



GRELL meeting

Group for Cancer Epidemiology
and Registration in Latin Language Countries

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Dijon, France

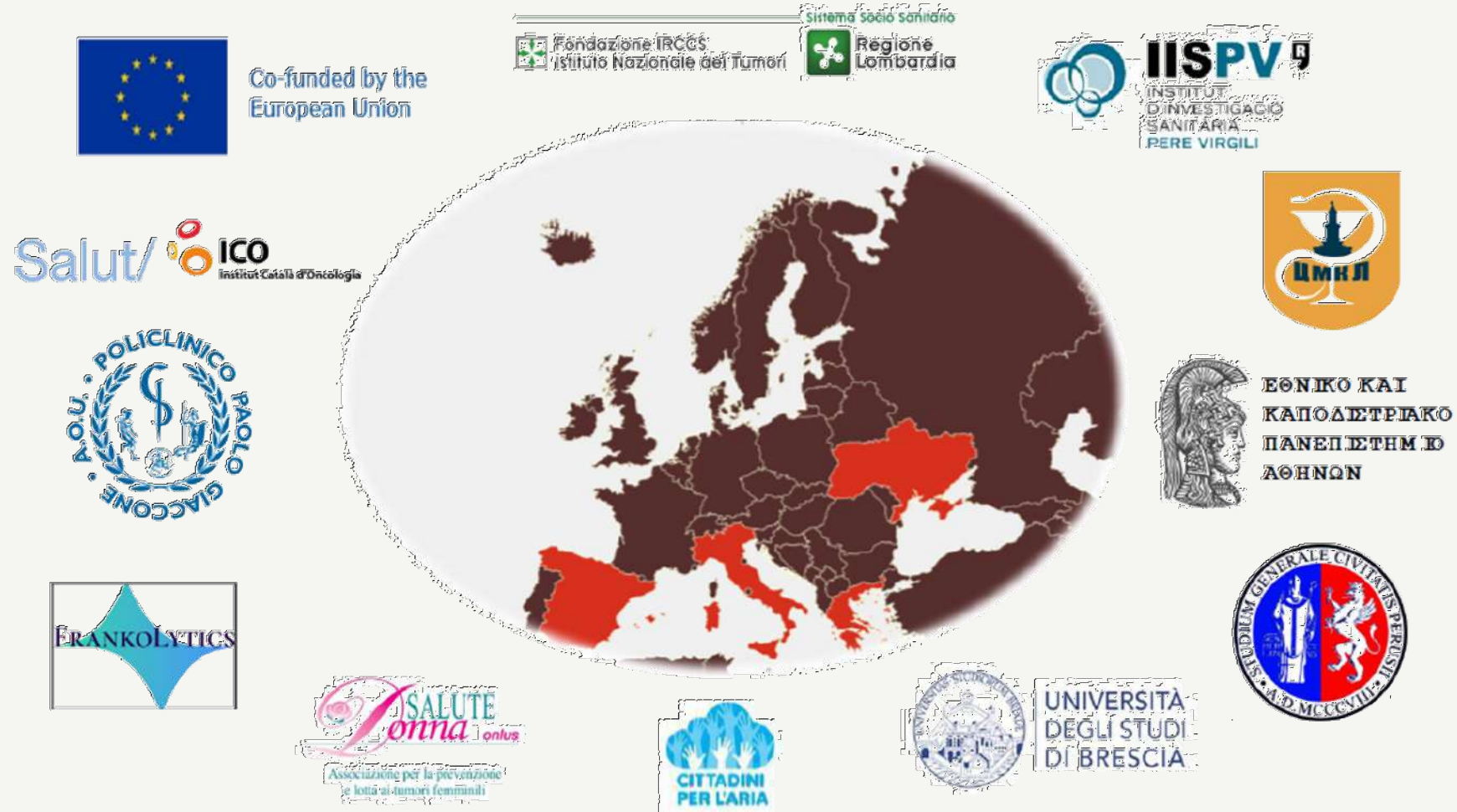


Atmospheric pollution, area deprivation and mortality hazards in women with a breast cancer diagnosis: results of the ELISAH project

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Study areas and participating institutions



ELISAH project design

The ELISAH project aims to reduce the burden of **breast cancer** by acting on modifiable **risk factors** in collaboration with JA-PreventNCDs, the EU Consortium on Cancer Prevention and other EU4Health actions



Risk factor prevalence Gap analysis

- European-wide analysis of national cancer plans, breast cancer rates and risk factor distribution
- **“High definition” analysis to assess the distribution of risk factors in women with a breast cancer diagnosis**

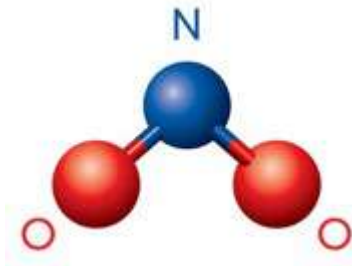


Intervention studies

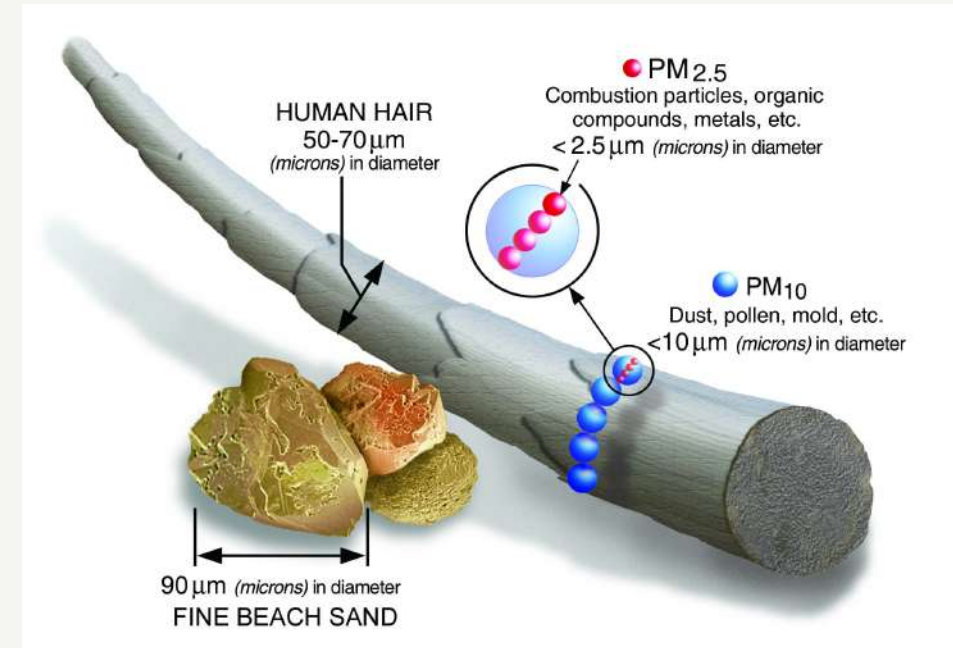
- Health-promoting lifestyle interventions using innovative approaches for organization and tools
- Improvements to the built environment to promote prevention in disadvantaged neighborhoods
- Increasing awareness of breast cancer risk factors and taking actions on inequalities that contributes as such

Study aims

- ▶ a) Quantify the exposure to PM_{2.5}, PM₁₀ and NO₂ in women with a BC diagnosis in Greece, Italy, Spain and Ukraine
- ▶ b) Compute the mortality risk in women with a BC diagnosis according to exposure to the atmospheric pollutants under analysis



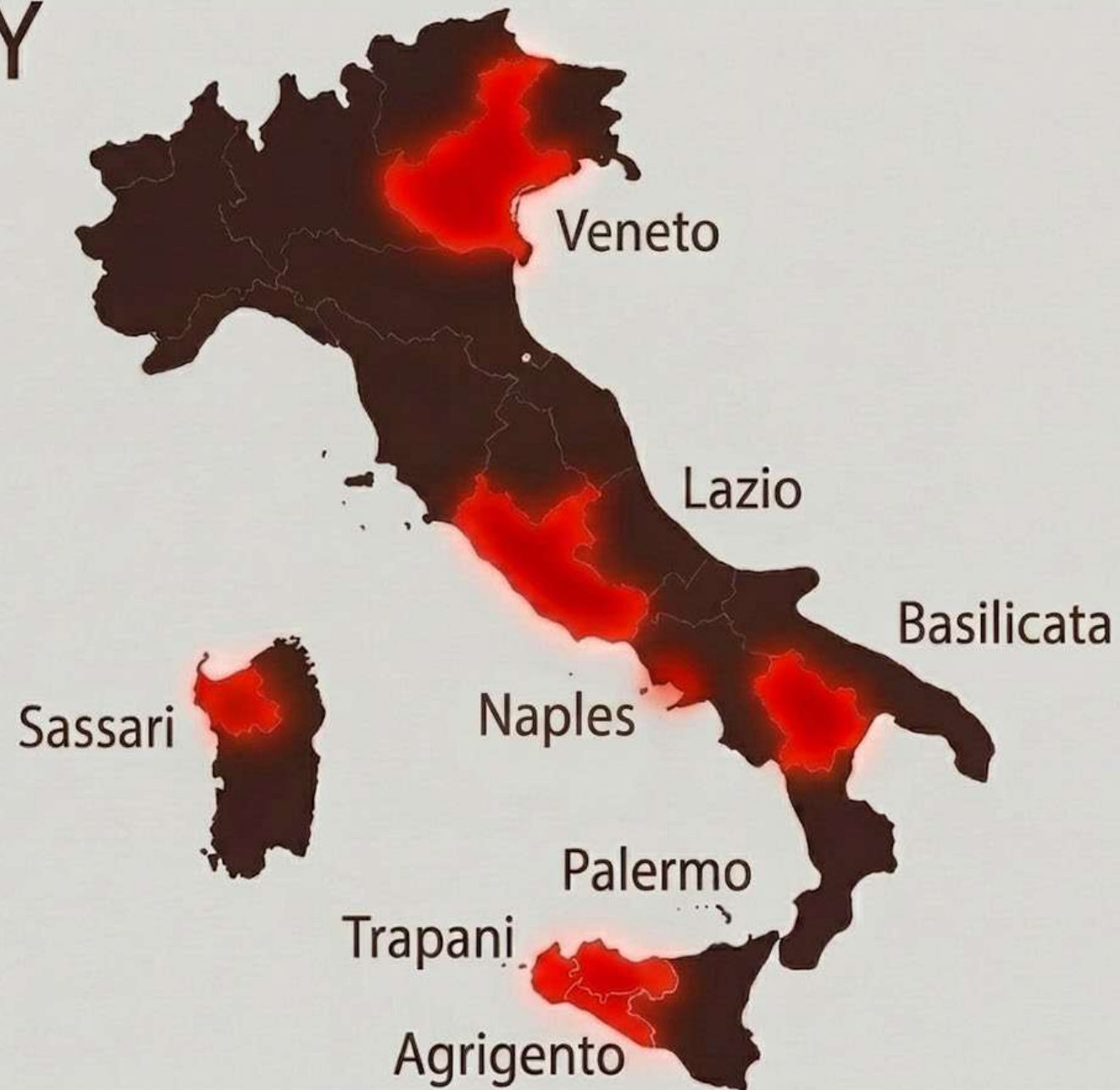
NO₂



Study design

- ▶ Retrospective study on a cohort of women diagnosed with primary BC.
- ▶ The cases were archived by the cancer registries participating in the ELISAH call for data.
- ▶ A search using site code C50 and malignant epithelial morphology codes M8000 to M8575 of the International Classification of Diseases for Oncology, Third Edition (ICD-O-3)

ITALY



SPAIN

Basque Country

Girona

Tarragona

Granada

GREECE



UKRAINE



Exposure assessment



- Estimation of PM_{2.5}, PM₁₀ and NO₂: pollutant concentrations were provided by the European Environment Agency (EEA) for Italy, Spain and Greece, and by Copernicus AMS for Ukraine



Copernicus

Resolution: 1km x 1km



Atmospheric Monitoring Service

Resolution: 10km x 10km

Exposure assessment

- ▶ Deprivation by neighbourhood was assessed using different databases for Greece, Italy and Spain
- ▶ -Italy: Deprivation index set up by Caranci et al.[1]
- ▶ -Spain: National formulation of the deprivation index as proposed by Duque et al. divided into quintiles [2]
- ▶ -Greece: No national deprivation index available. We restricted its application to the region of Attica using the index proposed by the Athens Social Atlas Group [3]
- ▶ *-Ukraine: No national deprivation index available. ELISAH working group developed a pilot project to evaluate it. The first version of the Ukraine deprivation index was used to classify women from the Ivano-Frankivsk region.*

1. Caranci N, Biggeri A, Grisotto L, Pacelli B, Spadea T, Costa G; The Italian deprivation index at census block level: definition, description and association with general mortality;. 2010 Jul-Aug, Epidemiol Prev,34(4):167-76. Italian. PMID: 21224518.
2. Duque I, Domínguez-Berjón MF, Cebrecos A, Prieto-Salceda MD, Esnaola S, Calvo Sánchez M, Marí-Dell'Olmo M; en nombre del Grupo de Determinantes Sociales de la Salud, iniciativa contexto de la Sociedad Española de Epidemiología; Índice de privación en España por sección censal en 2011 [Deprivation index by enumeration district in Spain, 2011]. 2021 Mar-Apr, Gac Sanit,35(2):113-122. Spanish. doi: 10.1016/j.gaceta.2019.10.008. Epub 2020 Feb 1. PMID: 32014314.
3. Arapoglou V, Karadimitriou N, Maloutas T, Sayas J; Deprivation areas in Attica, in Maloutas T., Spyrellis S. (eds) Athens Social Atlas, Digital compendium of texts and visual material. 2021; <https://www.athenssocialatlas.gr/en/article/deprivation-areas>

Statistical analysis

- ▶ The multivariate model included **age, tumour grade, urbanisation** and **deprivation index** to control for the possible confounding effects of these variables on mortality
- ▶ The analyses performed by us are based on the Cox proportional hazards model

$$\underbrace{\lambda(t | X) = \lambda_0(t) e^{\beta X}}_{\text{Hazard of death at the instant "t"}}$$

$\lambda_0(t)$ → Baseline hazard
 β → Coefficients
 X → Covariables

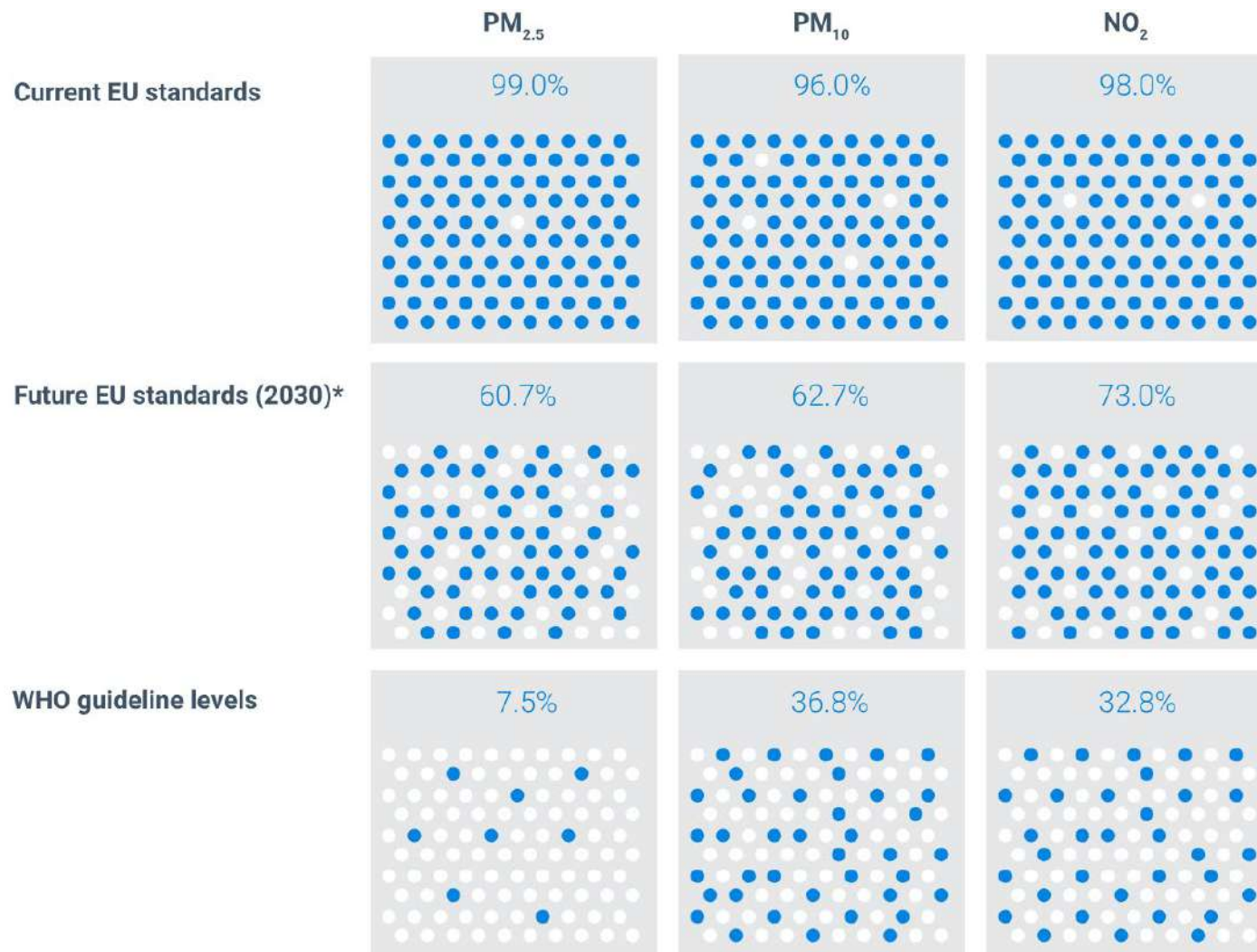
$$\underbrace{HR_{ij} = \frac{\lambda(t | X_i)}{\lambda(t | X_j)} = e^{\beta(X_i - X_j)}}_{\text{Hazard ratio. Null hypothesis } \lambda(t | X_i) = \lambda(t | X_j)}$$

↓
Likelihood ratio test

Annual maximum thresholds for air pollutants PM2.5, PM10 and NO2 set by the EU for 2030 and by the WHO in 2021.

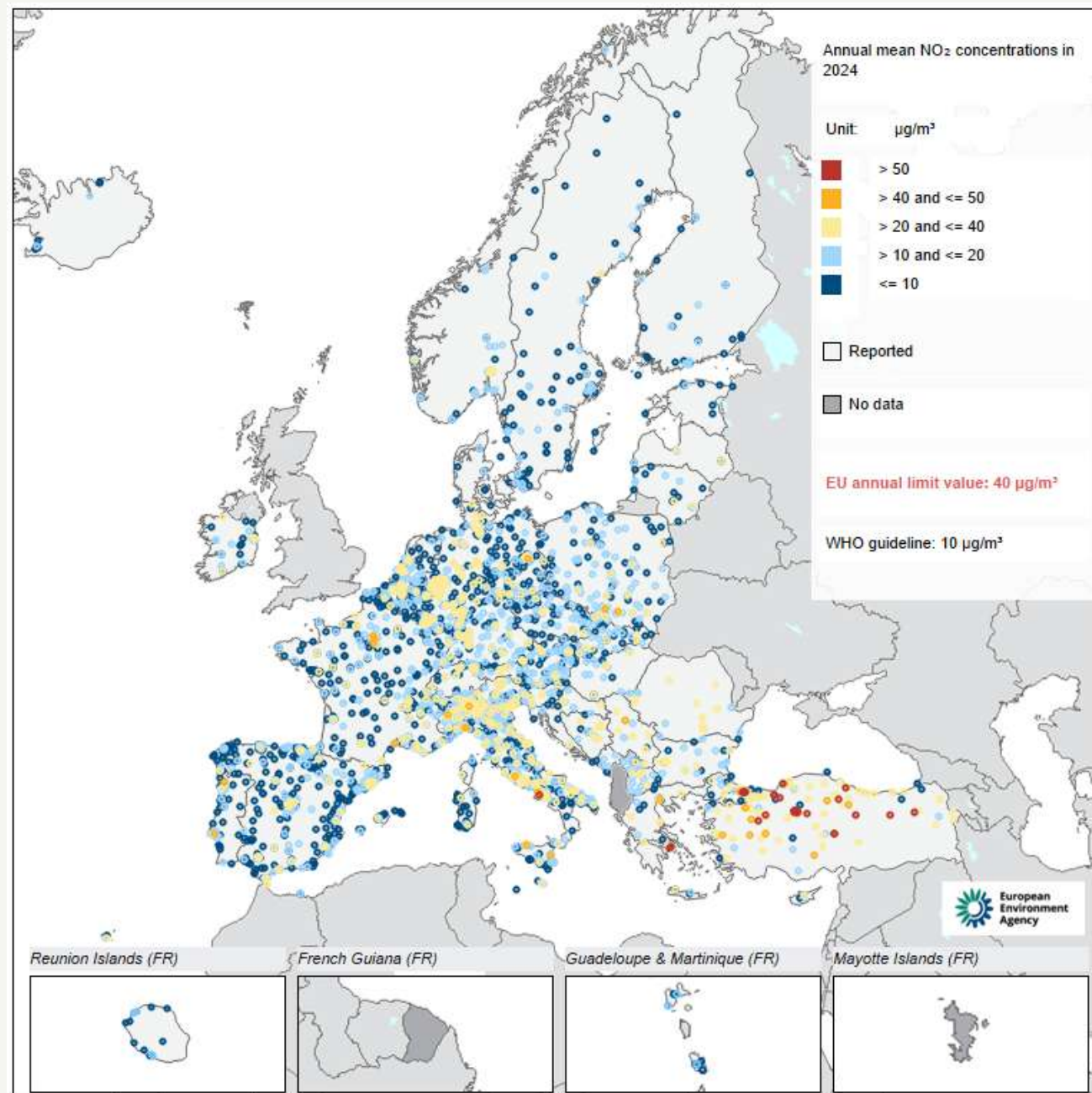
Pollutant	Reference period	EU 2030 limit value	WHO limit value
PM2.5	Calendar year	10 µg/m ³	5 µg/m ³
PM10	Calendar year	20 µg/m ³	15 µg/m ³
NO2	Calendar year	20 µg/m ³	10 µg/m ³

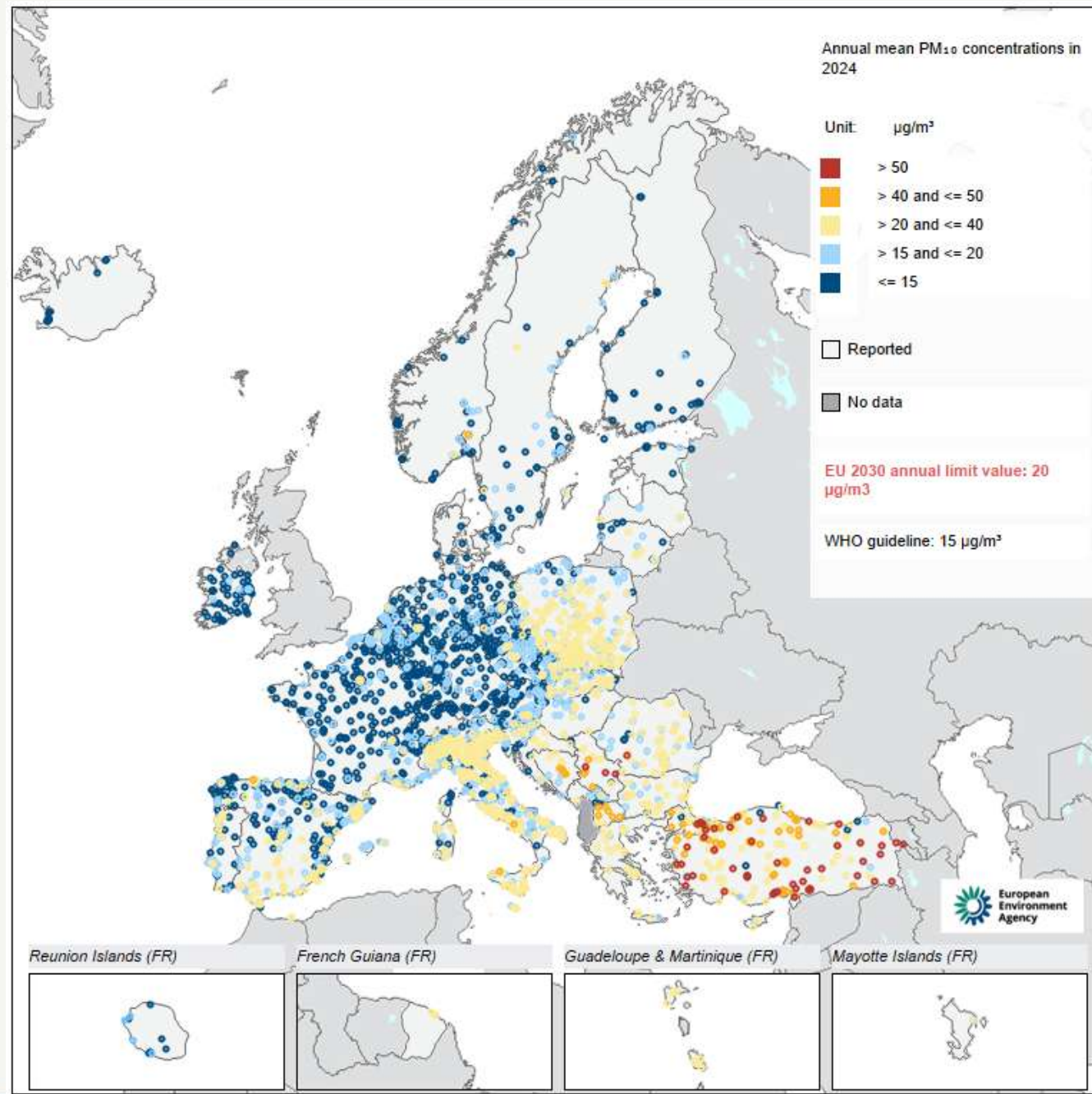
Percentage of monitoring stations in 2024 with annual concentrations below applicable EU standards and WHO guideline levels

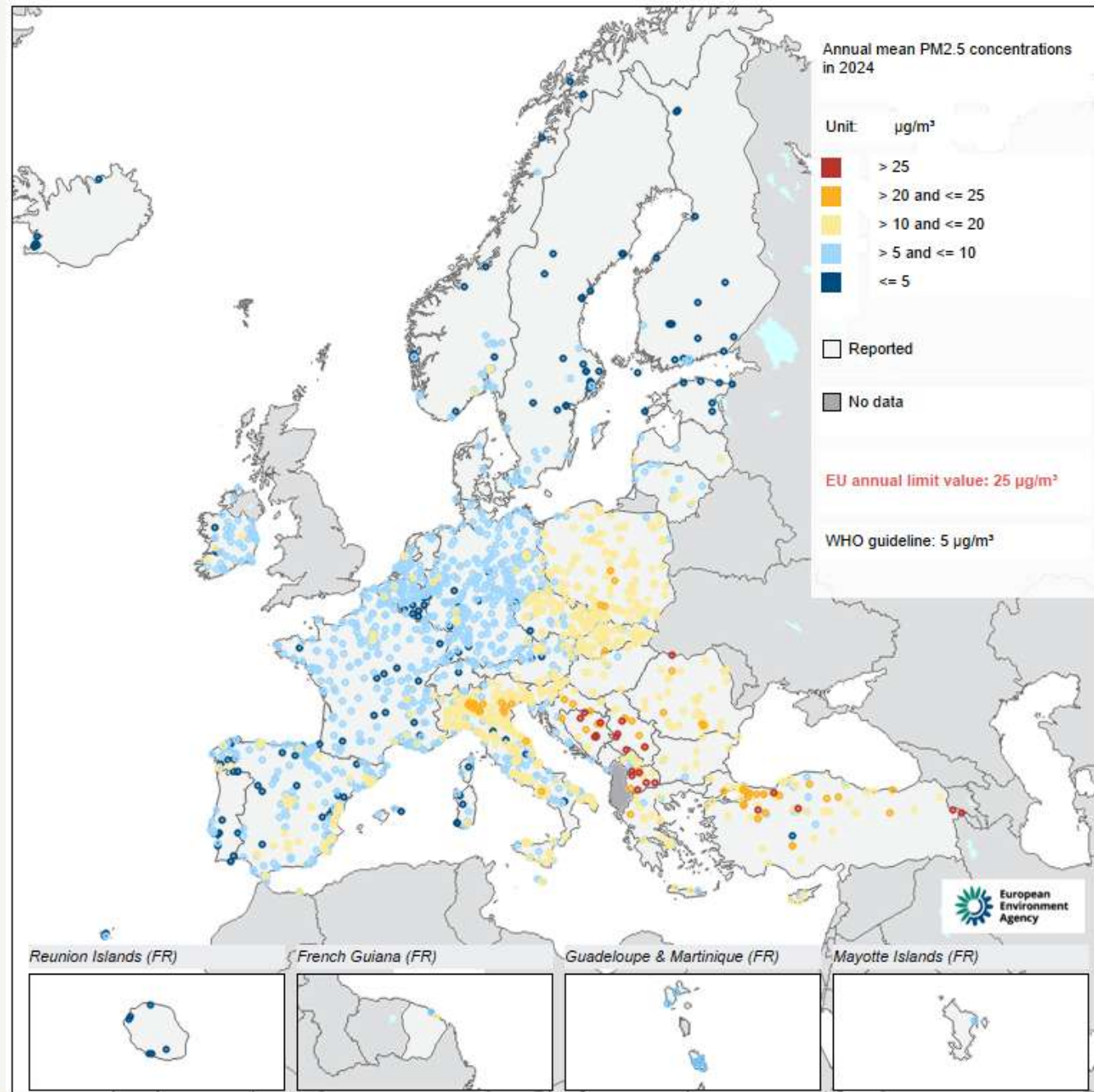


Source: [Air Quality - spatial download service per monitoring stations, 2013 - now](#), European Environment Agency (EEA)

*The 2030 limit values are presented for comparative purposes only to show the distance to target to achieve these limits by 2030.







Results

- ▶ A total of 137 812 BC cases were collected and checked, and a database was built for the storage of clinical and environmental information.
- ▶ For the analysis presented in this report we selected cases diagnosed in the period 2015-2020 according to registry data availability, with a total of 36 794 cases.

Share of women with a diagnosis of BC exposed to PM2.5, PM10 and NO2 concentrations above current EU standard and 2021 WHO guideline values.



Italy

EU Limit

WHO Limit

PM2.5



PM10



NO2



Spain

EU Limit

WHO Limit

PM2.5



PM10



NO2



Greece

EU Limit

WHO Limit

PM2.5



PM10



NO2



Ukraine

EU Limit

WHO Limit

PM2.5



PM10

-

-

NO2



Hazard ratios (HR) and 95% confidence intervals (CI) for all-cause mortality in relation to PM2.5, PM10 and NO2 exposure and deprivation index for all ages

(Cause-specific death analysis are ongoing...)

Exposure	Breast cancer cases (N)	All-cause deaths (N)	HR (95%CI) All-cause death	
PM2.5 (µg/m3)	36794	5360	Years from diagnosis	0-3: 1.10 (0.79-1.53) >3: 1.16 (0.74-1.78) 0-5: 1.11 (0.84-1.46)
PM10 (µg/m3)	36794	5360	Years from diagnosis	0-3: 0.74 (0.45-1.23) >3: 0.54 (0.27-1.09) 0-5: 0.68 (0.44-1.05)
NO2 (µg/m3)	36794	5360	Years from diagnosis	0-3: 1.16 (1.02-1.31) >3: 1.09 (0.91-1.32) 0-5: 1.13 (1.02- 1.25)
Deprivation index	36794	5360	Deprivation quintiles 0-5 years from diagnosis	Least: 1 0.92 (0.84-1.01) 0.94 (0.86-1.04) 1.02 (0.92-1.13) Most: 1.18 (1.06-1.31)

Conclusion

- ▶ The ELISAH project succeeded in building a large cohort of BC cases collected by population-based cancer registries, linking information on PM2.5, PM10, NO2 as well as the deprivation index by neighbourhood
- ▶ The vast majority of women of the ELISAH cohort were exposed to levels of PM2.5, PM10 and NO2 above the threshold suggested by the WHO guidelines
- ▶ Analysis of the cohort of women with a BC diagnosis showed a mortality risk related to NO2 exposure
- ▶ Analysis of the cohort of women with a BC diagnosis highlighted a mortality risk related to living in deprived areas
- ▶ The previous points prompt urgent application of interventions to reduce atmospheric pollutant exposure as suggested by the WHO to combat BC mortality

The background of the slide features a photograph of a colorful, patterned tiled roof, likely from a historic building. On the right side, a tall, ornate statue is visible. The sky above is a soft, hazy mix of yellow and blue, suggesting a sunrise or sunset. The overall image has a slightly faded, artistic quality.

Thank you for your attention