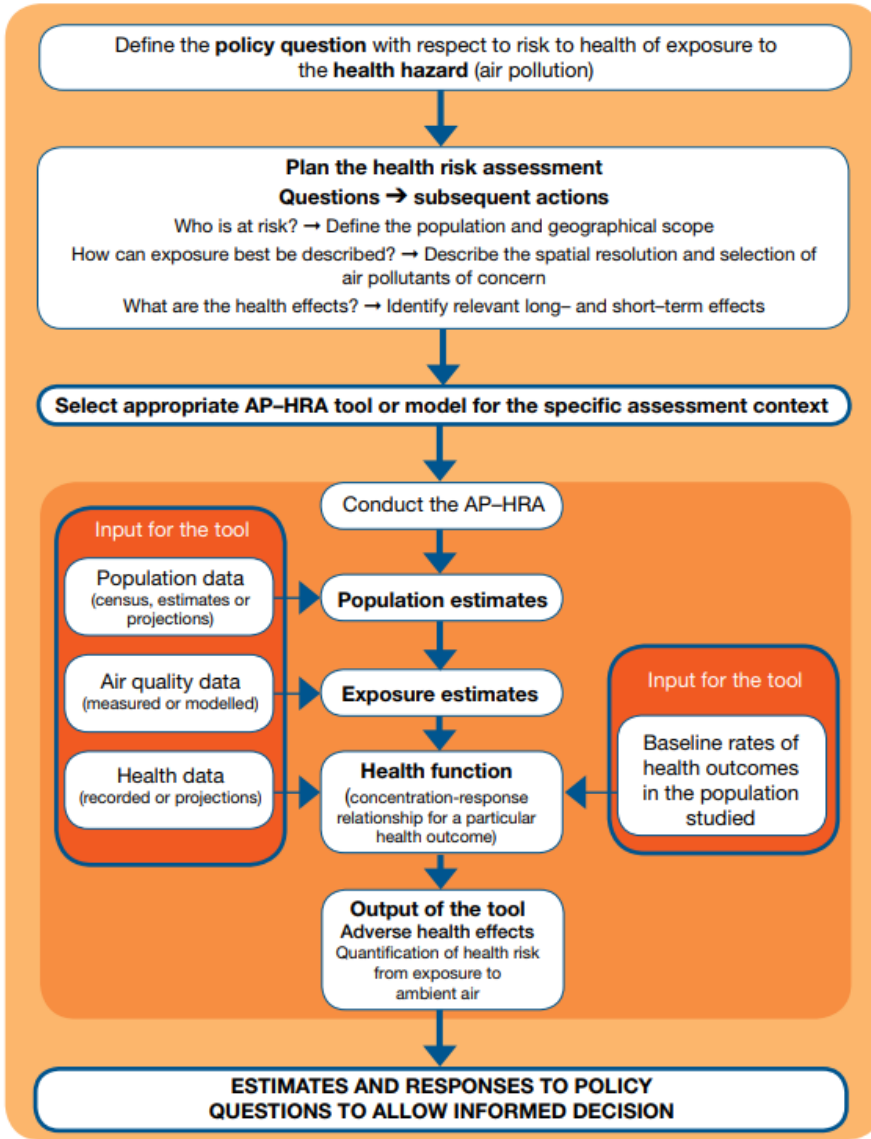
A health hazard can be defined as a source of risk to human health or wellbeing. A health risk assessment is the scientific evaluation of potential adverse health effects resulting from human exposure to a particular hazard. In the context of VIAQ activity, the health hazard of interest is air pollution.

[http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0006/298482/Health-risk-assessment-air-pollution-General-principles-en.pdf?ua=1](http://www.euro.who.int/__data/assets/pdf_file/0006/298482/Health-risk-assessment-air-pollution-General-principles-en.pdf?ua=1)

## The 4 Step Risk Assessment Process



<https://www.epa.gov/risk/conducting-human-health-risk-assessment#tab-3>



AP-HRA - air pollution health risk assessment



Hazard ratio for i-th substance:

$$HQ_i = \frac{AC_i}{RfC_i}$$

Hazard index:

$$HI = \sum_i HQ_i$$

Where:

$AC_i$  – average concentration, mg/m<sup>3</sup>

$RfC_i$  - reference (safe) concentration, mg/m<sup>3</sup>

If hazard index is more than 1, than there is a risk for human health. Than more hazard index than more is risk.

# Reference concentrations

for air pollutants

Substance	Reference concentration, mg/m <sup>3</sup>	
	acute	chronic
CO	23	3
NO	0.72	0.06
NO <sub>2</sub>	0.47	0.04
HCHO	0.043	0.003
PM <sub>2.5</sub>	0.065	0.015
PM <sub>10</sub>	0.15	0.05
O <sub>3</sub>	0.18	0.03



# Observed concentrations of air pollutants in vehicle saloon

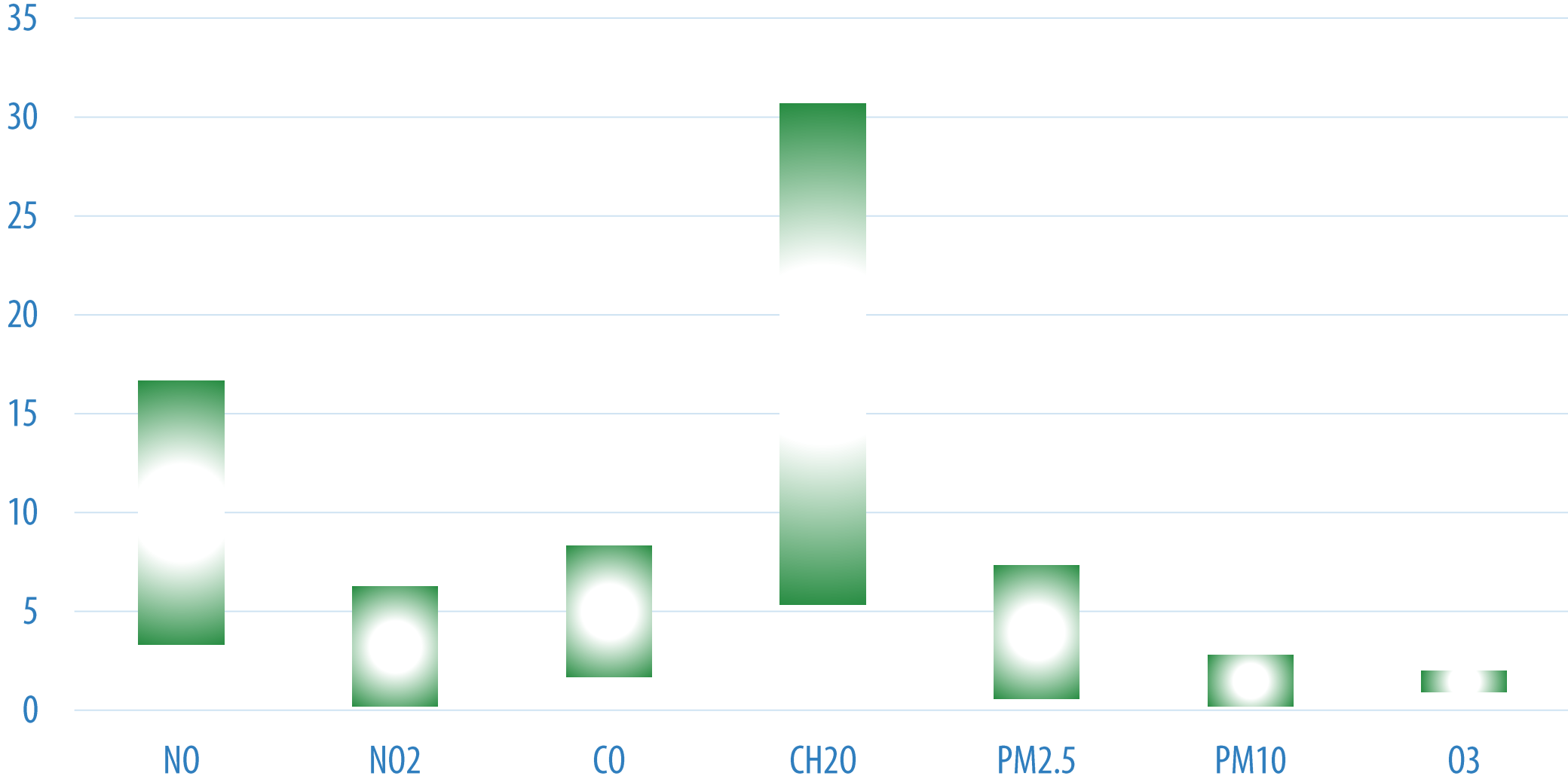
for air pollutants

Substance	Observed concentration, mg/m <sup>3</sup>	
	minimal	maximal
CO	5	25
NO	0.2	1
NO <sub>2</sub>	0.008	0.25
HCHO	0.016	0.092
PM <sub>2.5</sub>	0.009	0.11
PM <sub>10</sub>	0.01	0.14
O <sub>3</sub>	0.028	0.06

Data sources see VIAQ-08-11



# Hazard ratio of main vehicle interior air pollutants (chronic effect)



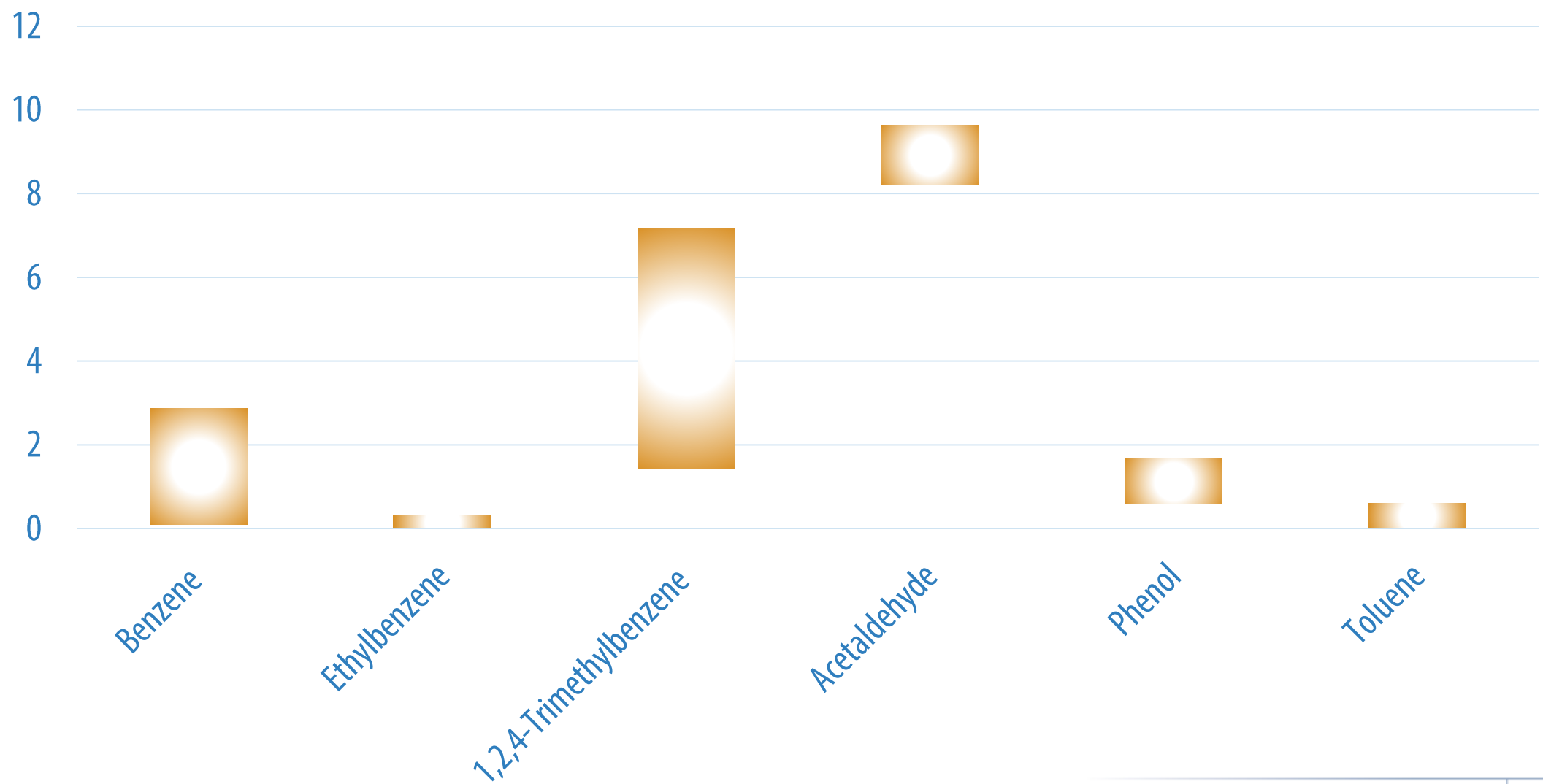
# Reference concentrations

for air pollutants

Substance	Reference concentration, mg/m <sup>3</sup>		Observed concentration, mg/m <sup>3</sup>	
	acute	chronic	minimal	maximal
Benzene	0.03	0.15	0.0027	0.086
Ethylbenzene	1	1	0.004	0.3
1,2,4-Trimethylbenzene	-	0.006	0.0085	0.0431
Acetaldehyde	0.009	0.115	0.0738	0.0868
Phenol	0.006	6.0	0.0035	0.01
Toluene	0.4	3.8	0.0054	0.24



# Hazard ratio of hydrocarbons (chronic effect)





## Conclusions

1. The human health risk assessment of main pollutants in vehicle interior air showed that most dangerous components are formaldehyde, NO, CO, and particles with diameter less than 2.5  $\mu\text{m}$ .
2. The risk assessment showed similar results with relative toxic effect assessment which was carried out early (see informal document VIAQ-13-04).
3. The human health risk of other hydrocarbons is smaller than effect of main pollutants.
4. It is advisable to include to scope of VIAQ IWG particulate matters and conduct some tests to assess particles concentration in vehicle interior air.

**Thank you for your attention!**

