4th Working Group Meeting

COT Action CA18218
European Burden of Disease Network

Burden of cardiovascular disease attributable to $PM_{2.5}$ exposure in Portugal: trends of mortality, 2011-2020

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14th September 2023

PMCardImpact project

aims to **relate pollution to high-impact** and **high-mortality diseases** and **health costs**.

Task 1 (ENSP) – Exposure assessment to $PM_{2.5}$ in Portugal

Task 2 (CHRC)
Burden of cardiovascular diseases associated to $PM_{2.5}$

Task 3 (ENSP)
Economic impact of cardiovascular diseases associated to $PM_{2.5}$

Task 4 (ENSP)
Project coordination, overall integration of results and dissemination

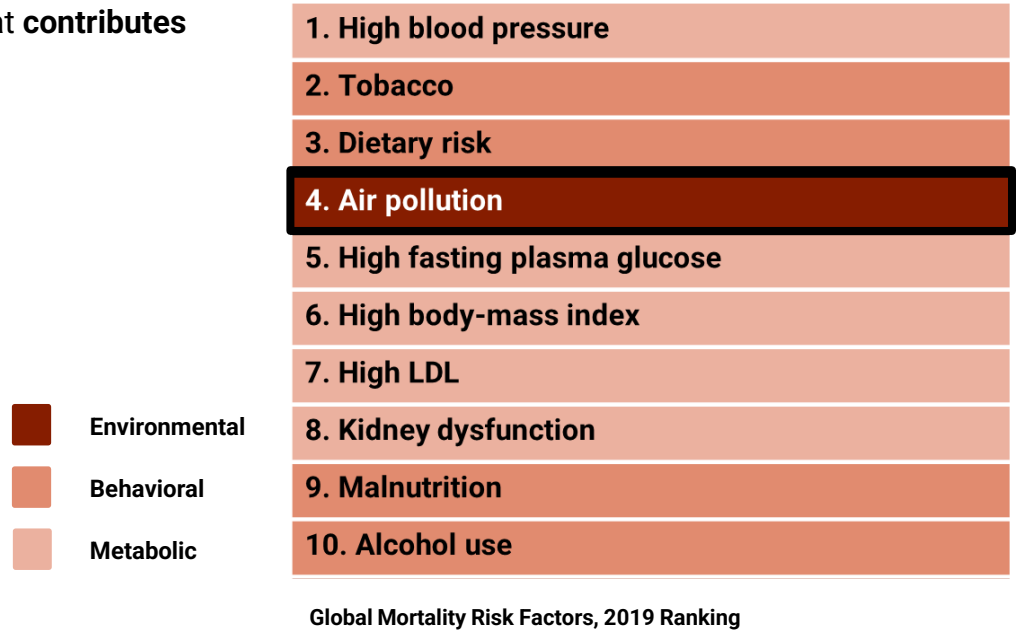
▪ National School of Public Health Carla Martins (PI) Susana Viegas (Co-PI) Florentino Serranheira Julian Perelman Lorena Lima, Mariana Corda, Francisco Madeira (Fellows) ▪ Egas Moniz School of Health and Science Ricardo Assunção	Research Team

PM2.5 PMCardImpact

BACKGROUND

Air pollution is **one of the major risks** for human health with air pollution associated with several health impacts.

Air pollution is the **environmental risk factor** that **contributes most to the burden of disease.**



Global Mortality Risk Factors, 2019 Ranking

Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Reference Life Table. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME), 2021.

BACKGROUND

Particulate matter with a diameter of 2.5 µm or less ($PM_{2.5}$) is **one of the air pollutants more harmful** to human **health.**

The cardiovascular diseases (CVD), namely **ischemic heart disease** and **stroke**, and air pollution are linked, and the American Heart Association suggests the existing **evidence of a causal relationship between exposure to particulate matter and cardiovascular morbidity and mortality**.

238,000 **premature deaths** in Europe, in 2020

Source: WHO

Brook RD et al. Particulate matter air pollution and cardiovascular disease: An update to the scientific statement from the american heart association. Circulation. 2010;121(21):2331–78.

HOW TO QUANTIFY THE IMPACT OF $PM_{2.5}$ ON HEALTH?

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Quantify the **atmospheric levels** of **$PM_{2.5}$**

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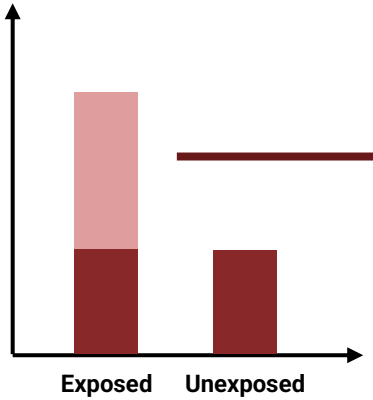
QUALAR
informação sobre qualidade do ar

apa
agência portuguesa do ambiente

Quantify the **attributable fraction** of the **exposure**

How much of **new events can be prevented** among the exposed if the **risk factor were eliminated**?



Number of cases related to **exposure**

$$PAF = \frac{1}{Pop_t} \sum Pop_c \cdot \left(\frac{RR_c - 1}{RR_c}\right)$$

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Population attributable fraction (PAF)

HOW TO QUANTIFY THE IMPACT OF $PM_{2.5}$ ON HEALTH?

Quantify the **atmospheric levels** of $PM_{2.5}$ → **Quantify** the **attributable fraction** of the **exposure**

↓

YLL = (Number of deaths x PAF) x Remaining life expectancy

RESULTS for mainland Portugal

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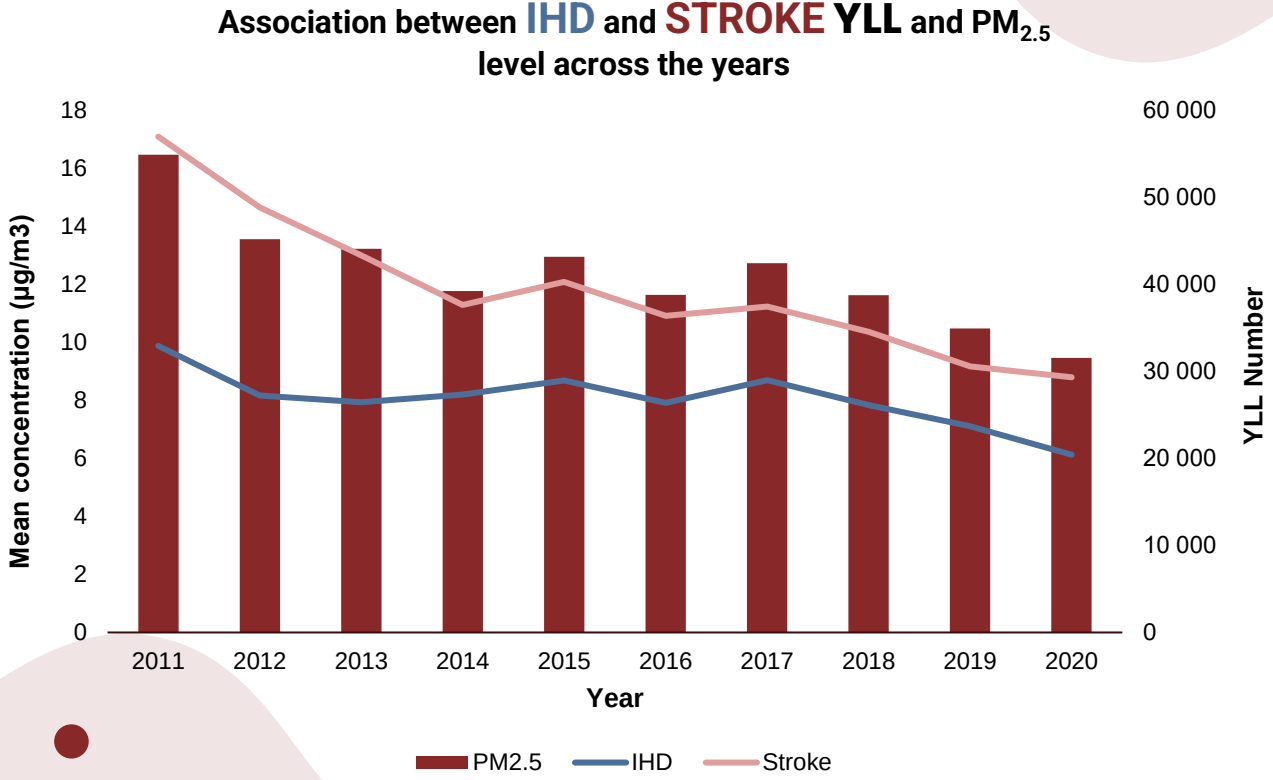
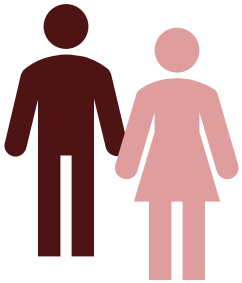


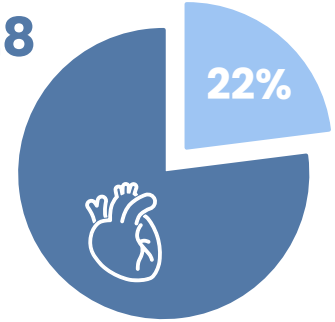
RESULTS for mainland Portugal

Between **2011-2020**



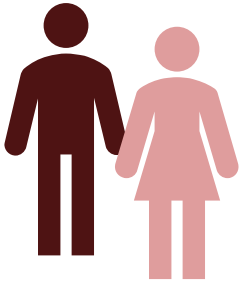
RESULTS for mainland Portugal

67,128



14,768 **deaths** attributable to **$PM_{2.5}$**

Between **2011-2020**



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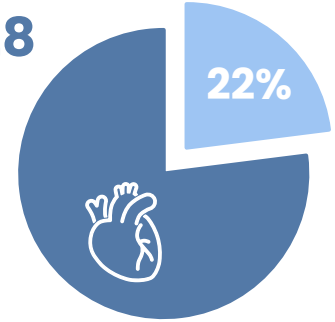

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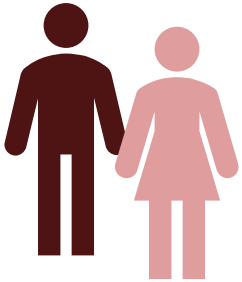
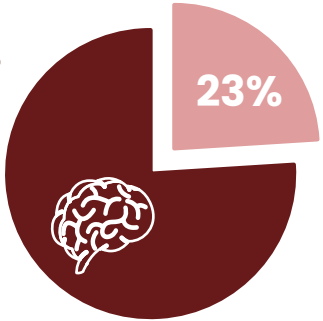


114,193



26,264 **deaths** attributable to **$PM_{2.5}$**

RESULTS for mainland Portugal

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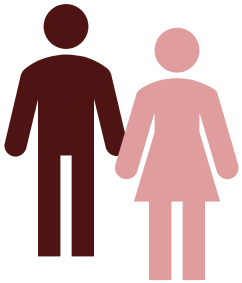

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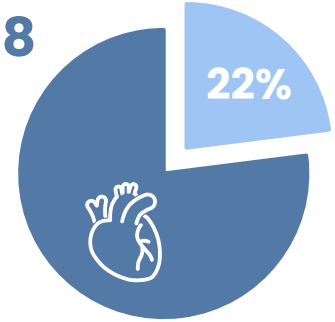
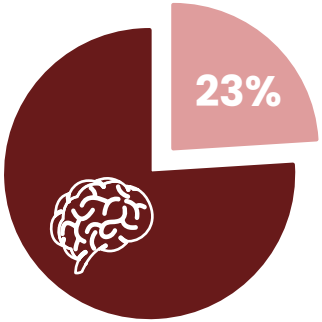


14,768 **deaths** attributable to **$PM_{2.5}$**

268,470.72 **YLL** attributable to **$PM_{2.5}$**

114,193



26,264 **deaths** attributable to **$PM_{2.5}$**

RESULTS for mainland Portugal

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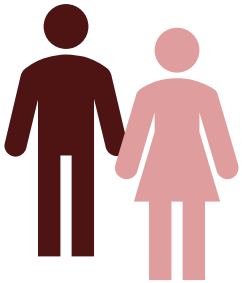

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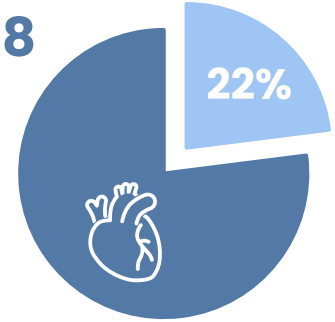

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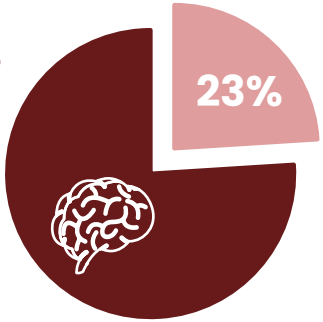
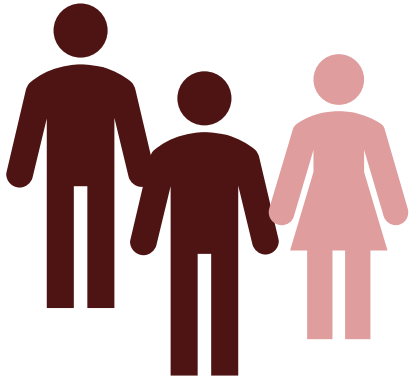


26,264 **deaths** attributable to **$PM_{2.5}$**

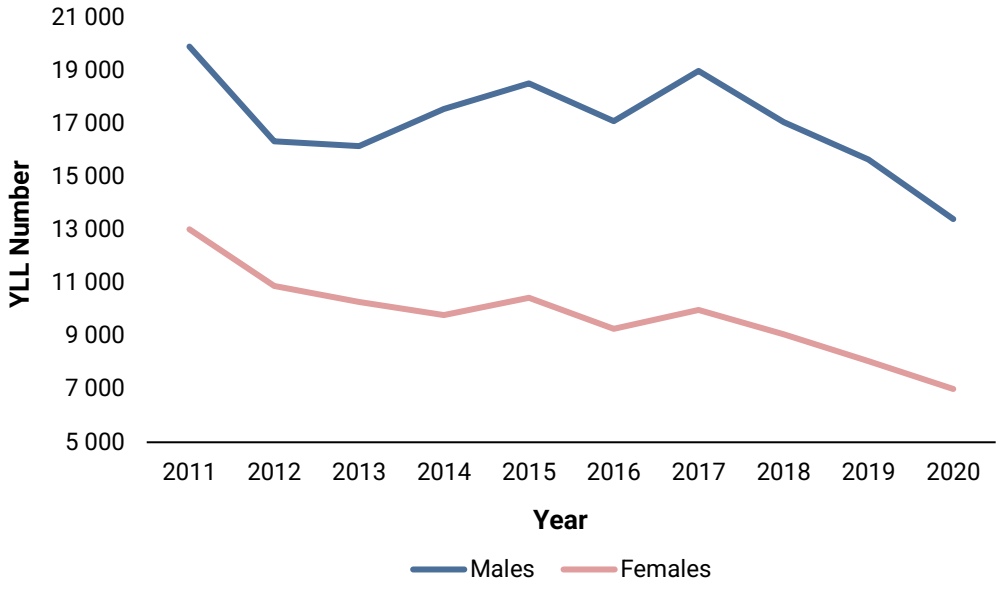
395,196.47 **YLL** attributable to **$PM_{2.5}$**

RESULTS for mainland Portugal

The **crude number of YLL** due to IHD attributable to $PM_{2.5}$ in **men is higher than in women.**

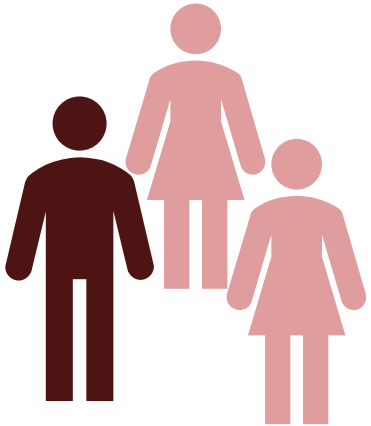


Number of ISCHEMIC HEART DISEASE YLL for different sex

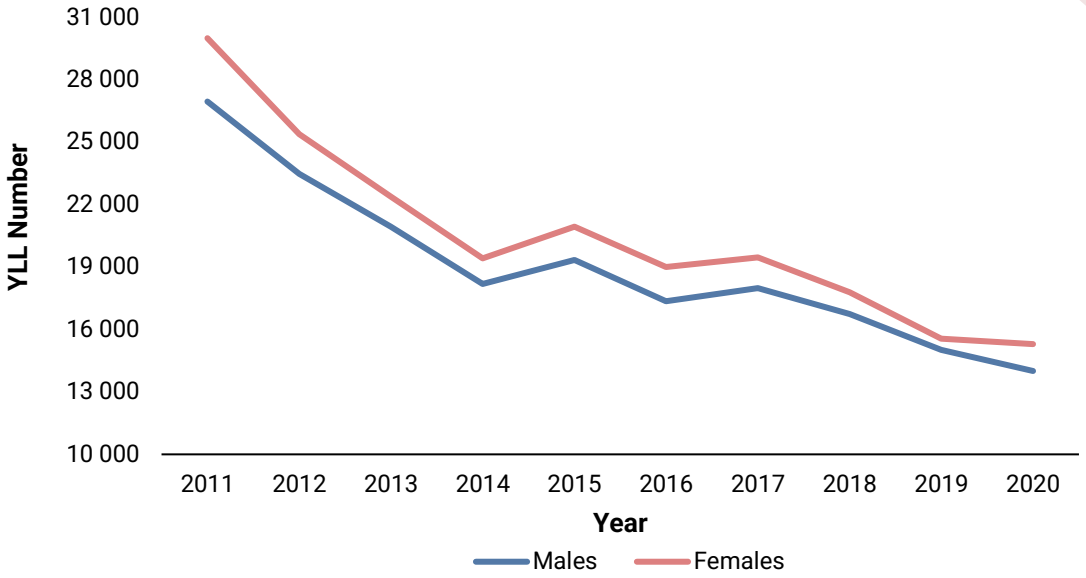


RESULTS for mainland Portugal

The **crude number of YLL** due to stroke attributable to $PM_{2.5}$ in **women is higher than in men.**



Number of STROKE YLL for different sex



RESULTS For different regions of mainland Portugal

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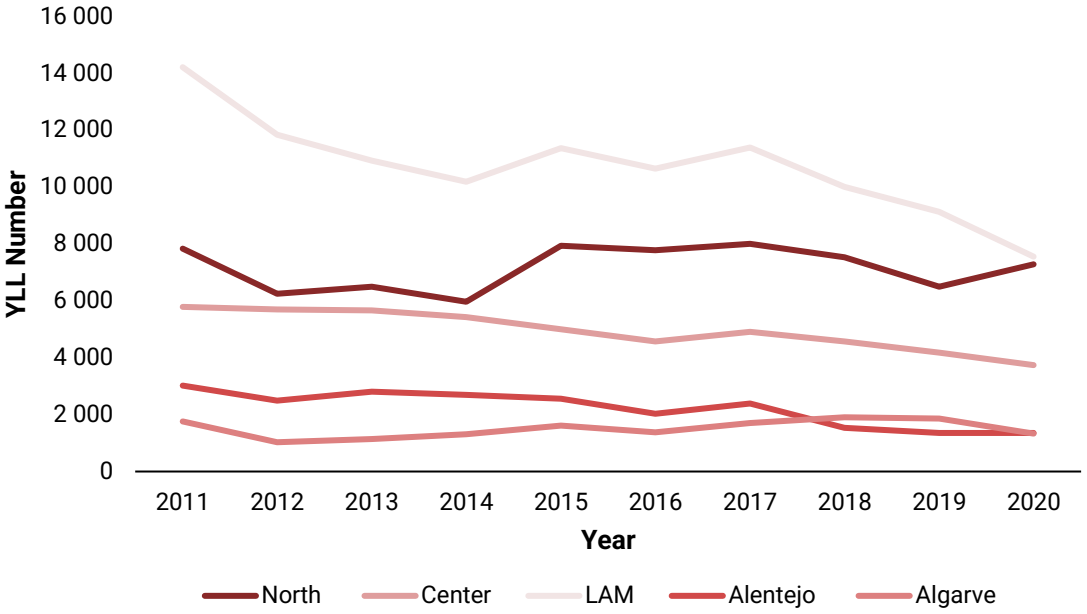
Crude number of IHD YLL – exposure $PM_{2.5}$

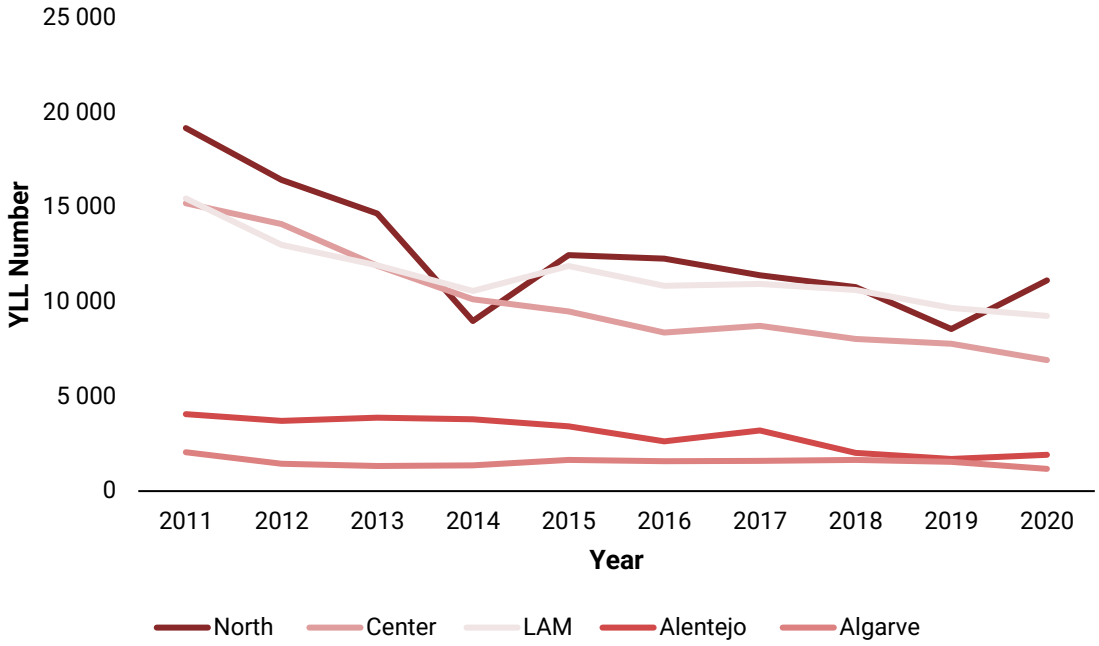
Evolution of crude number IHD YLL attributable to $PM_{2.5}$ exposure, between 2011-2020



RESULTS For different regions of mainland Portugal

Crude number of STROKE YLL – exposure $PM_{2.5}$

Evolution of crude number STROKE YLL attributable to $PM_{2.5}$ exposure, between 2011-2020



TAKE HOME MESSAGE

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HEALTH IMPACT

A safe minimum level
doesn’t exist

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A safe minimum level
doesn't exist

TO REDUCE

Be exposed at **lowest level**
as possible

TAKE HOME MESSAGE

HEALTH IMPACT

A safe minimum level doesn't exist

TO REDUCE

Be exposed at **lowest level** as possible

CALL TO ACTION

Implementation of **policies to reduce air pollution**

TAKE HOME MESSAGE

HEALTH IMPACT

Even at **levels** that meet the **legal limits**

A safe minimum level doesn't exist

TO REDUCE

Be exposed at **lowest level** as possible

CALL TO ACTION

Implementation of **policies to reduce air pollution**

Health impact

Associated costs

Burden of cardiovascular disease attributable to $PM_{2.5}$ exposure in Portugal: trends of mortality, 2011-2020

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Thank you for your attention!

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