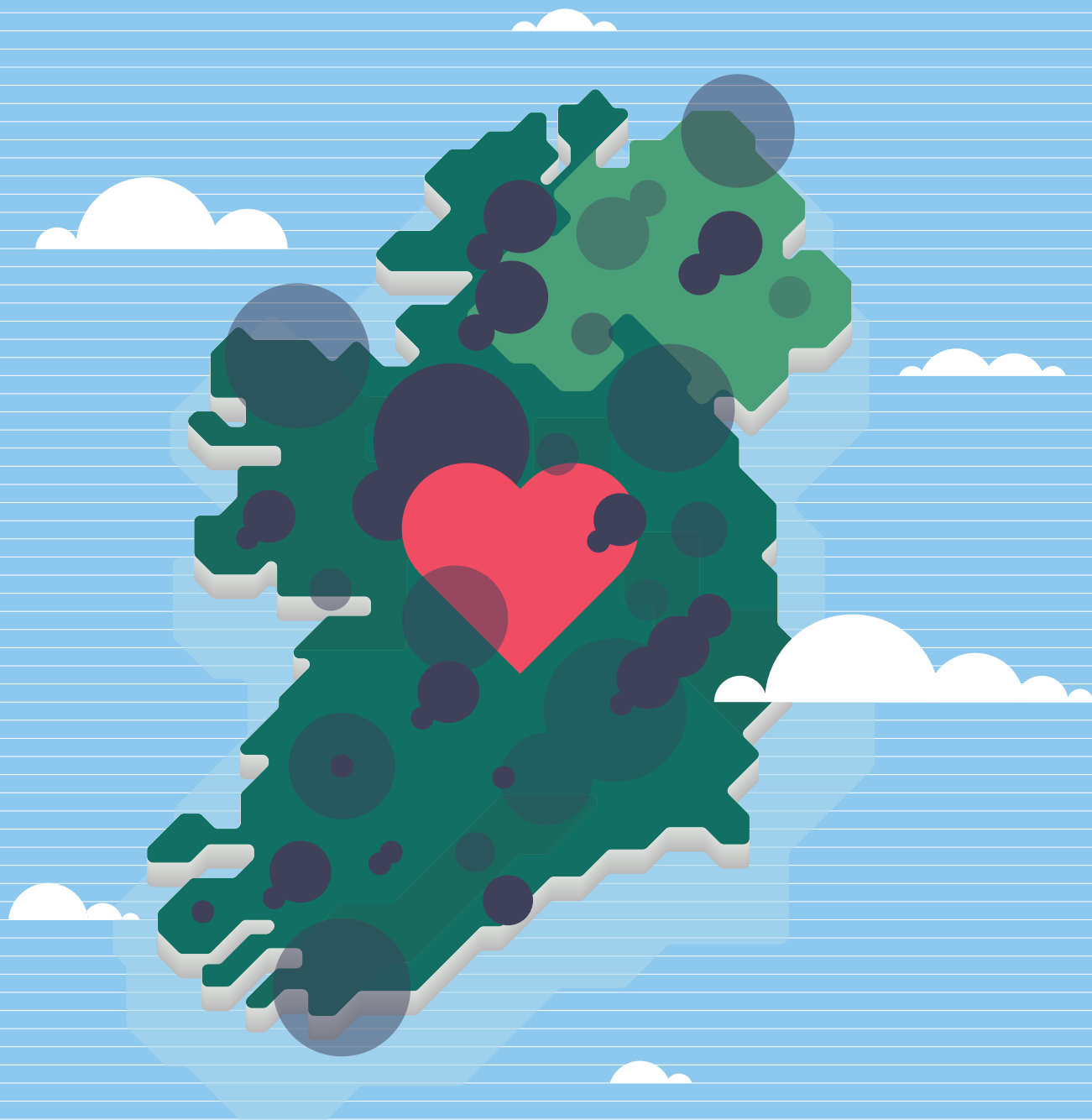


AIR POLLUTION AND MORTALITY ON THE ISLAND OF IRELAND



Working in partnership to tackle air pollution: **British Heart Foundation & Irish Heart Foundation**



What we do

Heart and circulatory diseases are the leading cause of death globally, taking an estimated 17.9 million lives each year.¹

In the UK and Ireland, the **British Heart Foundation (BHF)** and the **Irish Heart Foundation (IHF)** are leading the fight against these diseases.

Together as part of the European Heart Network, we work with other foundations and associations dedicated to preventing cardiovascular diseases, supporting patients, representing patient interests and funding research.

Action on air pollution

The World Health Organization (WHO) estimates that in 2019, 37% of outdoor air pollution-related premature deaths were due to ischaemic heart disease and stroke.² Across Northern Ireland and the Republic of Ireland, poor air quality continues to detrimentally impact public health.

That's why the BHF and IHF have joined forces on this transboundary issue, to advocate for urgent policy changes to improve air quality across the island of Ireland – ultimately improving heart health for everyone.

Community Foundation All-Island fund grant

In July 2021, we received funding from the Community Foundation Ireland All-island Community Fund to commission a team at Queen's University Belfast (QUB) and Technological University Dublin (TUD) to conduct research into air pollution and mortality on the island of Ireland.

Using data from 2019, the most recent year unaffected by COVID-19, their report estimates the number of premature deaths associated with fine particulate matter air pollution exposure across the island of Ireland and estimates the number of lives that could be saved by meeting WHO 2021 Air Quality Guidelines.

This briefing is a summary of those findings and policy recommendations for improving air quality to protect health.

1. World Health Organization. (2023). *Cardiovascular diseases*. <https://www.who.int/health-topics/hypertension/cardiovascular-diseases>.

2. World Health Organization. (2022). *Ambient (outdoor) air pollution*. [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health).

Air pollution: The silent killer

What is air pollution?

Air pollution is the presence of extremely small particles and gases in the air which can cause harm if you breathe them in.

The gases and small particles include:

- Gases such as nitrogen dioxide (NO₂), ozone (O₃), sulphur dioxide (SO₂) and carbon monoxide (CO).
- Particulate matter (PM), made up of particles such as soot and dust. These tiny toxic particles are of particular concern to our health.

Polluted air can come from several sources, including domestic wood and coal burning, road transport, and industrial combustion and processes.

How does air pollution cause harm to health?

Research funded by the British Heart Foundation has shed light on how fine particulate matter, or PM_{2.5} for short, causes harm to the heart and circulatory system, contributing to the development of new health problems or putting people with existing conditions at increased risk of fatal events like a heart attack or stroke.

When PM_{2.5} is present in the air we breathe, these particles are small enough to enter our lungs, and from there, the particles can enter our bloodstream. Prolonged exposure can affect your heart and circulation by:

- Damaging the inside walls of your blood vessels, causing them to become narrower and harder.
- Restricting the movement of your blood vessels, which can increase your blood pressure and add to the strain on your heart.
- Making your blood more likely to clot.
- Affecting the normal electrical functioning of your heart which could cause abnormal heart rhythms.
- Causing small changes to the structure of the heart like those that are seen in the early stages of heart failure.

This damage can increase the risk of potentially fatal heart attacks and strokes, especially in vulnerable people, and worsen existing heart conditions.

Figure 1.



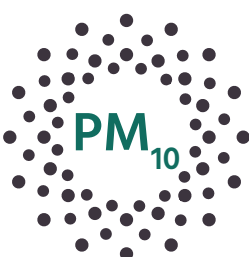
Ultrafine particulate matter

Around a thousandth of the width of a human hair.



Fine particulate matter

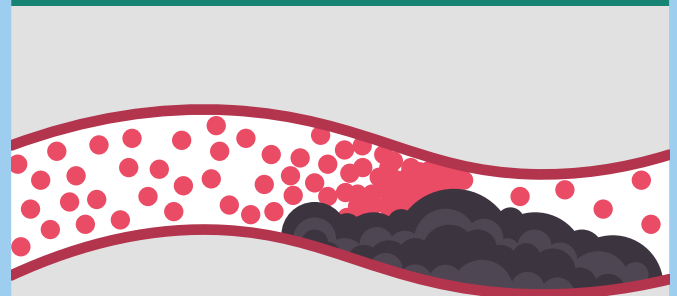
Anything with a diameter of less than 2.5 micrometres – that's around a 30th of the width of a human hair.



Coarse particulate matter

Coarse particulate matter.

Figure 2.



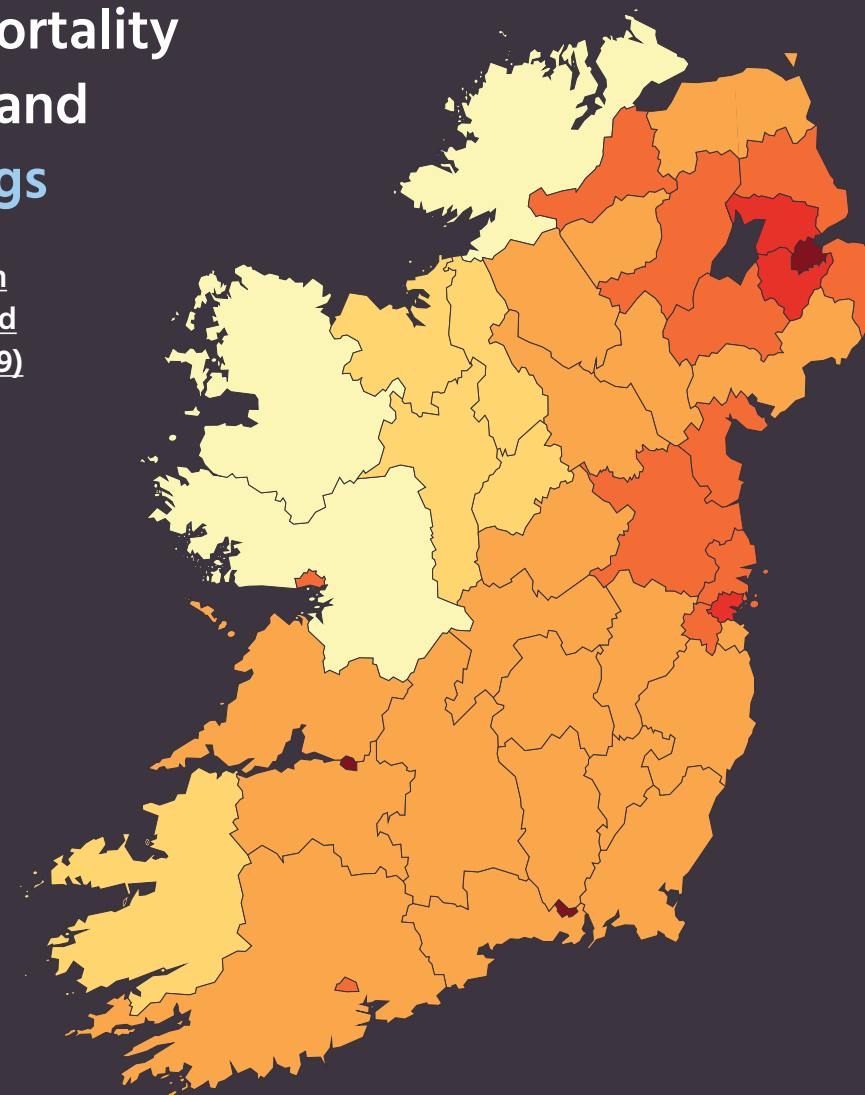
Toxic particles can worsen the build up of fatty materials inside the arteries causing blood clots.

Air pollution and mortality on the island of Ireland

Key research findings

Annual average PM_{2.5} concentration by county and city council (ROI) and Local Government District (NI) (2019)

Micrograms per cubic metre



Source: P. Goodman, B. Jahanshahi, D. McVicar and N. Rowland. (2023). *Air Pollution and Mortality on the Island of Ireland*.

Pollutant	Current legal limits	2021 WHO Air quality guidelines
Fine particulate matter (PM _{2.5})	25 µg/m ³ annual mean	5 µg/m ³ annual mean

µg/m³ = Micrograms per cubic metre. PM_{2.5} = Particulate matter less than 2.5 micrometres.

Average PM_{2.5} outdoor air pollution exposure (2019):

- Generally highest in densely populated areas, with Limerick City (11.1 µg/m³) and Belfast (10.1 µg/m³) experiencing the highest levels of pollution in Republic of Ireland (ROI) and Northern Ireland (NI) respectively, closely followed by other urban centres including Waterford City and Dublin City.
- Average PM_{2.5} exposures met the current legal limits in every county and city council in ROI and Local Government District (LGD) in NI. However, each county and LGD exceeded the 2021 WHO Air Quality Guideline (AQG) level for PM_{2.5}, above which there is compelling evidence for harm to human health.

Estimated mortality burden (2019) across ROI county/city councils and NI Local Government Districts (LGDs):

- Approximately 2,600 premature deaths across the island of Ireland were attributable to PM_{2.5} air pollution exposure, with 900 in Northern Ireland and 1,700 in Republic of Ireland.
- Almost 1,000 of these 2,600 premature deaths were heart and stroke-related – 314 in NI and 681 in ROI.
- All-cause and heart and stroke premature deaths were highest in Belfast and Dublin, but there are attributable deaths in all county/city councils in Republic of Ireland and LGD in Northern Ireland.

Estimated mortality burden of PM_{2.5} exposure in 2019

Table 1 and Table 2 contain estimates of the mortality burdens of PM_{2.5} exposure in 2019 by local government area in Northern Ireland and Republic of Ireland, respectively. In each table, columns 2 and 3 show deaths due to all causes (minus deaths due to external causes) and due to circulatory-related diseases; column 4 shows the estimated PM_{2.5} level in each local area in 2019; columns 5–6 show the percentage of deaths attributable to ambient PM_{2.5} air pollution, i.e. the Attributable Fraction. The final two columns provide the estimated number of attributable deaths by cause.

Table 1. Estimated mortality burden in Northern Ireland in 2019³

Area	Deaths (16+)		PM _{2.5} µg/m ³	Attributable fraction		Attributable deaths due to PM _{2.5} air pollution	
	All-cause	Circulatory		All-cause	Circulatory	All-cause	Circulatory
Antrim and Newtownabbey	1,123	273	9.4	7.0%	9.4%	79	26
Ards and North Down	1,414	338	8.9	6.6%	8.8%	93	30
Armagh City, Banbridge and Craigavon	1,402	364	8.7	6.5%	8.6%	90	31
Belfast	2,891	664	10.1	7.5%	10.0%	216	66
Causeway Coast and Glens	1,182	323	7.5	5.6%	7.5%	66	24
Derry City and Strabane	1,164	278	8.4	6.2%	8.4%	73	23
Fermanagh and Omagh	883	215	7.4	5.5%	7.4%	49	16
Lisburn and Castlereagh	1,149	285	9.3	6.9%	9.2%	79	26
Mid and East Antrim	1,213	317	8.5	6.3%	8.5%	77	27
Mid Ulster	958	280	8.1	6.0%	8.1%	58	23
Newry, Mourne and Down	1,319	345	8.0	5.9%	8.0%	78	27
NI	14,698	3,682	8.6	6.4%	8.5%	936	314

3. P. Goodman, B. Jahanshahi, D. McVicar and N. Rowland. (2023). *Air Pollution and Mortality on the Island of Ireland*.

Table 2. Estimated mortality burden in the Republic of Ireland in 2019⁴

Area	Deaths (15+)		PM _{2.5} µg/m ³	Attributable fraction		Attributable deaths due to PM _{2.5} air pollution	
	All-cause	Circulatory		All-cause	Circulatory	All-cause	Circulatory
Carlow County	375	125	7.8	5.8%	7.8%	22	10
Cavan County	453	153	7.0	5.3%	7.1%	24	11
Clare County	744	227	7.4	5.5%	7.4%	41	17
Cork City	1,029	331	8.9	6.6%	8.8%	68	29
Cork County	2,422	768	7.3	5.5%	7.3%	132	56
Donegal County	1,168	385	6.0	4.5%	6.1%	53	23
Dublin City	4,024	1,148	9.0	6.7%	9.0%	270	103
Dún Laoghaire-Rathdown	1,422	478	7.8	5.8%	7.8%	83	38
Fingal	1,055	284	8.6	6.4%	8.6%	68	24
Galway City	375	109	8.7	6.5%	8.7%	24	9
Galway County	1,213	366	5.9	4.5%	6.0%	54	22
Kerry County	1,159	351	6.0	4.5%	6.1%	53	21
Kildare County	968	266	7.8	5.8%	7.8%	56	21
Kilkenny County	624	181	7.9	5.9%	8.0%	37	14
Laois County	433	122	7.6	5.7%	7.6%	24	9
Leitrim County	287	90	6.2	4.6%	6.2%	13	6
Limerick City	437	142	11.1	8.2%	10.9%	36	16
Limerick County	883	265	7.6	5.7%	7.6%	50	20
Longford County	284	94	6.9	5.2%	6.9%	15	7
Louth County	798	194	8.4	6.3%	8.4%	50	16
Mayo County	1,040	334	5.8	4.3%	5.8%	45	19
Meath County	884	255	8.0	6.0%	8.0%	53	21
Monaghan County	399	136	7.2	5.4%	7.3%	22	10

4. P. Goodman, B. Jahanshahi, D. McVicar and N. Rowland. (2023). *Air Pollution and Mortality on the Island of Ireland*.

Area	Deaths (15+)		PM _{2.5} µg/m ³	Attributable fraction		Attributable deaths due to PM _{2.5} air pollution	
	All-cause	Circulatory		All-cause	Circulatory	All-cause	Circulatory
Offaly County	462	142	7.2	5.4%	7.2%	25	10
Roscommon County	490	135	6.2	4.7%	6.3%	23	8
Sligo County	497	152	6.5	4.9%	6.6%	24	10
South Dublin	1,260	355	8.2	6.1%	8.2%	77	29
Tipperary	1,213	357	7.3	5.5%	7.4%	67	26
Waterford City	315	85	10.5	7.8%	10.4%	24	9
Waterford County	463	152	7.6	5.7%	7.6%	26	12
Westmeath County	535	164	7.4	5.5%	7.4%	30	12
Wexford County	1,027	329	7.6	5.7%	7.7%	59	25
Wicklow County	874	253	7.2	5.4%	7.2%	47	18
ROI	29,612	8,928	7.6	5.7%	7.6%	1,682	681

Potential impact of reducing PM_{2.5} level to WHO 2021 AQG Level:

- Approximately 950 lives could be saved each year across the island of Ireland if PM_{2.5} levels were reduced to 5.0 µg/m³ as recommended by the WHO. 382 in Northern Ireland and 564 in the Republic of Ireland.

Countries	Hypothetical PM _{2.5} (µg/m ³)	Estimated attributable deaths associated with hypothetical PM _{2.5} level	Difference between hypothetical and 2019 estimated number of attributable deaths
NI	5.0	555	-382
ROI	5.0	1,118	-564
On the island of Ireland		1,673	-946

To read the full report visit:

www.bhf.org.uk/what-we-do/in-your-area/northern-ireland/campaigning-and-influencing-in-northern-ireland/taking-action-on-air-pollution-in-northern-ireland

www.irishheart.ie/advocacy/climate-action

Policy recommendations to reduce PM_{2.5} air pollution to help save lives:

All-island:

- Adopt WHO 2021 Air Quality Guidelines as legally binding measures in both jurisdictions to protect health and ensure that efforts to reduce air pollution achieve meaningful outcomes, particularly for vulnerable groups whose lives are impacted by outdoor exposure.
- Establish statutory alignment of air quality legislation in both jurisdictions.
- Establish a formal working group on air pollution between the Department of Environment, Climate, and Communications and the Department of Agriculture, Environment and Rural Affairs, and at the North-South Ministerial Council.
- Develop a coordinated all-island approach to phasing out the sale of the most health-harming solid fuels. The Northern Ireland Executive and the government in the Republic of Ireland must work together to ensure that any restrictions on the sale of the most polluting solid fuel for domestic heating are enforced.

Northern Ireland:

1. Improved monitoring of PM_{2.5} to enable accurate measurement of progress against targets. It will also allow for better provision of information to vulnerable groups on the risks to their health in their area.
2. Increased investment in walking and cycling infrastructure to increase active travel and reduce the use of traditional combustion vehicles.
3. Increased public awareness of the health impacts of air pollution and air pollution levels in their area.

Republic of Ireland:

1. Improve enforcement of existing air quality legislation by providing additional resources to local authorities to monitor and enforce air quality legislation.
2. Expedite and allocate the necessary resources to meet the National Retrofitting Scheme of 500,000 homes by 2030, prioritising social housing and households most vulnerable.
3. Guarantee a permanent allocation of 20% to the capital budget in transport to walking and cycling infrastructure. The remaining budget allocated 2:1 to public transport and continued maintenance of the current road network.