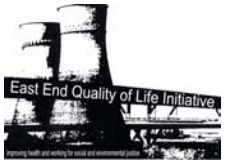
Darnall, Acres Hill, Housteads, & Tinsley 2010

Air Quality

Health Effects of Air Pollution

Some Health Trends

Sheffield Neighbourhoods Information System (SNIS)



2007-2008
Delivering Cleaner Air

Prepared by
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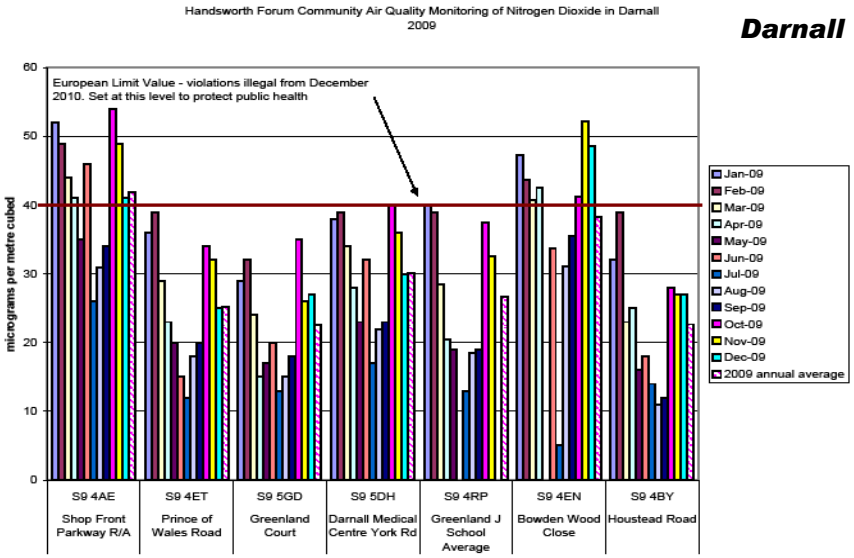
Community Air Quality Monitoring of Nitrogen Dioxide for 2009



Darnall

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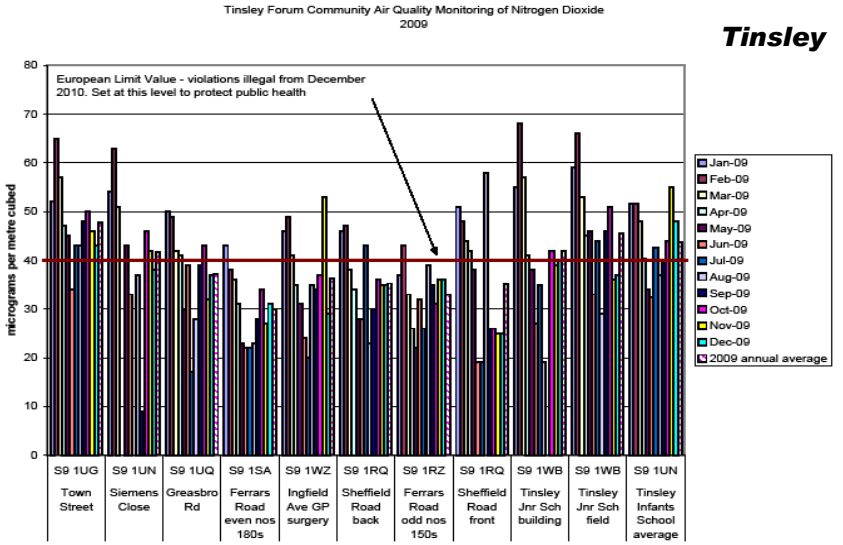

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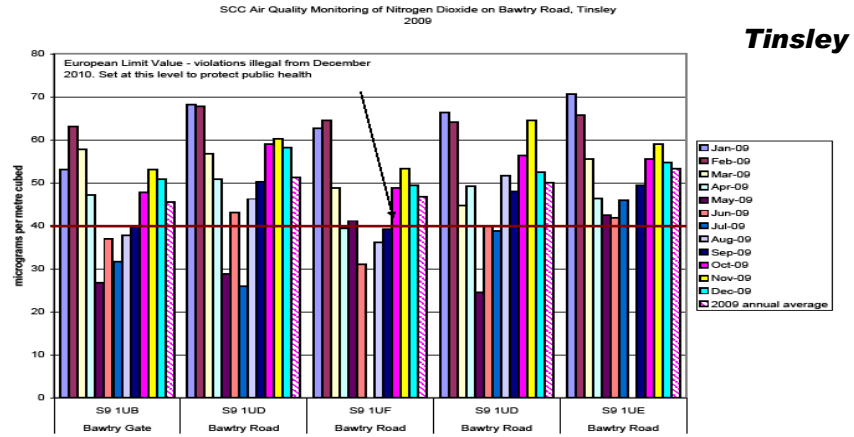

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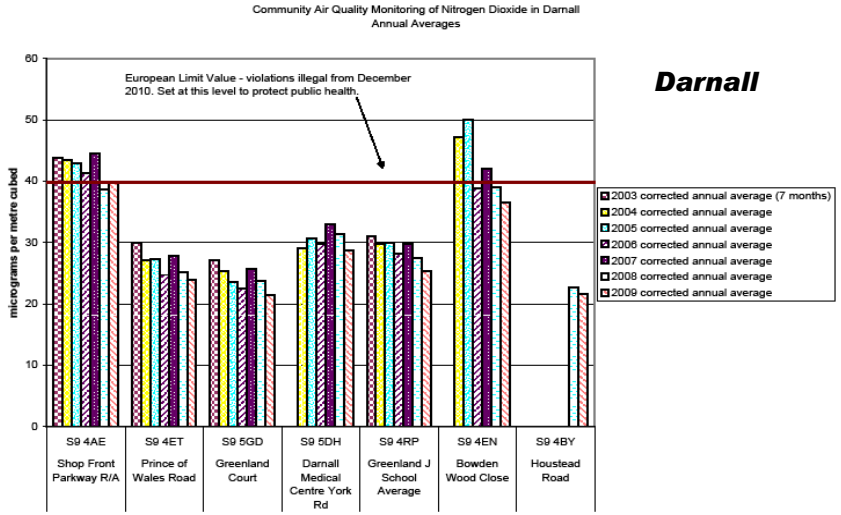
Community Air Quality Monitoring of Nitrogen Dioxide - Annual Averages



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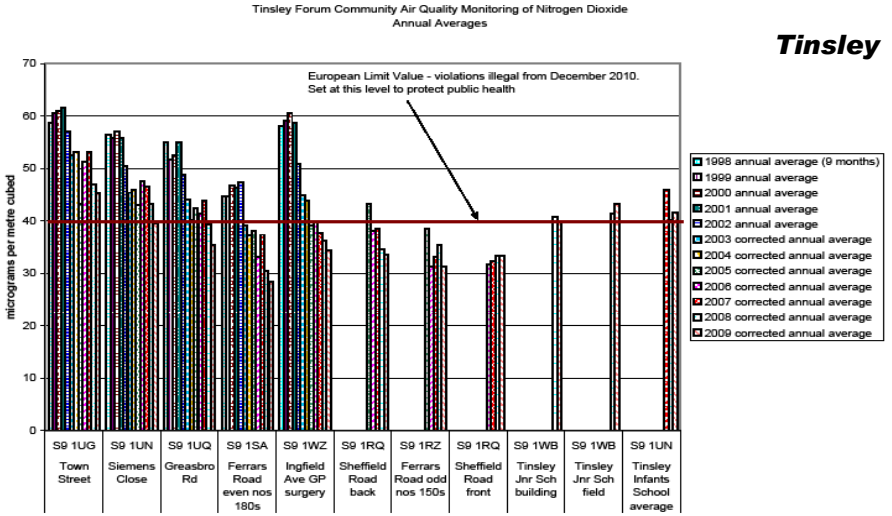

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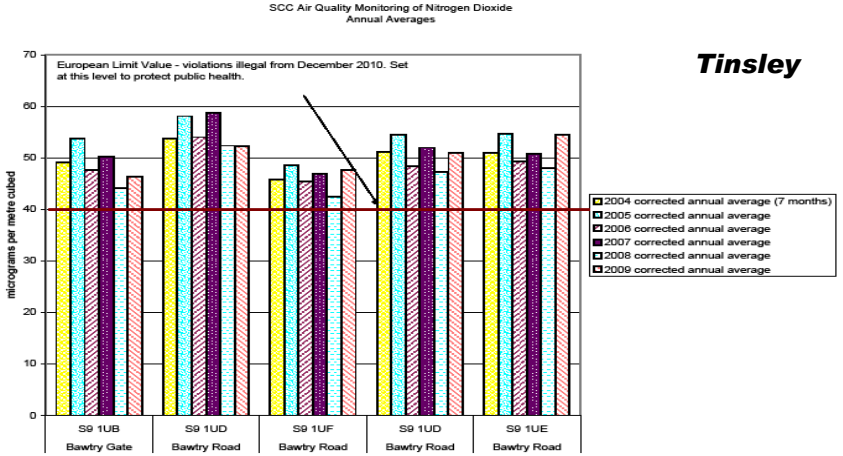

Tinsley

in partnership with East End Quality of Life Initiative and SCC Carbon Reduction and Air Quality Team

This briefing by Professor Reece Walters in the *What is crime?* series, draws attention to an area of harm that is often absent from criminological debate. He highlights the human costs of air pollution and failed attempts to adequately regulate and control such harm. Arguing for a cross disciplinary 'eco-crime' narrative, the author calls for greater understanding of the far-reaching consequences of air pollution which could set in train changes which may lead to a 'more robust and meaningful system of justice'.

Briefing 8
September 2009

CENTRE FOR CRIME AND JUSTICE STUDIES

Crime is in the air :
air pollution and regulation in the UK

Professor Reece Walters

The Centre for Crime and Justice Studies (CCJS) at King's College London is an independent charity that informs and educates about all aspects of crime and criminal justice. We provide information, produce research and carry out policy analysis to encourage and facilitate an understanding of the complex nature of issues concerning crimes and related harms.

The *What is crime?* project aims to stimulate debate about what crime is, what it isn't and who gets to decide. The project is focused on the themes of violence, finance and the environment.

The views expressed in this document are those of the author and not necessarily those of the Centre for Crime and Justice Studies.

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Editorial

This latest briefing by Professor Reece Walters in the *What is crime?* series, draws attention to an area of harm that is often absent from criminological debate. He highlights the human costs of air pollution and failed attempts to adequately regulate and control such harm. Arguing for a cross disciplinary 'eco-crime' narrative, the author calls for greater understanding of the far-reaching consequences of air pollution which could set in train changes which may lead to a 'more robust and meaningful system of justice'.

Describing current arrangements in place to control and regulate air pollution, Walters draws attention to the lack of neutrality in current arrangements and the bias 'towards the economic imperatives of free trade over and above the centrality of environmental protection'.

While attention is often given to direct and individualised instances of 'crime', the serious consequences of air pollution are frequently neglected. The negative effects of pollution on health and well-being are often borne by people already experiencing a range of other disadvantages. In a global and national context, it is often the poor who are affected most. Ultimately, political and economic imperatives have historically helped to shape legal and regulatory regimes. Whether this is an inherent flaw in current systems or something that can be overcome in favour of dealing with more wide-ranging harms is an area that requires further discussion and debate.

Rebecca Roberts is Senior Policy Associate and Will McMahon is Policy Director at the Centre for Crime and Justice Studies.

Introduction

The air we breathe is contaminated, polluted and, in some instances, toxic. The very substance that is essential for our existence is also responsible for widespread death and injury. The World Health Organization (WHO) estimates that air pollution causes the annual premature deaths of two million people worldwide (WHO, 2009). The majority of these deaths are caused by respiratory infections, heart disease and lung cancer – all accelerated by or the direct result of air pollution (COMEAP, 2004).

While the UK has been praised for its progressive legal mechanisms for controlling air pollution (Thornton and Beckwith, 2004), it is estimated that 24,000 British residents die prematurely every year because of air pollution and many thousands are hospitalised (COMEAP, 2009). Put another way, life expectancy in the UK is reduced by eight months

wates foundation

Health Effects of Air Pollution

Pollutant	Effects related to short-term exposure	Effects related to long-term exposure
Particulate matter	• Lung inflammatory reactions • Respiratory symptoms • Adverse effects on the cardiovascular system • Increase in medication usage • Increase in hospital admissions • Increase in mortality	• Increase in lower respiratory symptoms • Reduction in lung function in children • Increase in chronic obstructive pulmonary disease • Reduction in lung function in adults • Reduction in life expectancy, owing mainly to cardiopulmonary mortality and probably to lung cancer
Ozone	• Adverse effects on pulmonary function • Lung inflammatory reactions • Adverse effects on respiratory symptoms • Increase in medication usage • Increase in hospital admissions • Increase in mortality	• Reduction in lung function development
Nitrogen dioxide (in ambient air, NO_2 serves as an indicator for a complex mixture of mainly traffic-related air pollution)	• Effects on pulmonary function, particularly in asthmatics • Increase in airway allergic inflammatory reactions • Increase in hospital admissions • Increase in mortality	• Reduction in lung function • Increased probability of respiratory symptoms

Source: World Health Organization, June 2004, Health Aspects of Air Pollution: Results from the WHO project 'Systematic Review of Health Aspects of Air Pollution in Europe.' p7

Air Pollution and Noise: their effects on human health and social inclusion - a review of recent literature

Executive Summary

This review of recent papers looks at the growing body of evidence of how environmental factors, and particularly road-traffic related air pollution, affect health. Some of the most recent studies focus on the effects of small particulates which penetrate to the lungs and their adverse effects on cardiovascular disease, coronary heart disease, and stroke. Other studies have highlighted the disproportionate burden of environmental degradation, particularly air quality and noise, on deprived communities, with consequent impacts on increasing social deprivation.

Children (and the unborn foetus) are especially vulnerable to the effects of air pollution, because their lungs, metabolic and immune systems are still developing, they have higher rates of respiratory infections, and have activity patterns which lead to higher exposure. The effects in childhood and foetal development can include:

- aggravation of asthma
- increased cough and bronchitis
- low birth weight
- infant deaths (due to respiratory and Sudden Infant Death Syndrome)
- pre-term births
- birth defects

leading to effects throughout adult life:

- premature ageing
- higher risk of infection
- susceptibility to tobacco smoke
- susceptibility to occupational exposure.

Air pollution has been associated with a range of health impacts, including:

- aggravating and causing respiratory disease (including asthma, bronchitis, emphysema, etc.)
- increased risk of cardiovascular disease and death
- increased risk of coronary heart disease and death
- increased risk of stroke
- eye disease
- DNA damage.

Examples of the costs of air pollution from Europe, the UK and Sheffield

European Union	kills 370,000 people per year reduces life expectancy by up to 9 months on average costs between €427 billion and €790 billion per year
United Kingdom	6,500 deaths brought forward (in 2002) 6,400 hospital admissions (in 2002) A 1 mg/m^3 decrease in $PM_{2.5}$ would give between 1.5 and 3.5 extra days of life per person NOx damage per tonne emission for 2010 €3,900 (low estimate) $PM_{2.5}$ damage per tonne emission for 2010 €37,000 (low estimate) SO_2 damage per tonne emission for 2010 €6,600 (low estimate)
Sheffield	National estimates of the health impact of air pollution translate locally into between 240 and 325 deaths brought forward each year in Sheffield, with estimated health costs of around £95 million per year Air pollution is estimated to reduce life expectancy at birth by 7-8 months on average for the population as whole. However the health impact falls very unequally and is therefore much greater on the young, the old, those with existing heart and lung problems, and those living in areas where air quality standards are regularly exceeded Estimated annual cost benefits of introducing a Low Emission Zone between £1.8 million and £11.4 million per year (compared with inner relief road, costing £59m capital costs, bringing annual cost benefits of £0.03m to £0.2m)

Noise and health

As well as the adverse effects of air pollution on health, road traffic generates noise which affects health in the following ways:
annoyance
sleep disturbance
quality of sleep
ischaemic heart disease
impaired performance by school children
some evidence to suggest that it may cause low birthweight in babies and psychiatric disorders.

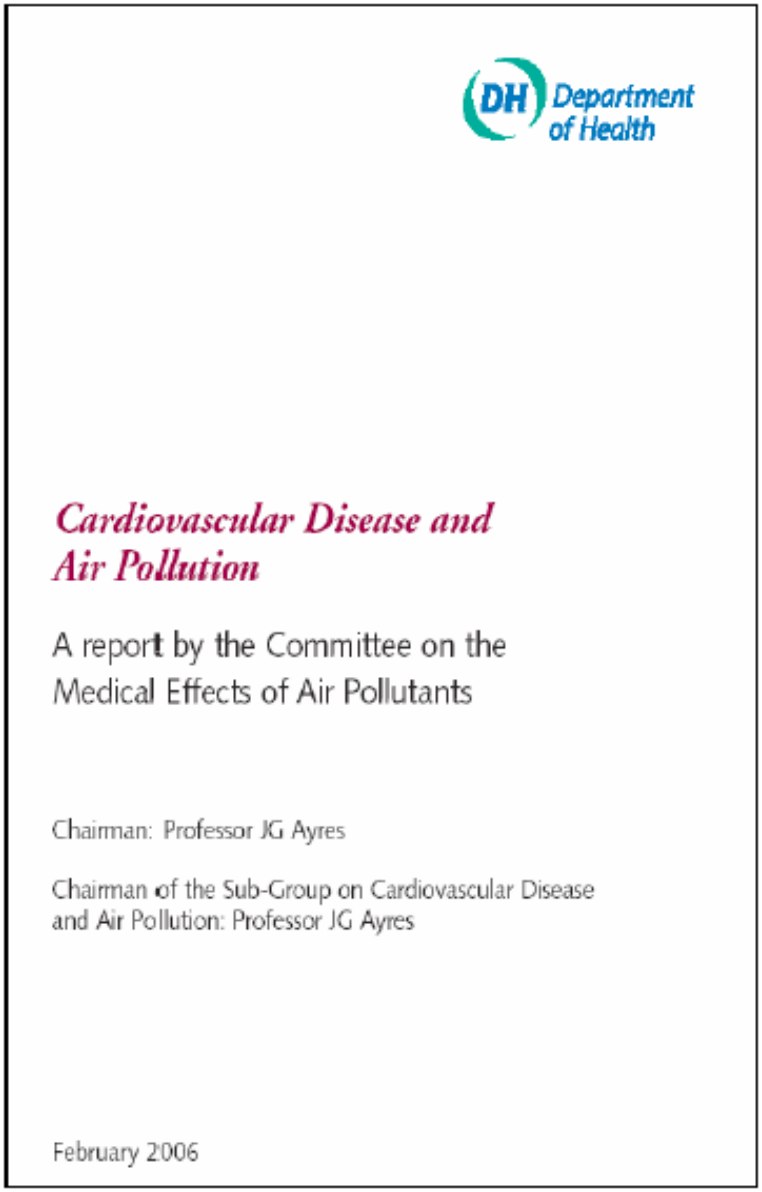
Conclusion

The growing body of evidence would suggest that bolder and more effective measures should be taken to reduce people's exposure to air pollution and noise attributable to road-traffic and thus reduce their risk of disease and mortality due to cardiovascular, respiratory, and other symptoms. The evidence suggests that there is no safe level of exposure to particulate matter, and especially to very small particles ($PM_{2.5}$) which penetrate into the lungs. Many studies highlight the possible under-estimates of the health effects of traffic-related air pollution and noise, due to problems in isolating these from other effects on health.

The most deprived communities experience the worst environmental degradation. The implications for policy therefore would seem to be to target measures to reduce air pollution in deprived areas and highly populated urban areas, where the relatively small individual health benefits can make a big impact because they reach a large population. Concerns about the U.K.'s ability to meet current targets to reduce air pollution, particularly in urban areas, further emphasise the need for reducing motor vehicle traffic but at the same time enhancing alternatives such as walking, cycling, and public transport.

Revised January 2006

Cardiovascular Disease and Air Pollution



"Cardiovascular disease is very common and, as exposure to air pollution, both in the long and short term contributes to initiation and exacerbation of disease, it is likely that even modest reductions in exposure will result in significant health gain"

The term cardiovascular disease includes all diseases of the heart and blood vessels including stroke.

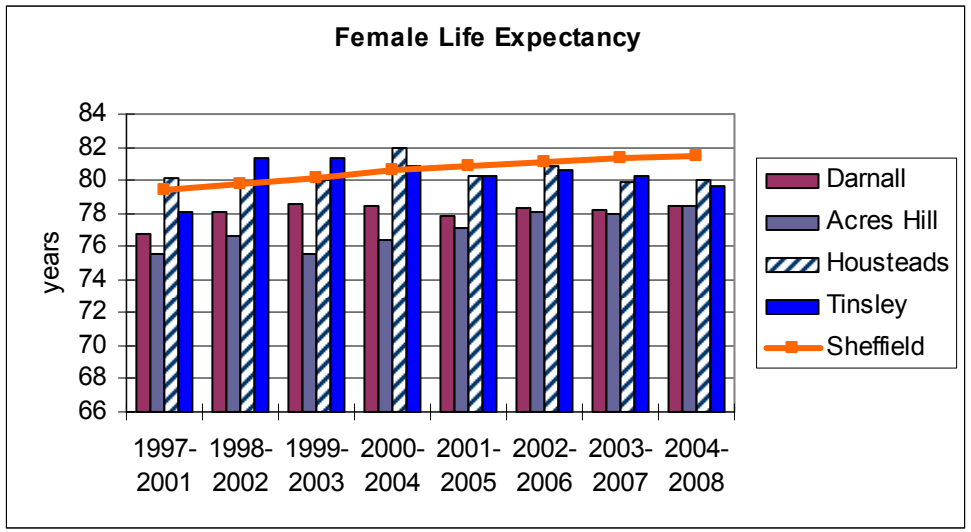
WHO REGIONAL OFFICE FOR EUROPE

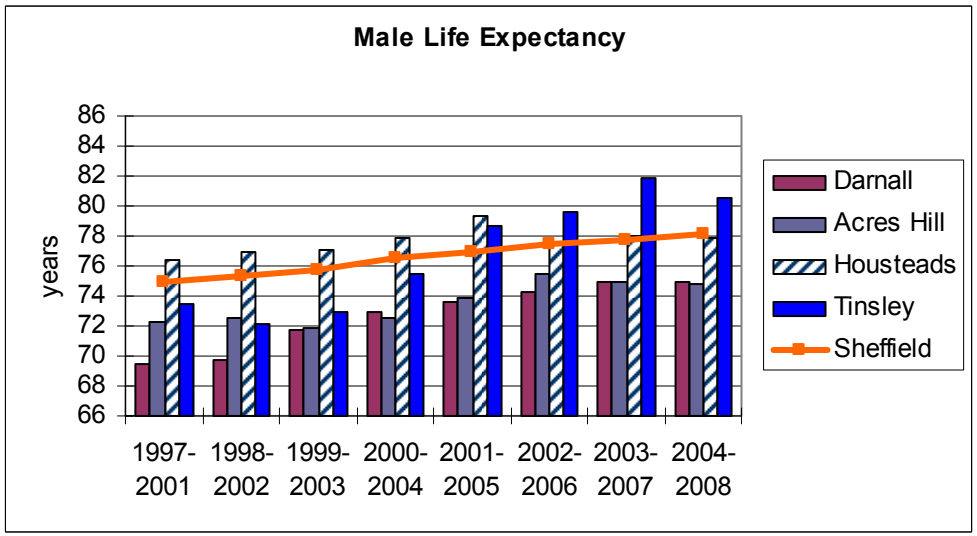
WHO Monograph[1]

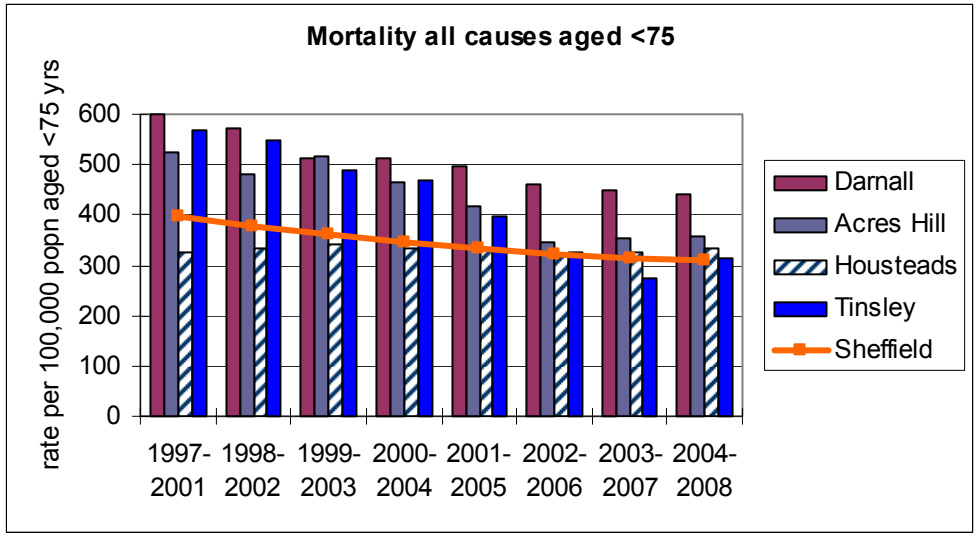
The effects of air pollution on children's health and development: a review of the evidence

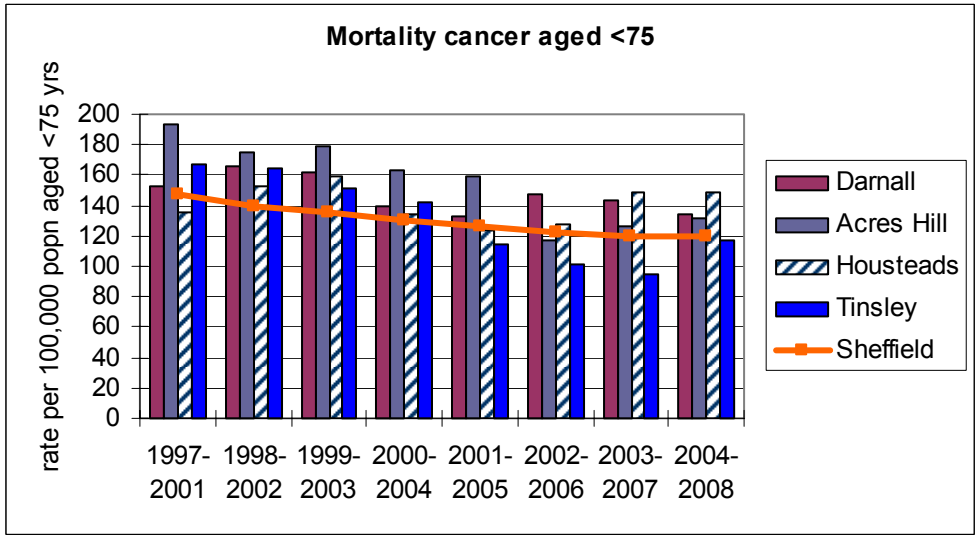
While recognizing the need for further research, current knowledge about the health effects of air pollution is sufficient for a strong recommendation to reduce children's current exposure to air pollutants, in particular to the pollutants related to traffic. The experts who conducted this review consider that such reductions in levels of air pollution will lead to considerable children's health benefits.

Life Expectancy and Deaths





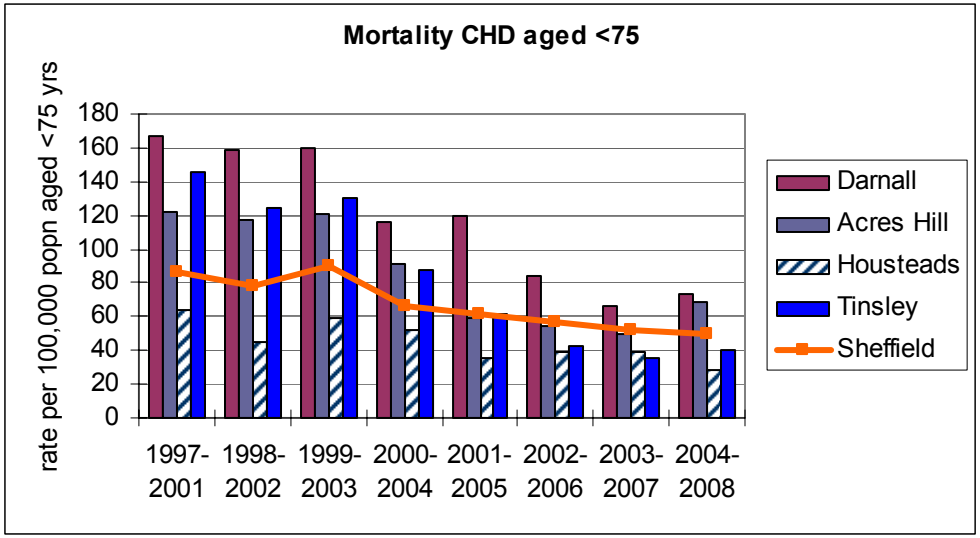


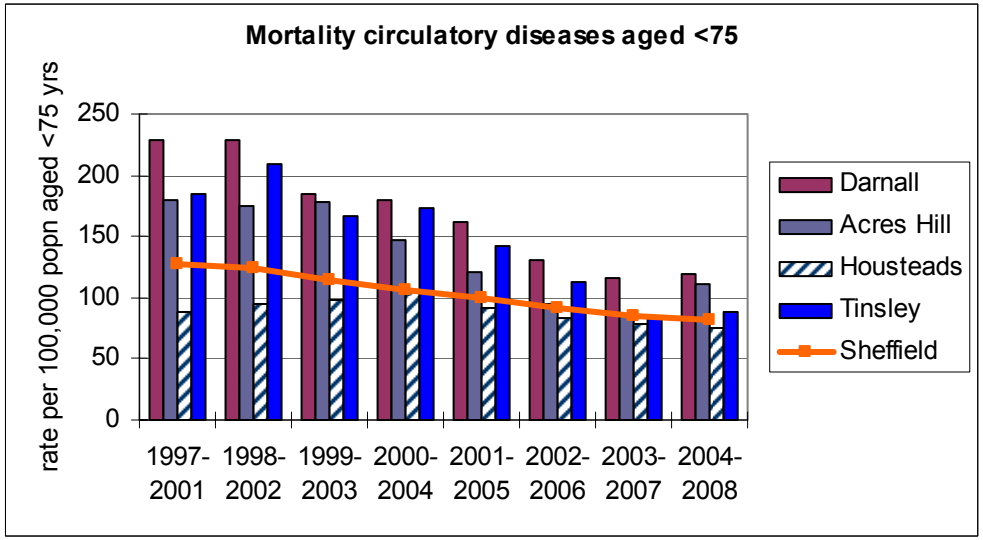


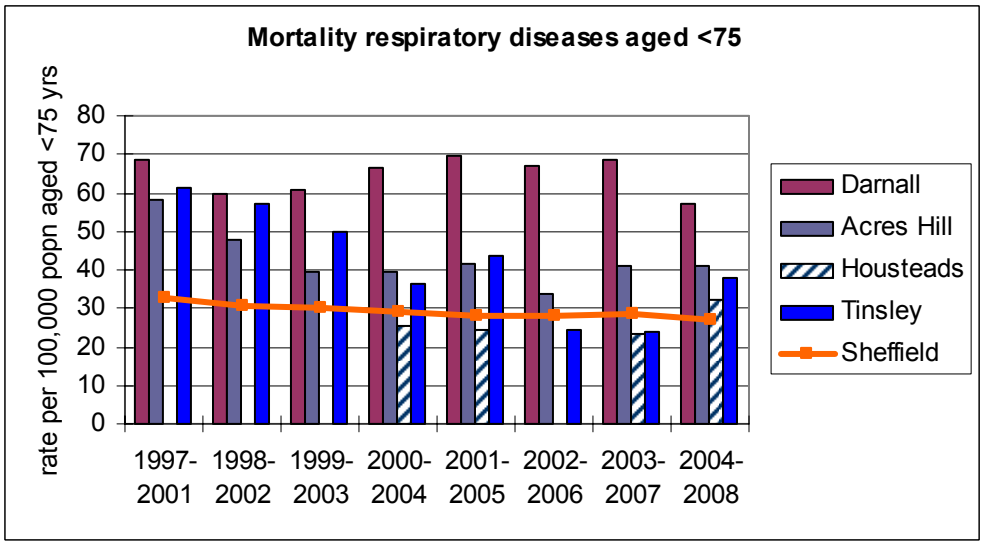
Data Source: Public Health Mortality Files, Office for National Statistics, Population Health Register

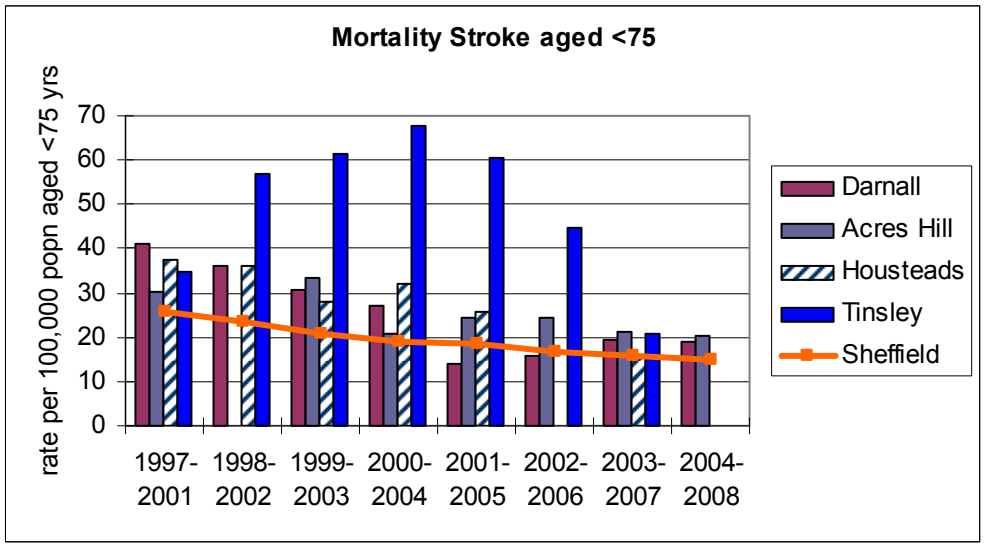
Life Expectancy calculation based on a method calculated by the West Midlands Public Health Observatory.

Deaths





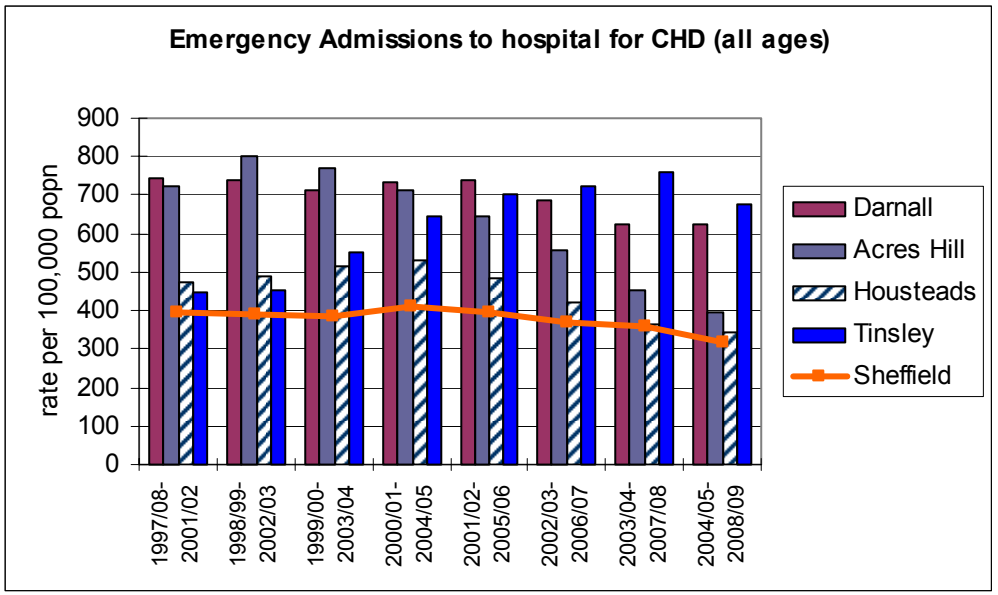


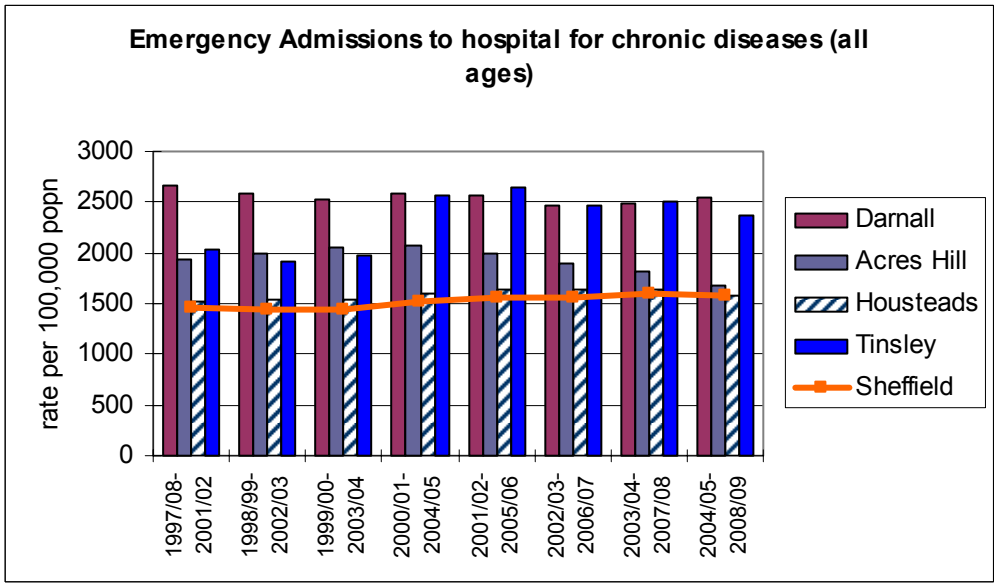


Data Source: Public Health Mortality Files, Office for National Statistics, Population Health Register extracts

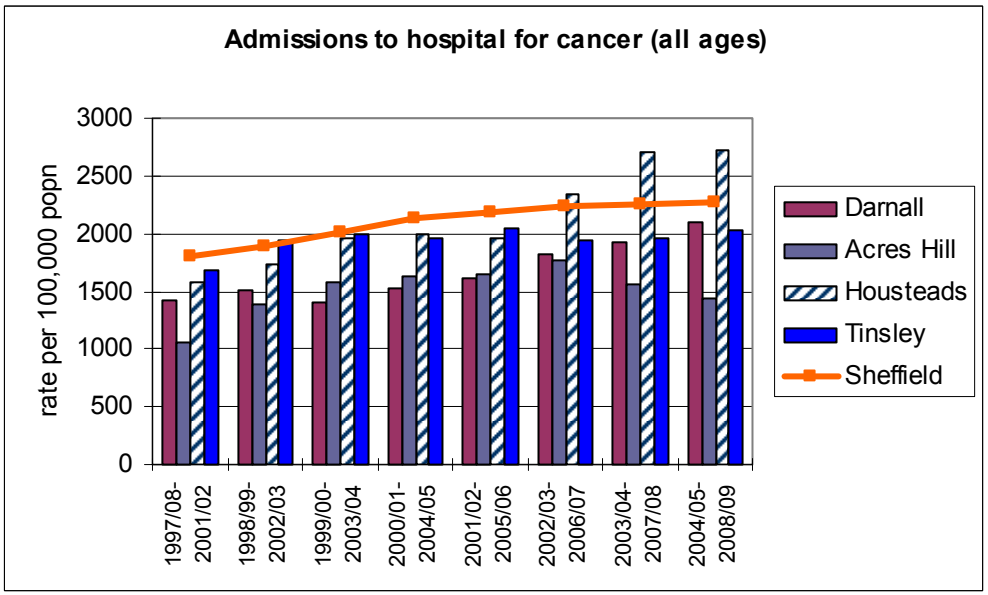
All mortality rates expressed as European Age Standardised rates per 100,000 population except infant deaths aged <1 year expressed as rate per 1,000 live births.

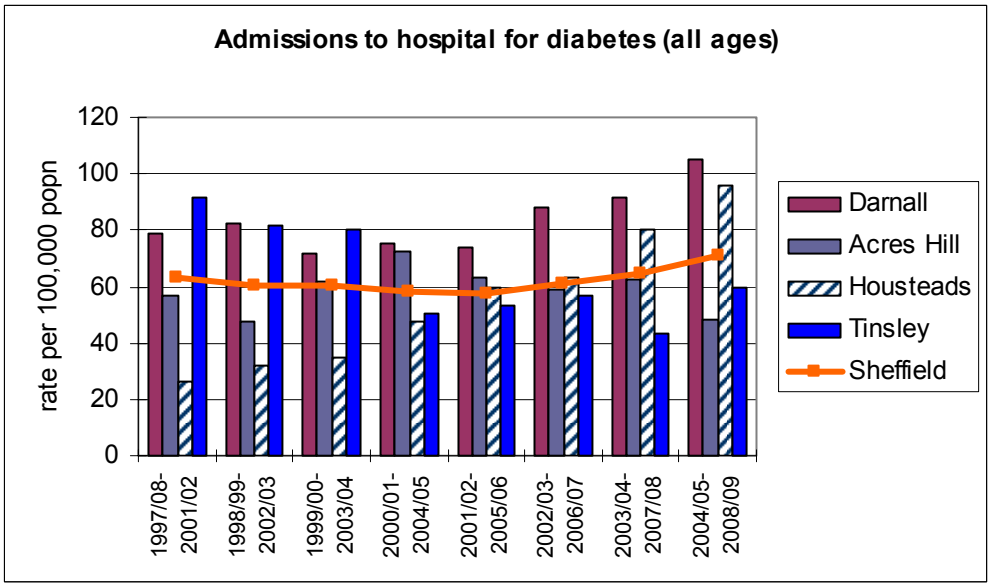
Hospital Admission Rates - *Emergency Admissions / A&E*





Hospital Admission Rates - *Other Admissions*

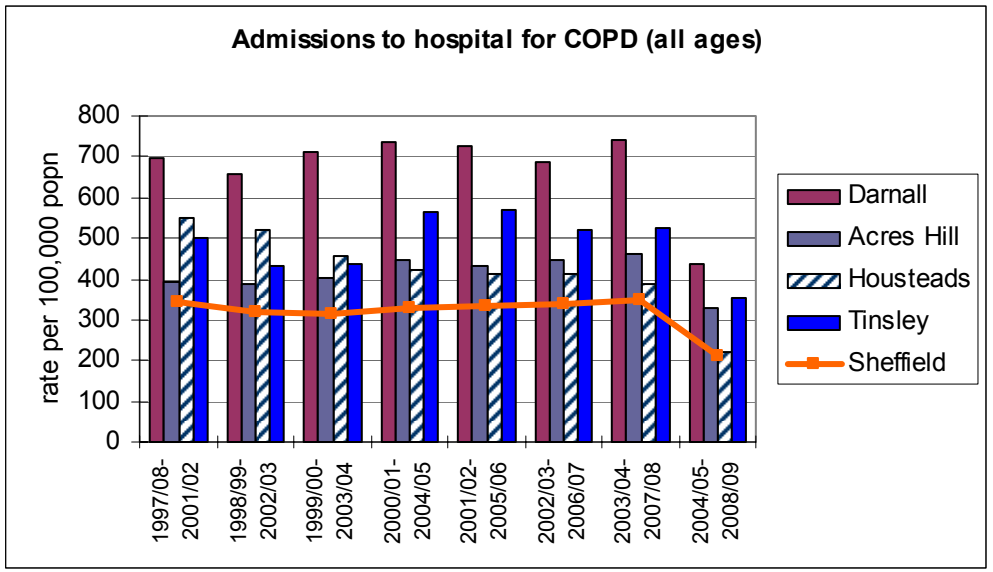


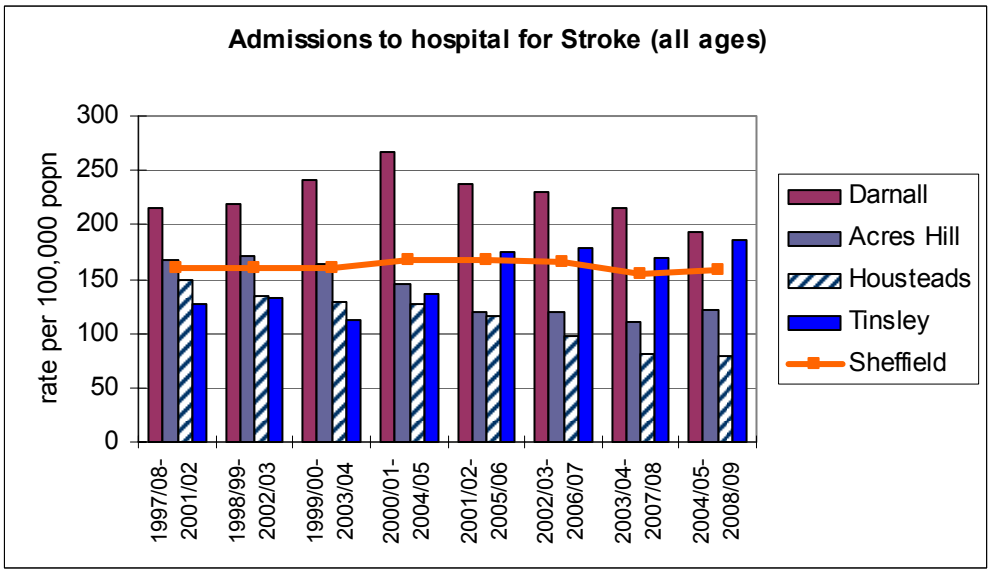


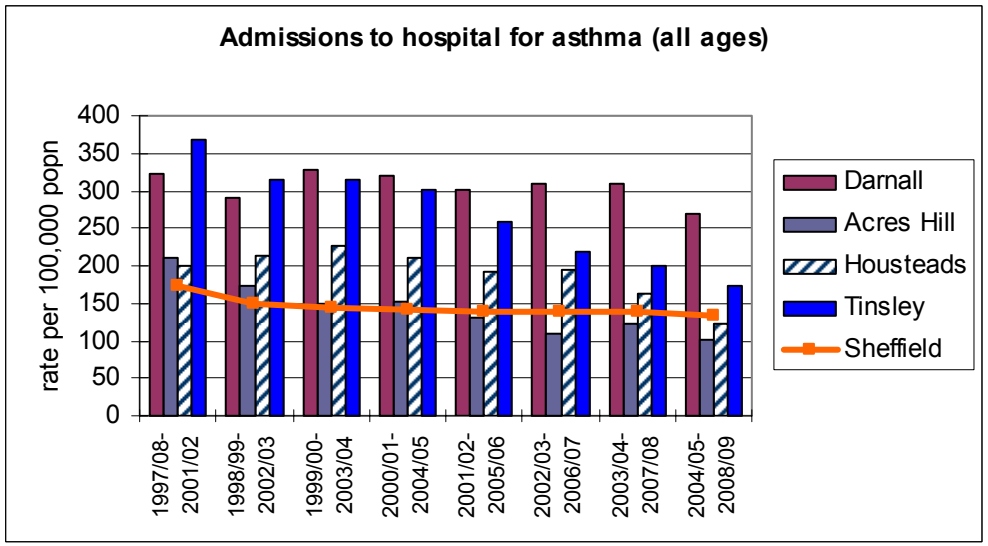
Data Source: Inpatient Minimum Data Sets, Population Health Register extracts

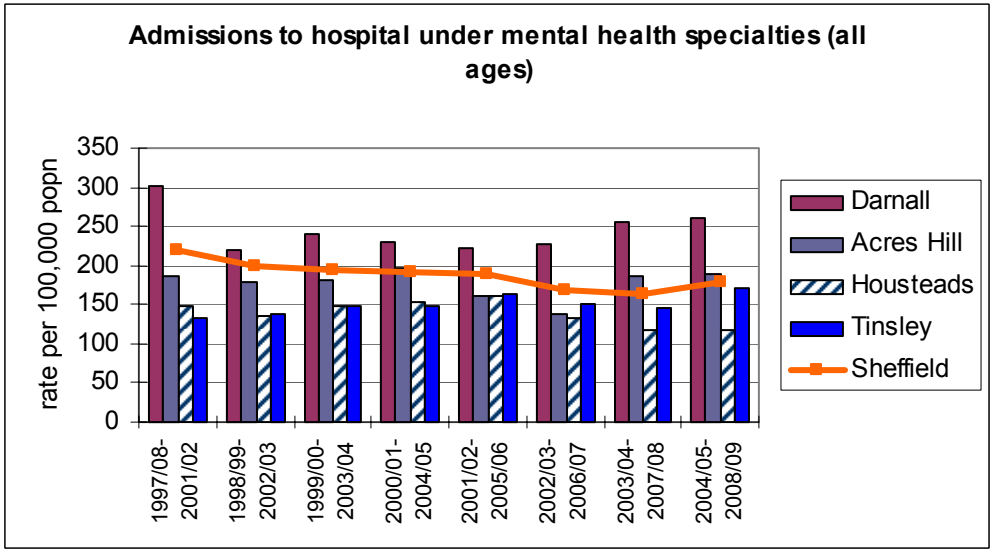
All rates expressed as European Age Standardised rates per 100,000 population except emergency admissions aged <18yrs expressed as rate per 1,000 population.

Hospital Admission Rates - *Other Admissions*



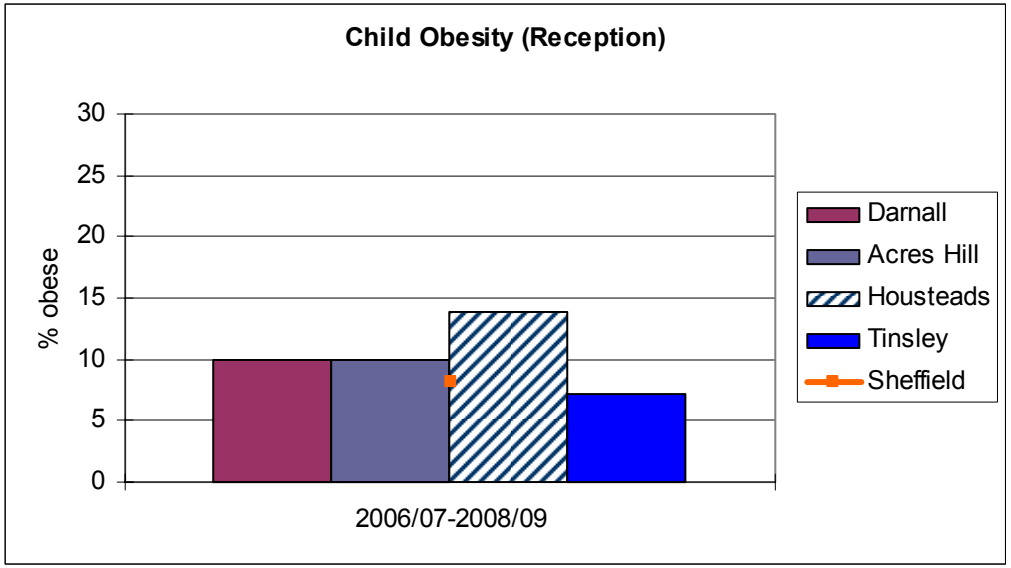


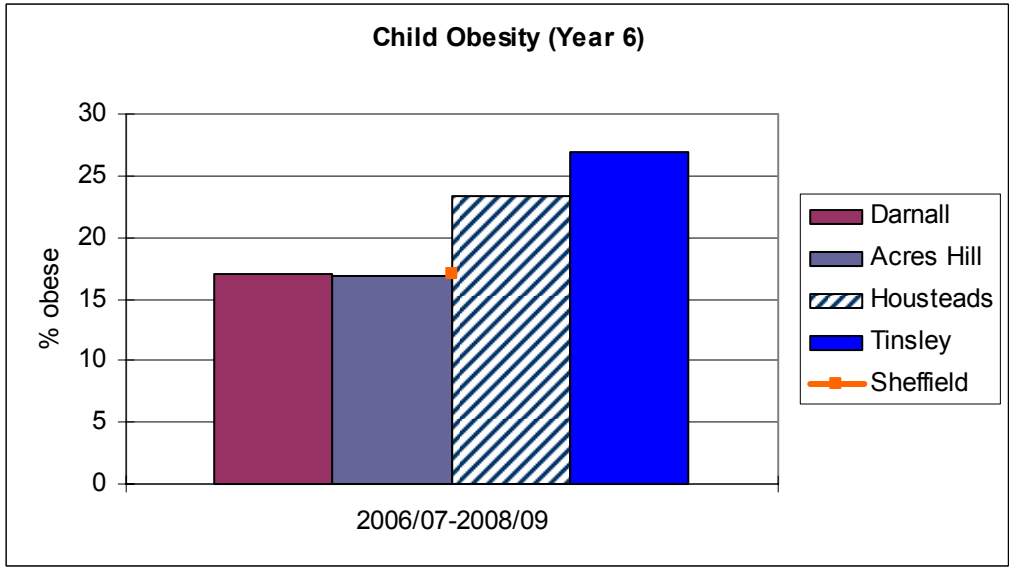


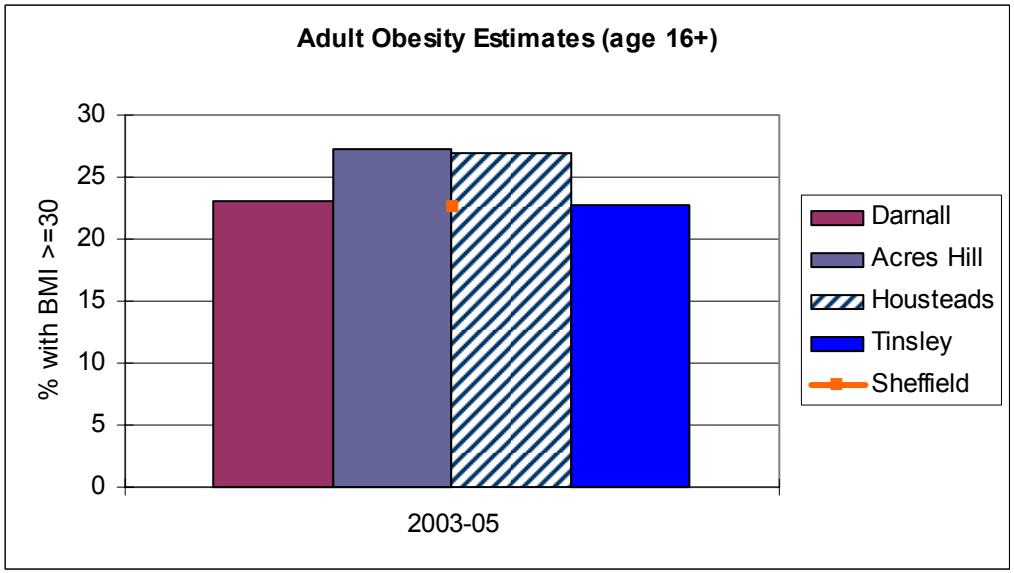


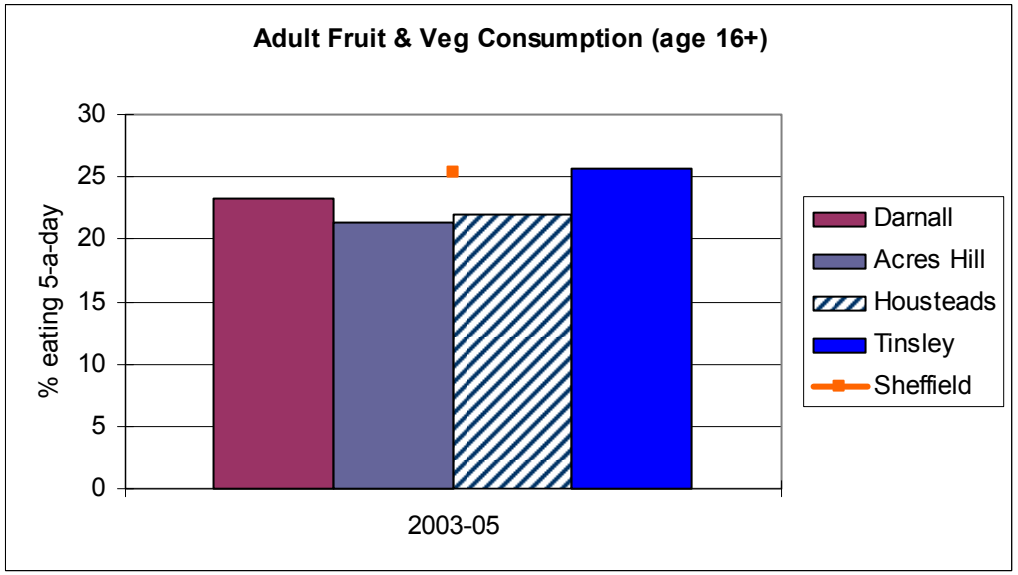
Data Source: Inpatient Minimum Data Sets, Population Health Register extracts.

Lifestyle Indicators





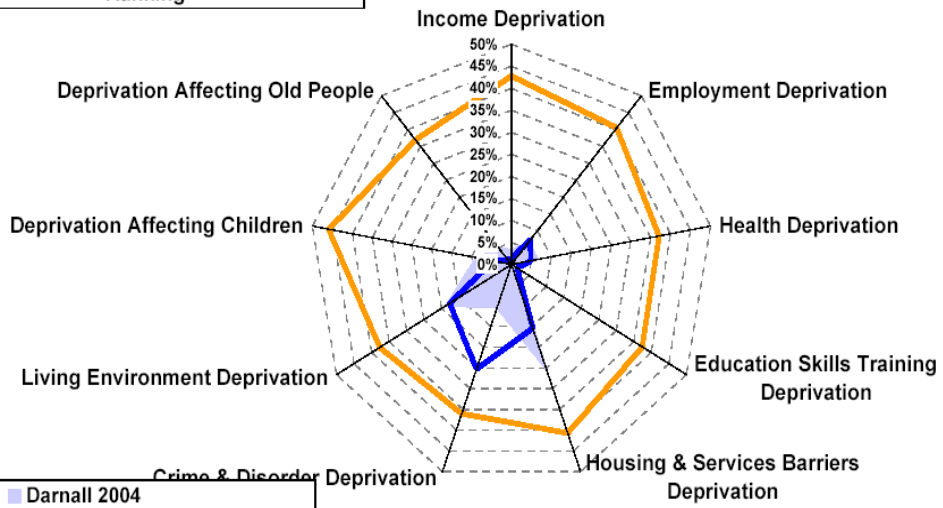




Data Source: National Child Measurement Programme, National Centre for Social Research using HSfE data

England Index of Deprivation by Domains % Ranking

Darnall

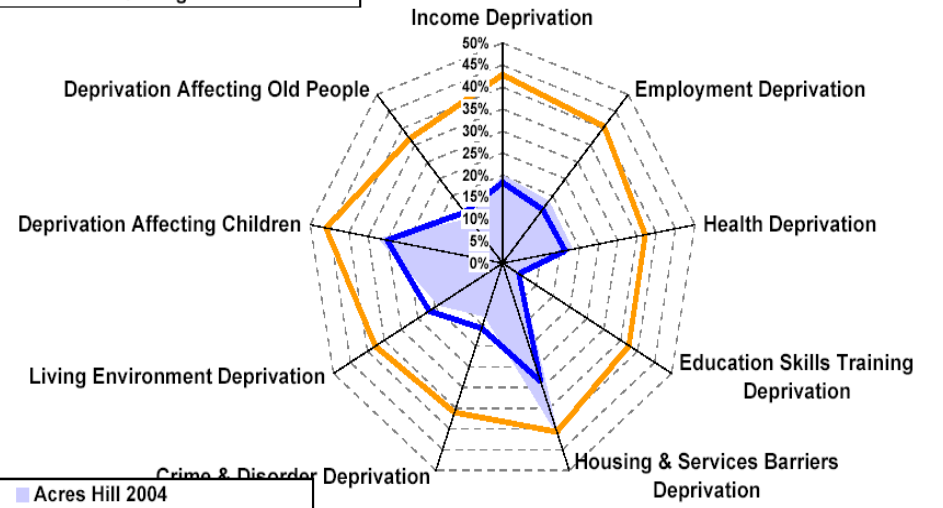


Darnall 2004
Darnall 2007
Sheffield Ranking 2007

10%= within most deprived 10% of areas in England

England Index of Deprivation by Domains % Ranking

Acres Hill



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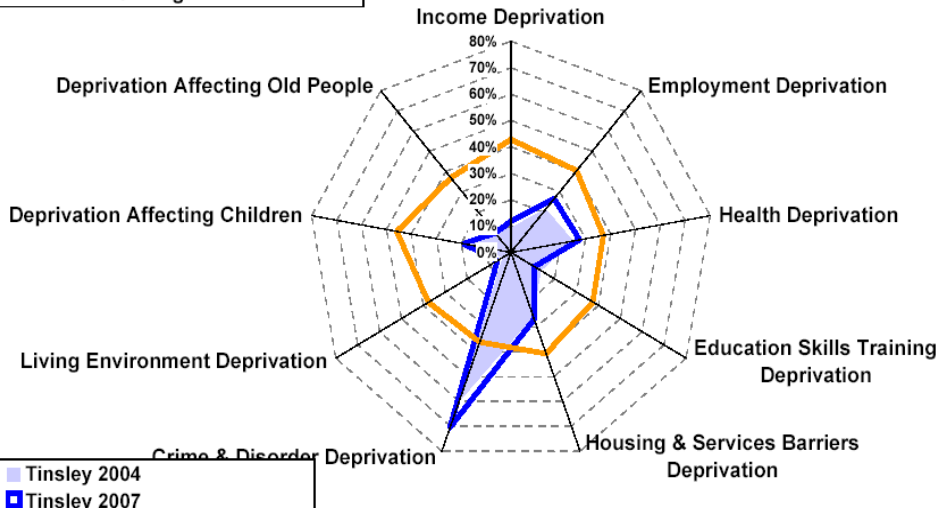
England Index of Deprivation by Domains % Ranking

Tinsley



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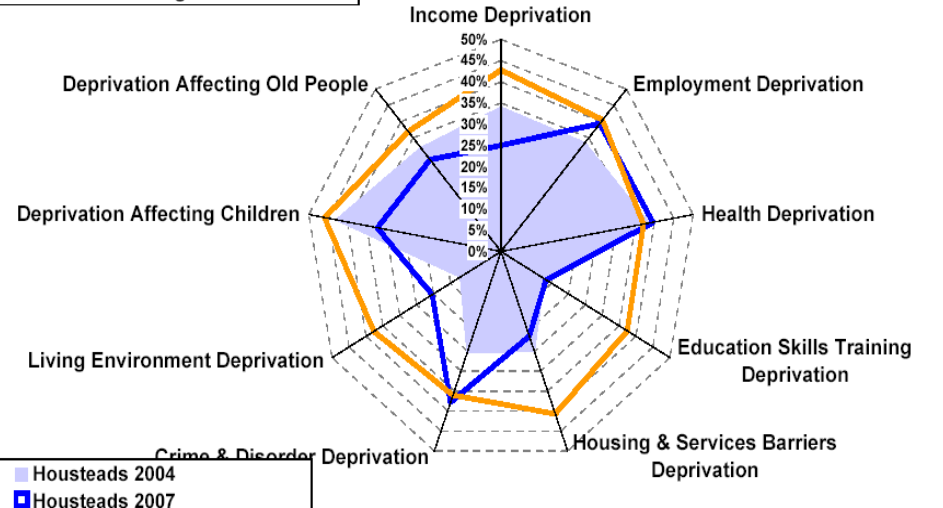
Housteads



Housteads 2004
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Data source: Sheffield City Council Neighbourhoods, 2007