

Evidence from Understanding Society, the UK Household Longitudinal Study, University of Essex

1. Introduction

1.1. Understanding Society, the UK Household Longitudinal Study, is a world-leading longitudinal survey of continuity and change in UK life. From an initial sample of around 40,000 households, the same people are invited to participate in annual surveys. Together with its predecessor, the British Household Panel Survey, the data now span 28 years. Understanding Society is based at the Institute for Social and Economic Research at the University of Essex. It is an important part of CLOSER, a partnership of leading social and biomedical longitudinal population studies in the UK (www.closer.ac.uk).

1.2. Understanding Society is primarily funded by the Economic and Social Research Council, part of UK Research and Innovation, and has received funding from a number of government departments, devolved administrations and agencies. Anonymised data from the surveys are made available to registered researchers.

1.3 As part of the Main Study, from Wave 1 onwards, participants are asked a number of questions about their general health. In Wave 2 and Wave 3 (2011-2013), adult participants received a follow-up health assessment visit from a registered nurse – giving us both objective and subjective health data. The value of this nurse collected data is that it facilitates research into how environmental factors ‘get under the skin’, affecting our health and biology.

1.4 A range of bio-medical measures were collected from around 20,000 adults, which included blood pressure, weight, height, waist measurement, body fat, grip strength and lung function. Blood samples were also taken at these visits and biomarker data is available including: cholesterol, measures of inflammation and the immune system, and measures of anaemia and liver and kidney function.

1.5 Understanding Society data can be linked to other sources, such as detailed air quality records from (for example) the UK Department for Environment, Food and Rural Affairs.

1.6 We have identified research which uses Understanding Society data and is relevant to the committee’s questions:

- What evidence exists of the extent of air pollution directly or indirectly impacting health of individuals or communities in England?
- What are the differential impacts, geographically, and across socioeconomic groups, of poor outdoor and indoor air quality?

2. Summary

- Reducing air pollution exposure and increasing access to green space may improve population health but may not decrease health inequalities.
- Higher concentrations of nitrogen dioxide are linked to higher odds of both hospital outpatient admissions and visits to the GP.
- The difference in memory quality between England’s cleanest and most polluted areas is equivalent to the loss of memory from 10 extra years of ageing.
- Living in more polluted local authorities/LSOAs has a higher impact on poor mental wellbeing.
- An increase in nitrogen dioxide levels has been linked to falling life satisfaction comparable to being separated or widowed.

3. Neighbourhood air pollution and overall physical health

3.1 Neighbourhood deprivation has been consistently linked to poor health.

3.2 Research using Understanding Society's biomarker data in 2018 showed that residents of poor neighbourhoods and those exposed to higher pollution and less green space had worse health outcomes.

3.3 However, only sulphur dioxide exposure significantly affected the association between neighbourhood socioeconomic deprivation and blood pressure, body-mass index and levels of C-reactive protein (a measure of inflammation in the body).

3.4 This research therefore concluded that reducing air pollution exposure and increasing access to green space may improve population health but may not decrease health inequalities in Britain.

3.5 Research in 2019, also using our biomarker data, showed that nitrogen dioxide concentrations predicted later elevated levels of fibrinogen – a blood-clotting factor. Low levels put people at risk of bleeding after surgery. High levels mean people may be in danger of forming clots that could harm the heart or brain.

3.6 This was true after accounting for social deprivation in the area.

4. Neighbourhood air pollution and hospital and GP visits

4.1 Increasing concentrations of nitrogen dioxide are linked to higher odds of both hospital outpatient admissions and visits to the GP.

4.2 This research also examined whether there was any difference by ethnicity, but did not find any.

5. Neighbourhood air pollution and memory

5.1 Human memory is significantly worse in parts of England with high levels of nitrogen dioxide and air particulates.

5.2 The difference in memory quality between England's cleanest and most polluted areas is equivalent to the loss of memory from 10 extra years of ageing.

5.3 The analysis took age, health, level of education, ethnicity, and family and employment status into account – and looked at regional variations in prevailing wind direction and population density to correct for the potential selection effect of people with impaired memory choosing to live in more polluted areas.

5.4 The most polluted air in England is in places like Kensington and Islington. The cleanest is on the west coast in places such as Devon and West Somerset. Author Professor Andrew Oswald has stated: "When it comes to remembering a string of words, a 50 year old in polluted Chelsea performs like a 60 year old in Plymouth. We are still not exactly sure how nitrogen dioxide and air particulates act to do this."

6. Neighbourhood air pollution and mental health

6.1 Higher odds of poor mental wellbeing have been observed with every 10microgram/m³ increase in nitrogen dioxide, sulphur dioxide, and particulate pollutants in local areas (both at the local authority level and Lower-Super-Output-Areas).

6.2 Living in more polluted local authorities/LSOAs therefore has a higher impact on poor mental wellbeing.

6.3 This research also examined ethnicity, and found inconclusive evidence on its moderating effect.

6.4 The evidence therefore suggests that environmental policies to reduce air pollution emissions can eventually improve the mental wellbeing of people in UK.

6.5 The same researchers carried out further work to examine effects on ethnic minorities, and found that Indian, Pakistani/Bangladeshi, Black/African/Caribbean and other ethnic groups and non-UK-born individuals reported poorer health with increasing concentrations of nitrogen dioxide, sulphur dioxide, and particulate pollutants in comparison to British-white and UK-born individuals.

6.6 This study therefore shows a link between air pollution and poor self-reported health, which is stronger for ethnic minorities and foreign-born individuals in the UK, partly explained by location-specific differences.

6.7 Air pollution mitigation is necessary to improve individuals' health, especially for ethnic minorities who are affected the most.

6.8 An increase in nitrogen dioxide levels has also been linked to falling life satisfaction.

6.9 A 10 µg/m³ increase in annual average NO₂ levels in one's LSOA is associated with a decrease in life satisfaction comparable to that of many 'big hitting' life events – equivalent, for example, to being separated or widowed when compared to being single, and approximately half that of being unemployed when compared to being employed.

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References

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