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Early life exposure to air pollution and its lifelong impact

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I.

Air pollution in early life (Prof Chris Dibben)

Air pollution and the life course

Exposure to air pollution in early life may have long-term consequences for health and wellbeing.

Early childhood as **sensitive period** for healthy development, especially for lung and brain development.

Life course perspective is required.



Place of work and residential exposure to ambient air pollution and birth weight



94 gram reduction in birth weight between the least and most polluted parts of Scotland




Environmental Research
Volume 140, July 2015, Pages 535-541



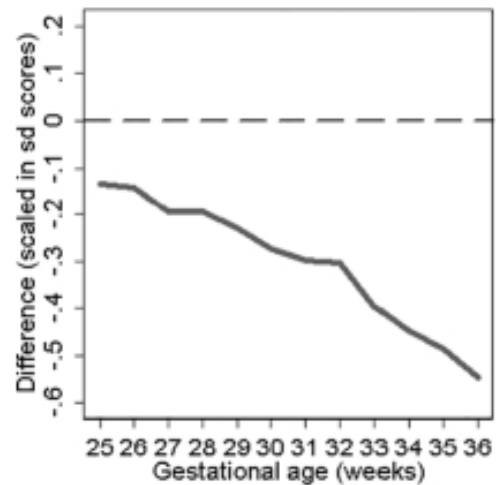
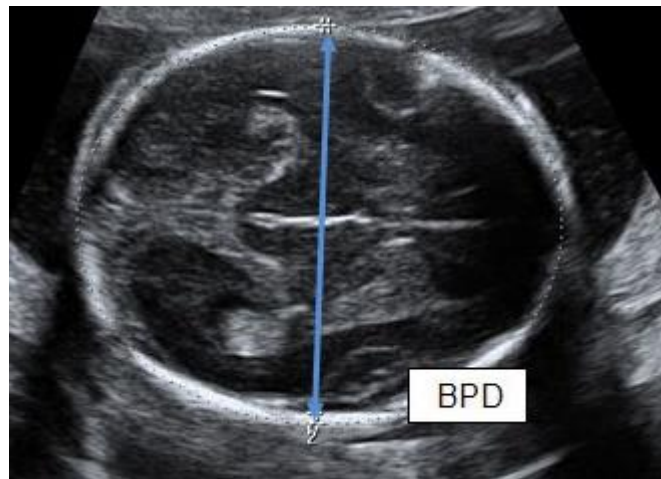
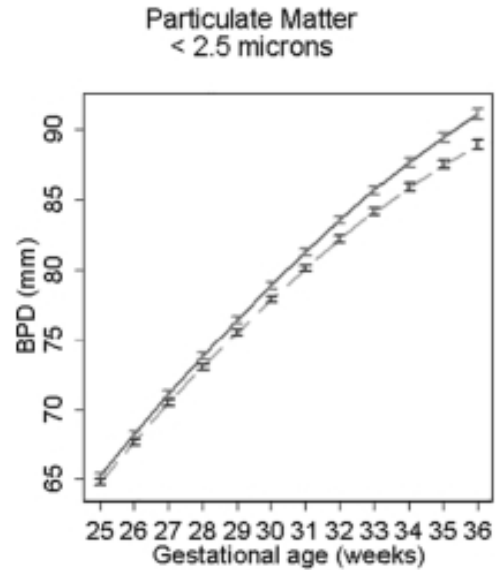
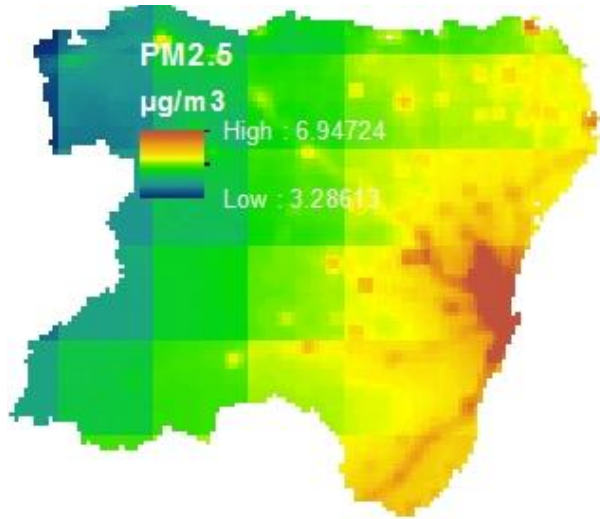
Place of work and residential exposure to ambient air pollution and birth outcomes in Scotland, using geographically fine pollution climate mapping estimates

[Chris Dibben](#)  [Tom Clemens](#)

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Growth of the head in the womb (Aberdeenshire)



Environment International
Volume 107, October 2017, Pages 216-226

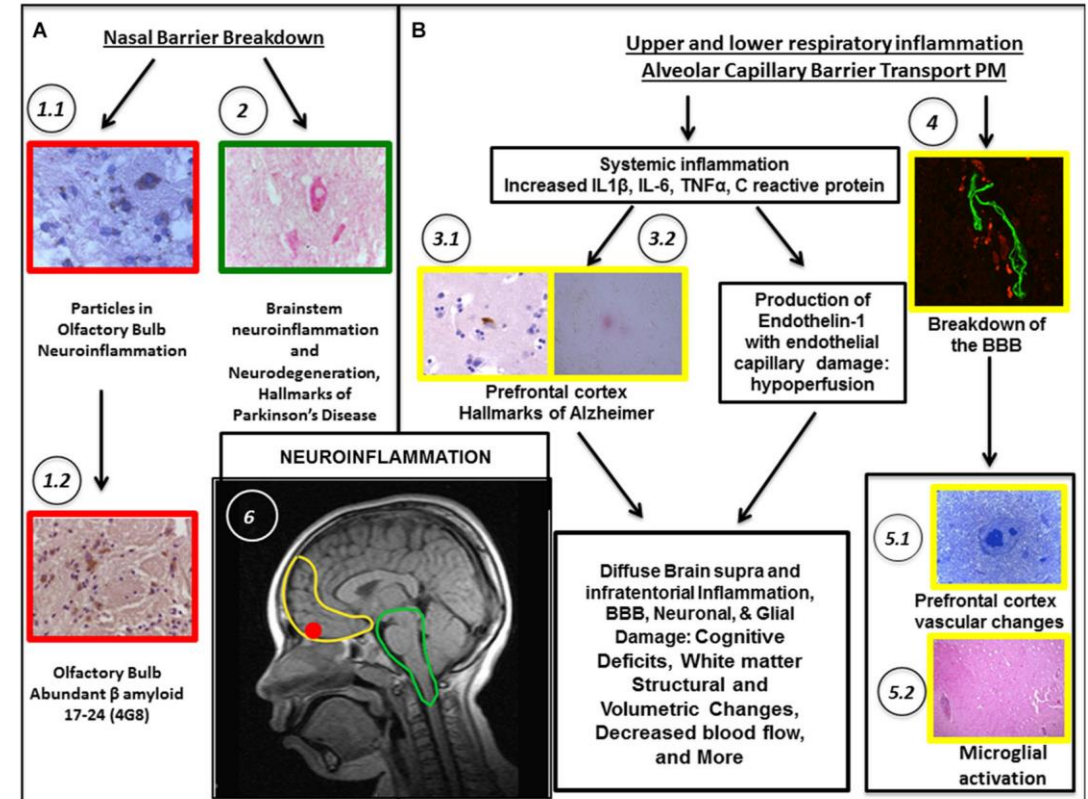


Maternal exposure to ambient air pollution and fetal growth in North-East Scotland: A population-based study using routine ultrasound scans

Tom Clemens^a, Steve Turner^b, Chris Dibben^a

Air pollution and cognitive ability

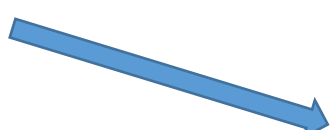
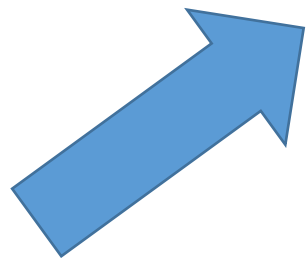
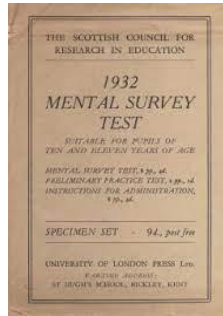
- Pollutants cause **oxidative stress** and **myelin sheath damage** in murine models (Zhang et al. 2018)
- **Greater white matter lesions** accumulate in children living in cities with high compared to low levels of air pollution (Calderon-Garciduenas et al. 2008).
- Children are continuously undergoing **neurological and physical changes** (Pinkerton & Joad, 2000).
- Children inhale up to **50% more air per kg** (Wang et al. 2009)



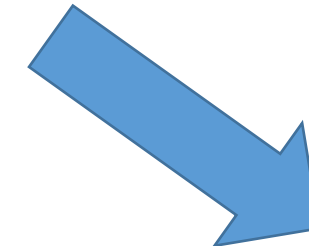
Pathway between air pollution and SES



Thinking skills
Cognitive
development



Ill health



Midlife socio-economic
position



II.

Long-term impacts of early life air pollution (Dr Gergő Baranyi)

Historical air pollution

Historical information on air pollution concentrations are required.

Air pollution is linked historically to industrial activity, heating and transport.

Concentrations are now much lower than in the 1950s, still they largely exceed WHO guideline limits.

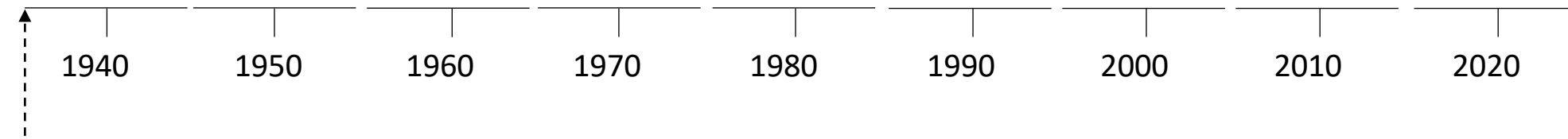


Smog in Edinburgh in the 1950s

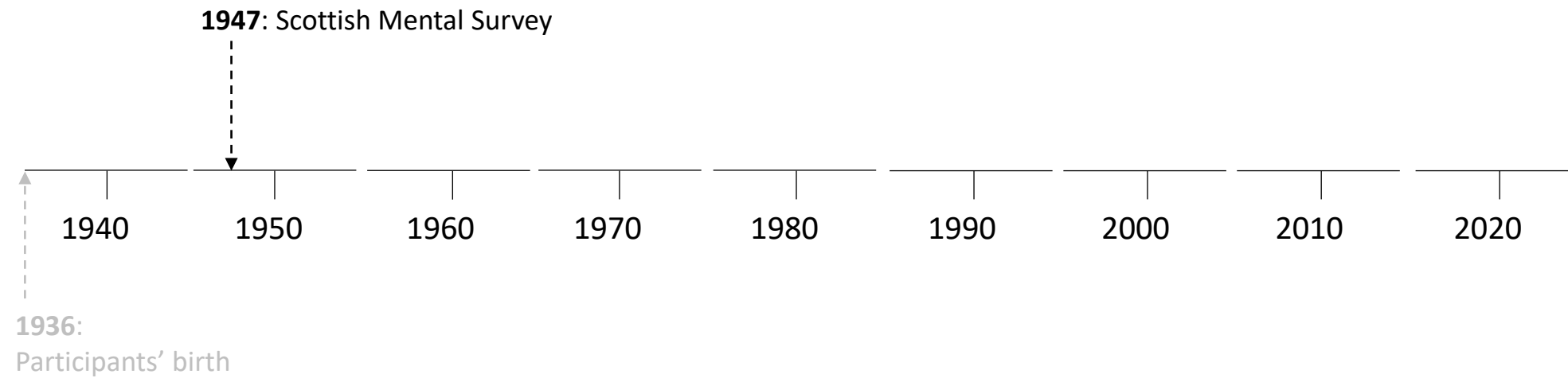
Scottish Longitudinal Study Birth Cohort of 1936

- Linked from routinely collected administrative data (e.g., NHS, census).
- 1936-born Scottish children followed-up throughout their lives.
- Random sample representing 5% of the population (2734 individuals)



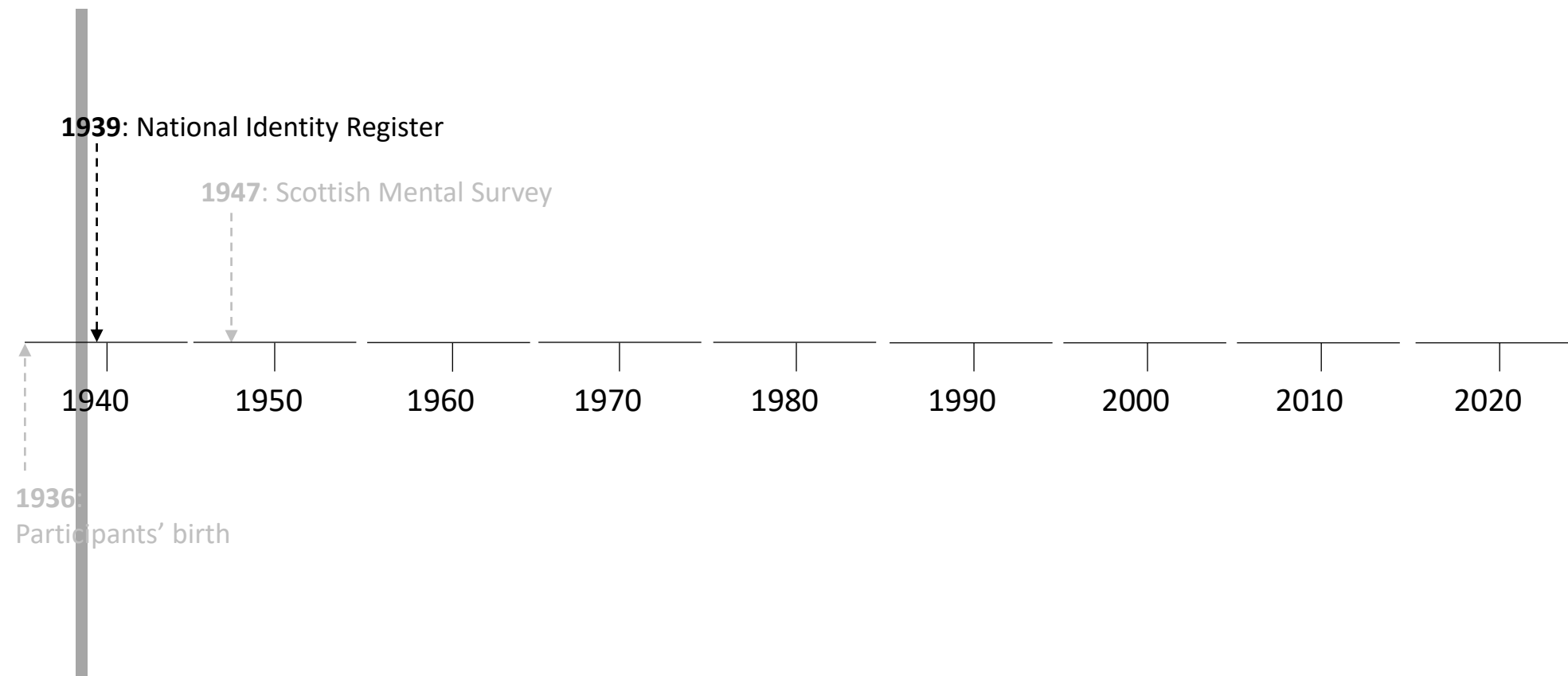


1936:
Participants' birth



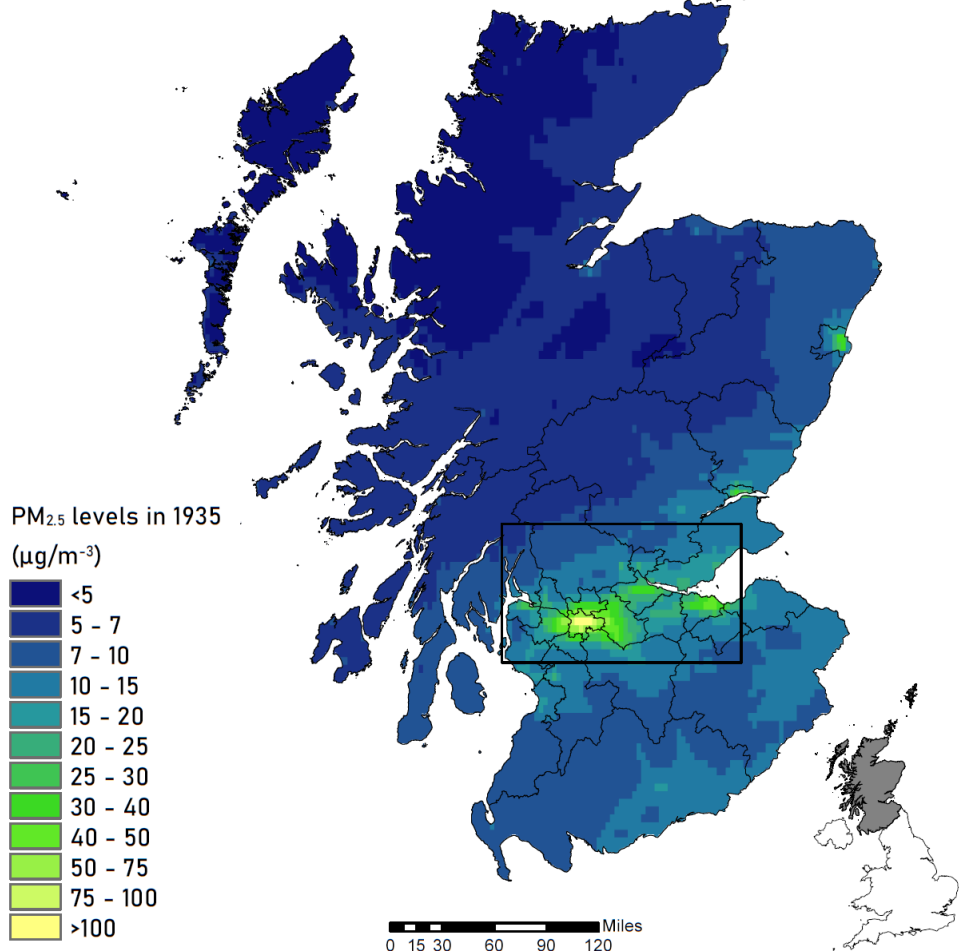
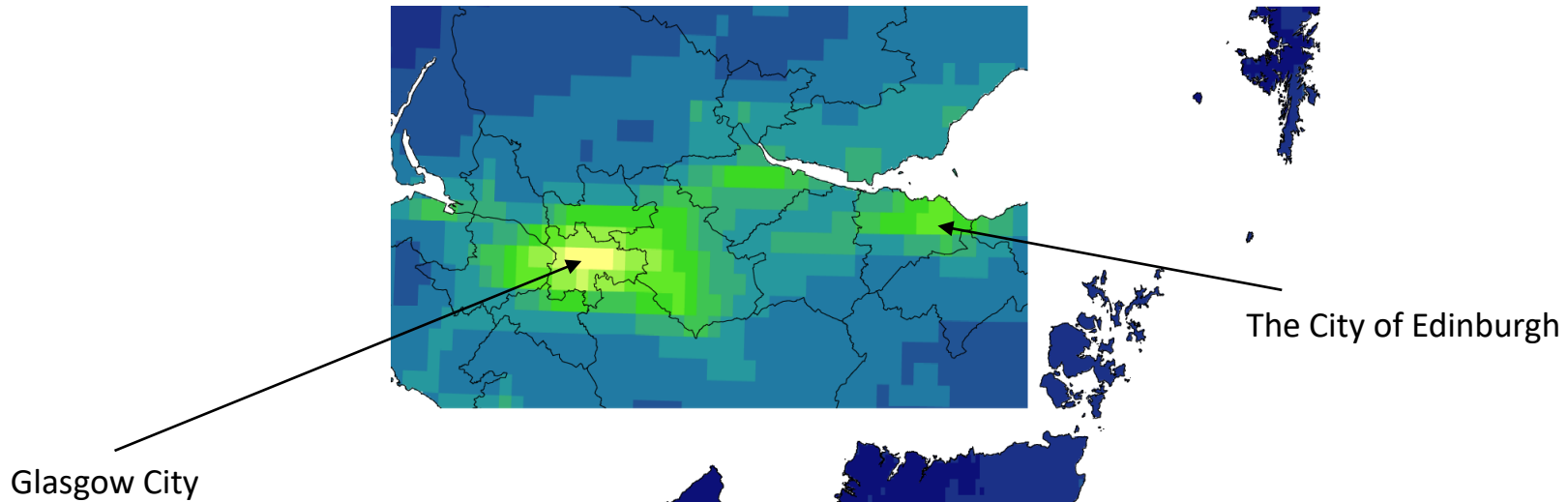
Scottish Mental Survey

- Childhood cognitive ability
- 4th June 1947
- General IQ test with mental tasks concerning reasoning, cipher decoding and spatial items

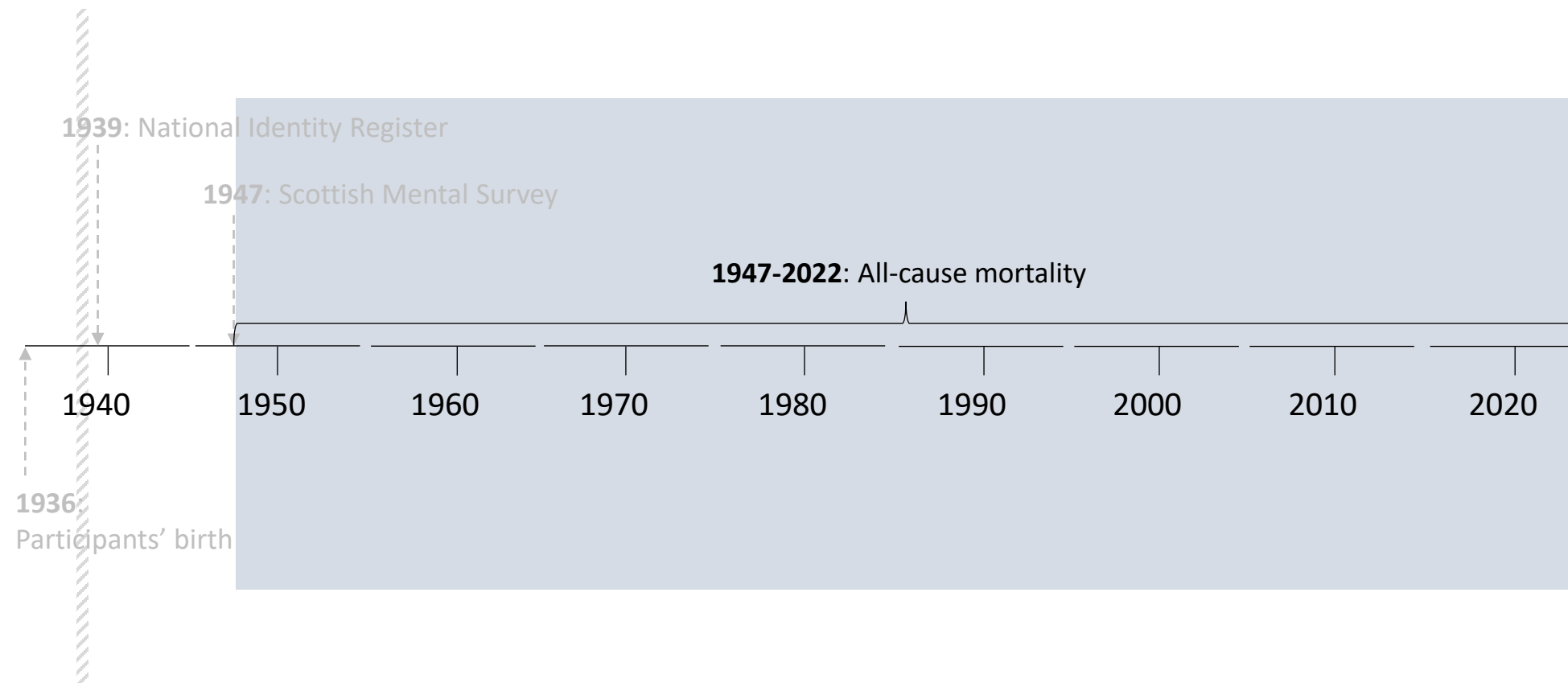


1939 National Identity Register

- Information on childhood circumstances
- **Address data**

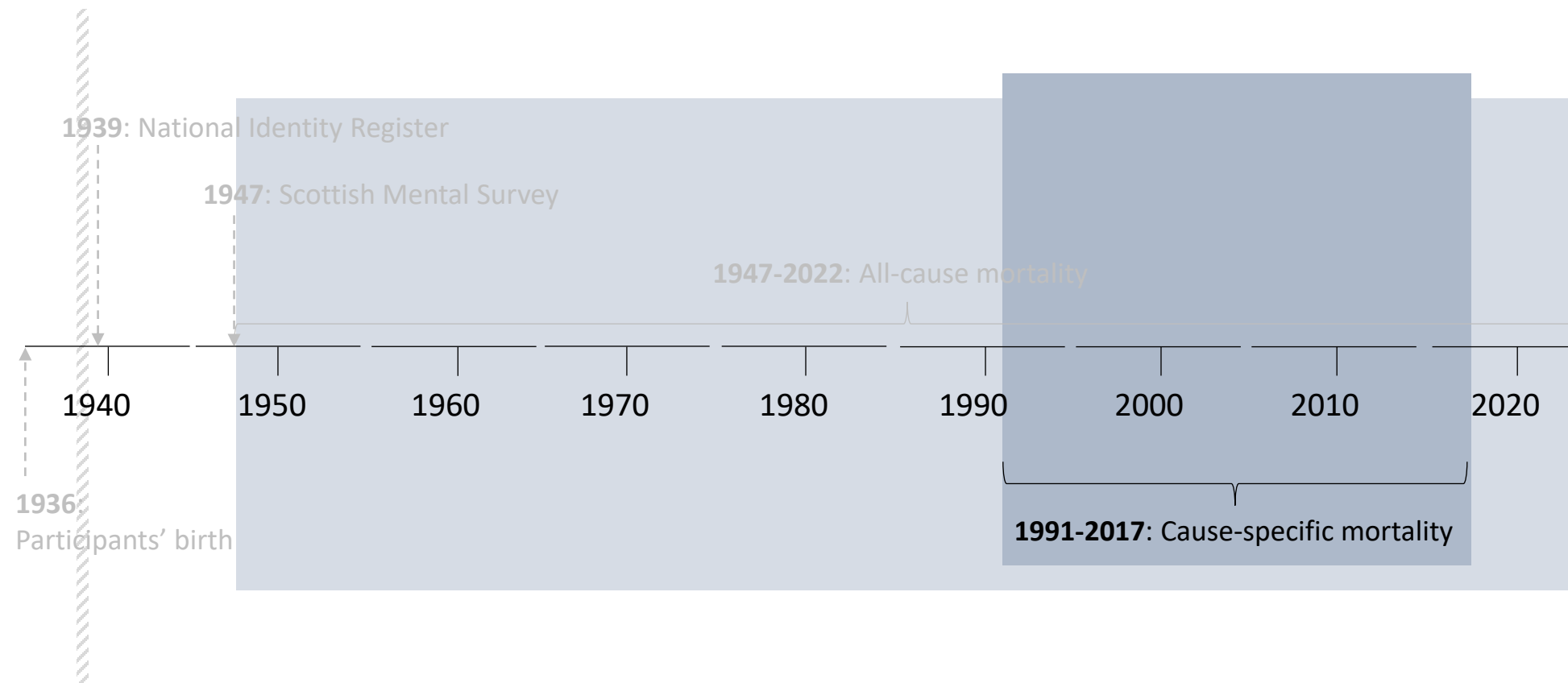


Air pollution in 1935



All-cause mortality

- Scotland's National Health Services Central Register



Cause-specific mortality

- Cardiovascular, respiratory, & cancer-related deaths

1. Is early life air pollution exposure linked to dying earlier?



Smog in Edinburgh in the 1950s

KEY FINDINGS 1.

Individuals living in areas with toxic air quality died on average 3 years earlier

Risk of dying differed:

- Females: between age 75-86 years
- Males: between age 65-75 years

2. In what conditions did people die?



KEY FINDINGS 2.

Early life air pollution was associated with dying in cancer

- The risk of dying in lung cancer was 11% higher among females living more polluted areas as a child.
- *Neurodegenerative disorders (e.g., dementia) among males*



FROM ANOTHER STUDY...

- We found faster biological ageing among females who were born in a more polluted areas of the UK
- Biological ageing, measured from blood sample, is a good predictor of longevity

3. Does childhood cognition plays a role?



KEY FINDINGS 3.

Childhood cognitive ability accounts for $\frac{1}{4}$ of the total effect of early life air pollution on mortality.

- Higher air pollution levels to lower test scores
- Lower test scores to higher risk of all-cause mortality (potentially due lower socioeconomic status in adulthood)

Conclusions

1. Living in areas in early childhood with higher air pollution is associated with **dying earlier**.
2. Cancer-related deaths, especially for **lung-cancer among females** was prominent.
3. **Thinking skills in childhood** might play a role.

Implications:

- Environments where we live have long-term consequences on our health
- Effects of air pollution on our health can endure for decades, even after significant efforts are made to reduce pollution levels

Acknowledgement

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<https://sls.lscs.ac.uk/>

Link to paper:



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