

Air pollution and energy use in England and Wales – a social and environmental justice analysis

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Overview

- Intro to MOT project and Mitchell & Dorling (2003)
- Air Pollution:
 - Poverty/Deprivation/Income
 - Age
 - Car Ownership
- Vehicles
- Domestic Energy Usage
- Total Direct Household Energy Usage
- Conclusions



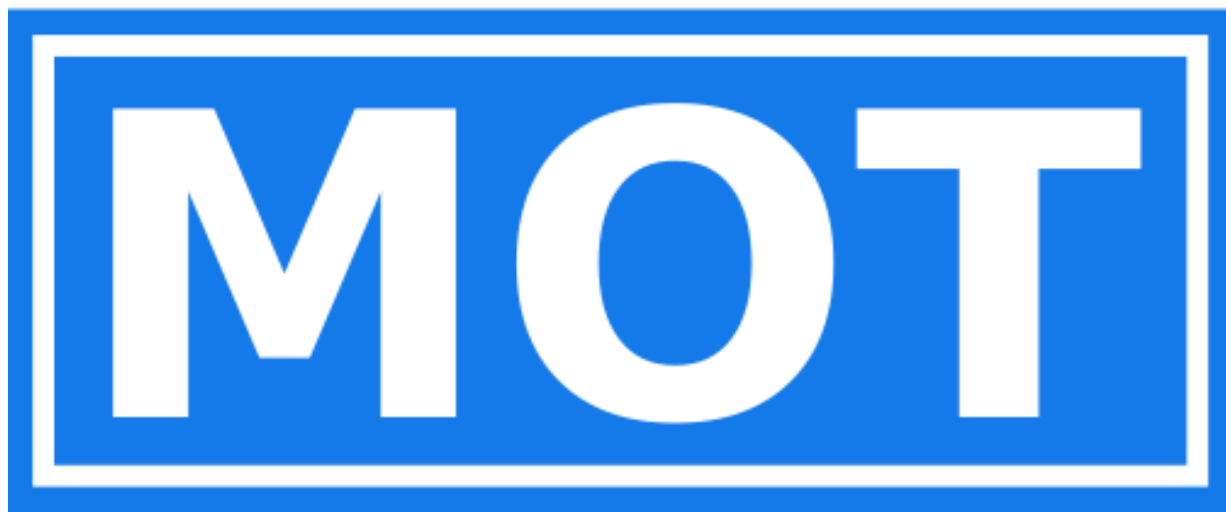
Department for Transport

EPSRC

Engineering and Physical Sciences
Research Council



Department
of Energy &
Climate Change



Motoring and Vehicle **O**wnership **T**rends in the UK



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UNIVERSITY
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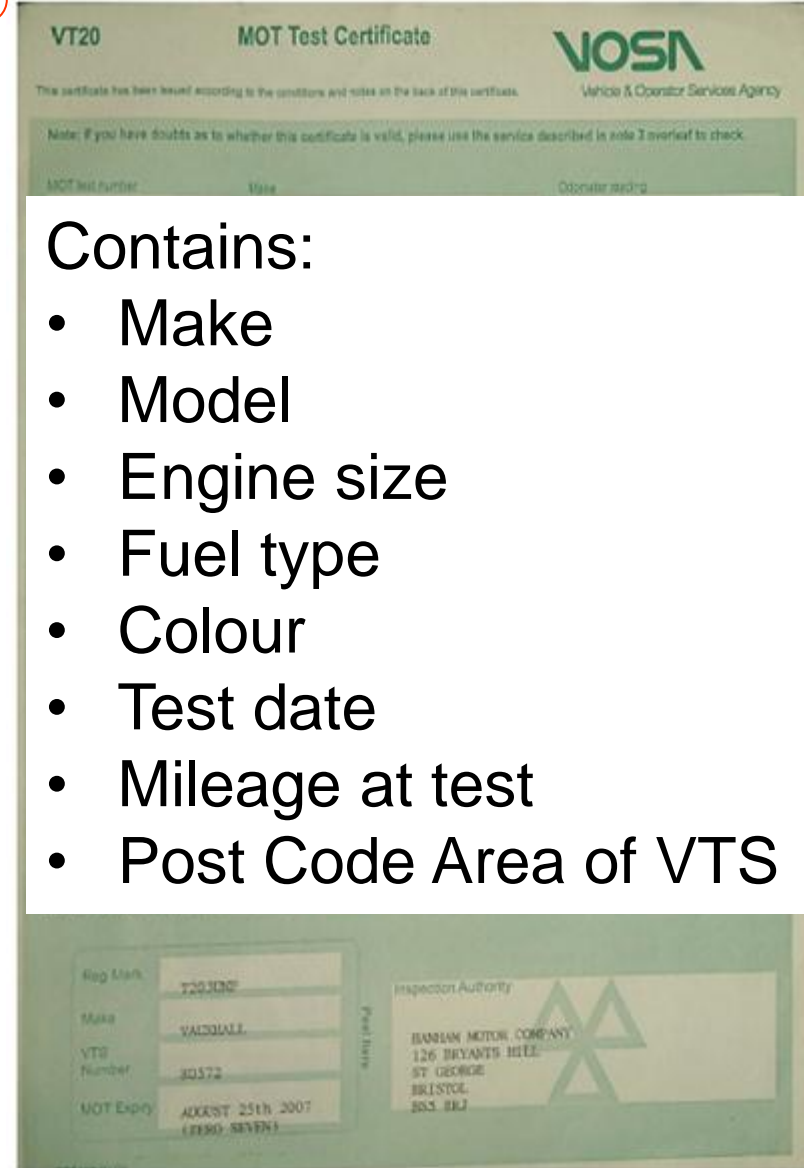
University of the
West of England



University of
BRISTOL

MOT Test Data

- MOT: the UK's annual safety inspection for all road vehicles older than 3 years
- Since 2005 the results have been captured and stored digitally
- In November 2010 DfT published the first 5 years of data online, and now regularly updated.
- 35 million vehicle tests each year
- >160m datapoints
- Similar tests carried out in other countries
- Test usually used for road safety and/or emissions



VT20 MOT Test Certificate **VOSA**
Vehicle & Operator Services Agency

This certificate has been issued according to the conditions and notes on the back of this certificate.
Note: If you have doubts as to whether this certificate is valid, please use the service described in note 2 overleaf to check.

MOT test number: _____ Make: _____ Colour: _____

Contains:

- Make
- Model
- Engine size
- Fuel type
- Colour
- Test date
- Mileage at test
- Post Code Area of VTS

Reg Mark: T203302
Make: VAUXHALL
VTS Number: 301572
MOT Expiry: AUGUST 25th 2007 (1180-88767)

Inspection Authority:
BANDIAN MOTOR COMPANY
126 BRYANTS HILL
ST GEORGE
BRISTOL
BS5 8BJ

IMPORTANT CAVEATS!!!

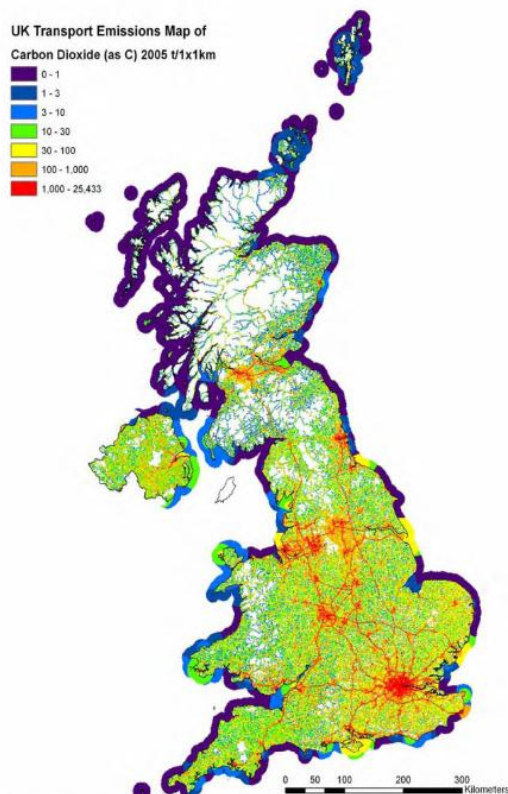
- **The location of the VTS not ideal proxy for the location of the owner of the vehicle.**
- **PCA resolution of MOT data is problematic but will be improved.**
- **The dataset does not include the majority of vehicles <3 years of age.**
- Vehicles disappear after their last test, so an unknown mileage is driven between last test and when it is scrapped or taken off the road.
- Some vehicles will not have an MOT test and will therefore be driven on the roads illegally.
- The current dataset contains cars, Light Goods Vehicles, motorbikes and private buses. Our analysis has not yet differentiated between different vehicle types.



Who....not Where or Why?

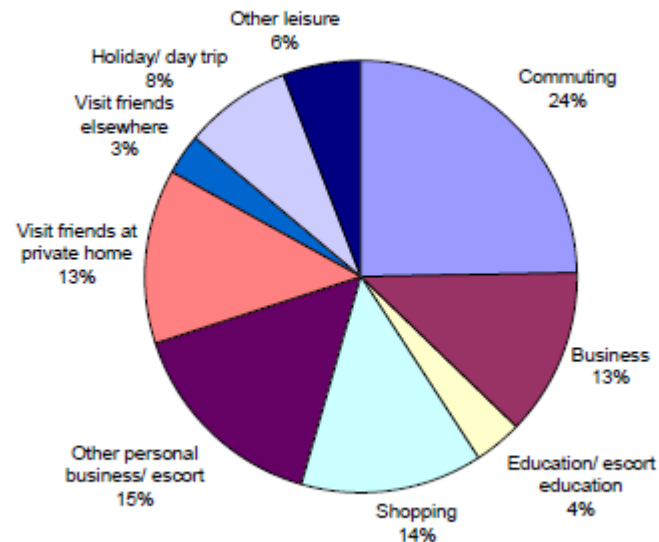
- Typically work on transport emissions focuses on ***point of use***.....

Figure 1.4: Domestic transport CO₂ emissions as carbon, UK, 2005



...or ***journey purpose***

Figure 3.3: Estimated CO₂ emissions from all modes of passenger transport by journey purpose, GB, 2002/2006 average



Source: DfT analysis



氣

Energy

+



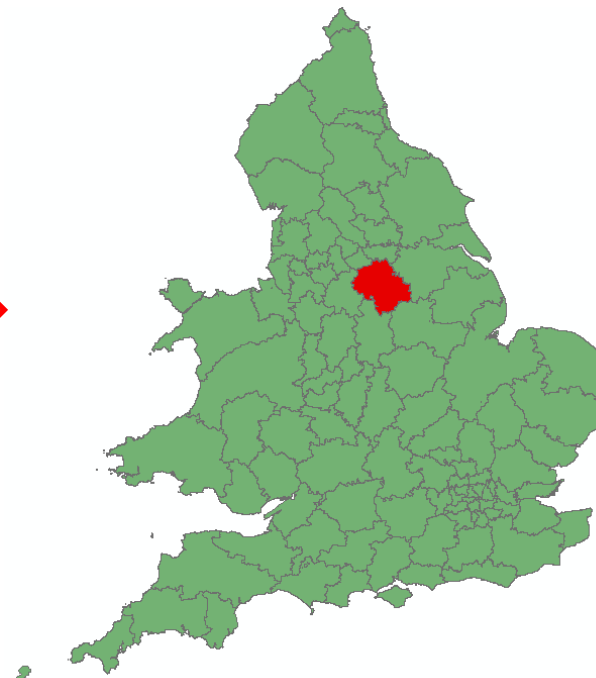
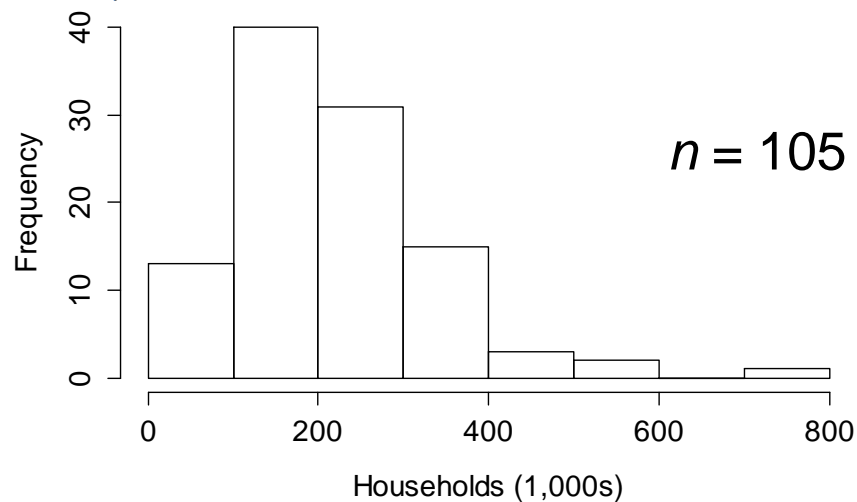
CO₂

+

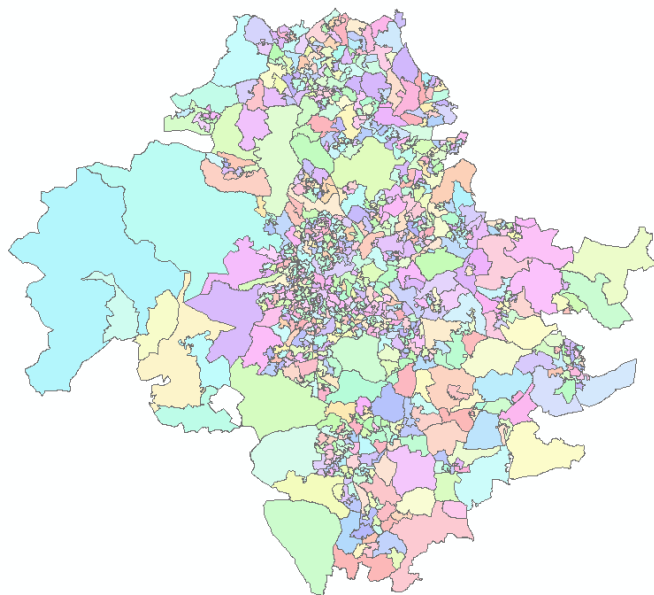
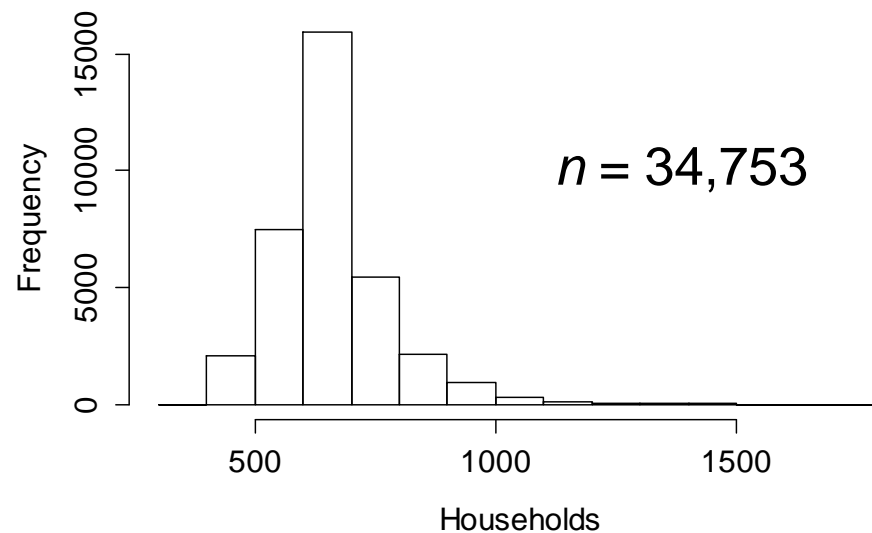




Households per Postcode Area



Households per LLSOA



1 PCA \approx 852 LSOAs

Mitchell & Dorling (2003)

- Mitchell G. & Dorling D., 2003. An environmental justice analysis of British air quality, *Environment and Planning A*. **35**(5), 909–929
- Ward level analysis of NO₂ concentrations (1999) and NO_x emissions against:
 - Age deciles
 - Poverty (Breadline Britain Index – BBI (Gordon & Pantazis, 1997))
 - Car ownership
- 1991 Census

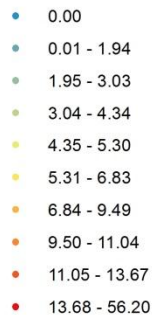
Poverty Analysis (Breadline Britain Index)

- 21.7% of Households with access to no car/van
- 20.3% of total HHs not in owner-occupied housing
- 16.0% of Lone-parent HHs
- 15.9% of the total HHs whose head was in social classes IV & V.
 - Household Reference Person in NS-SeC categories equivalent to Social Classes IV (semi-skilled) (L11.2, L12.2, L12.4, L12.5, L12.7, L13.1, L13.2, L13.5) and V (unskilled) (L13.4)
- 9.4% of HHs headed by unemployed workers (NS-SeC category 8)
- 10.8% of total HHs with person with long-term limiting illness

“the weakest direct relationship with car ownership of any of the common deprivation measures” (Mitchell & Dorling, 2003)

[adapted from Gordon & Pantazis (1997)]

Air Pollution – NO₂ and NOx

Defra Background NO₂ concentrations (2011)

NAEI Road NOx emissions (2011)



Weighted average NO₂ per LSOA

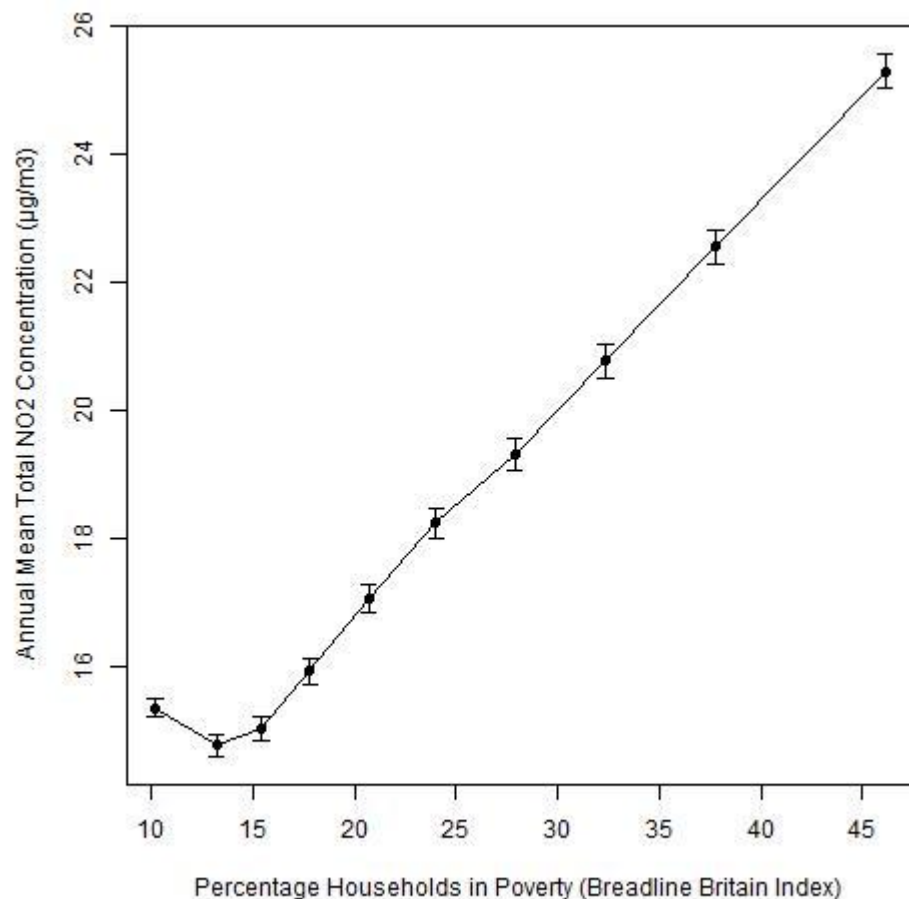
Average NO_x per km² per LSOA

Air Pollution and Poverty/Deprivation/Income

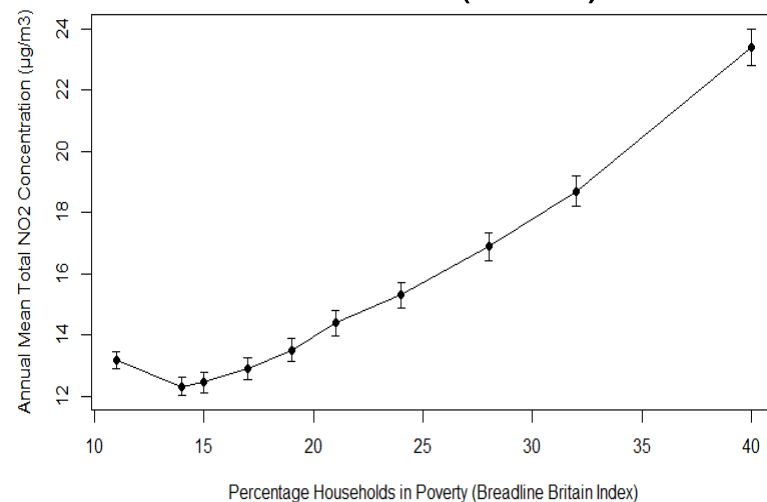


Poverty Against NO₂

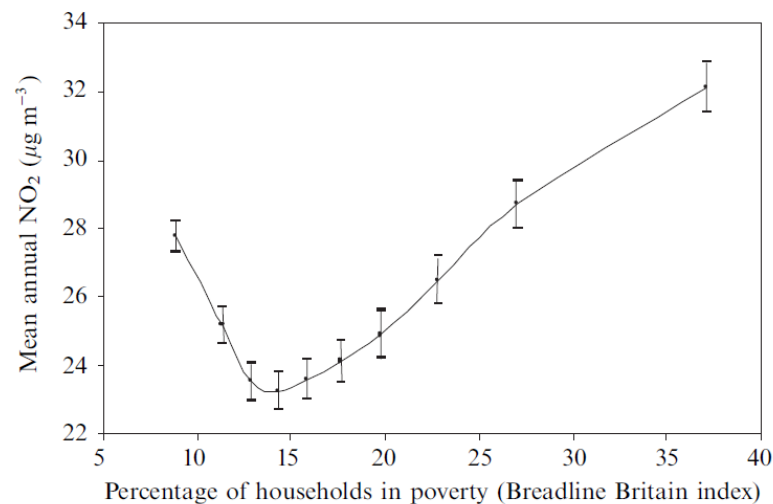
LSOA (2011)



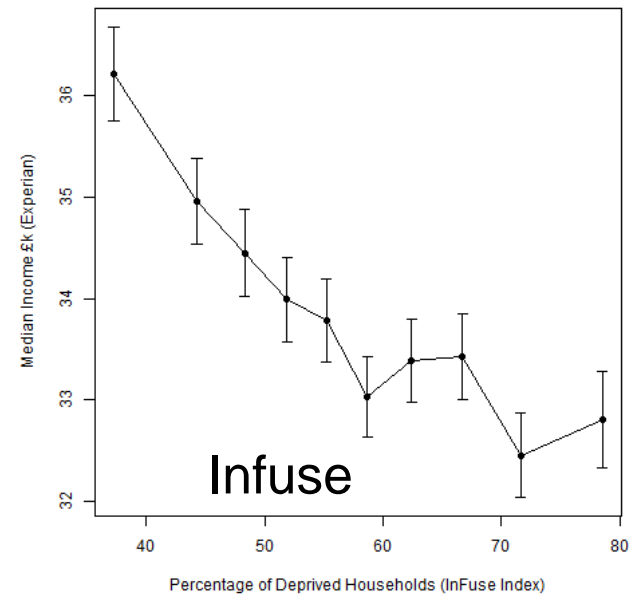
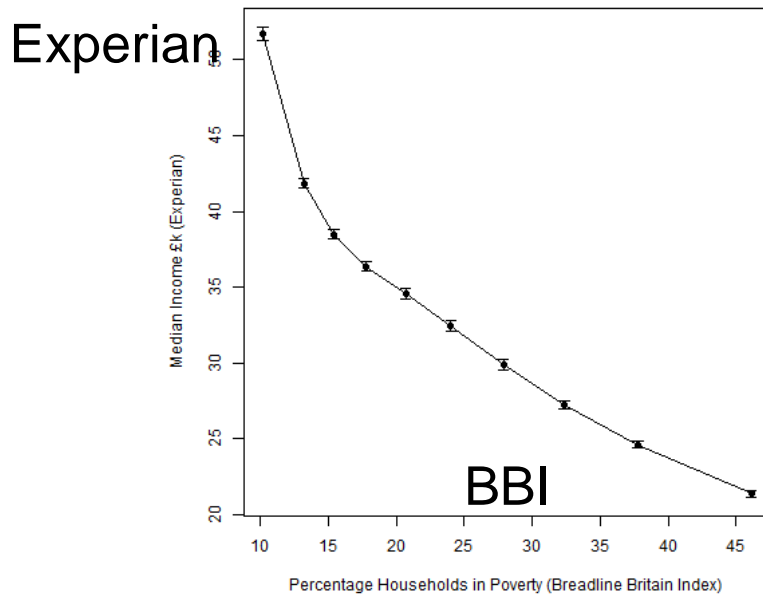
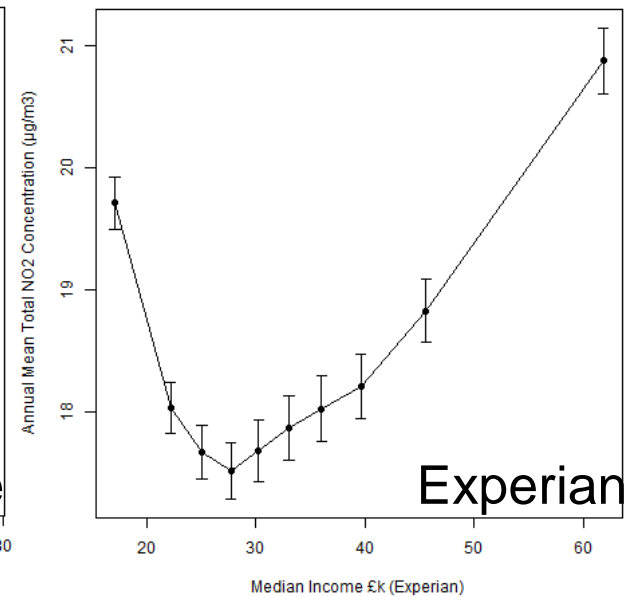
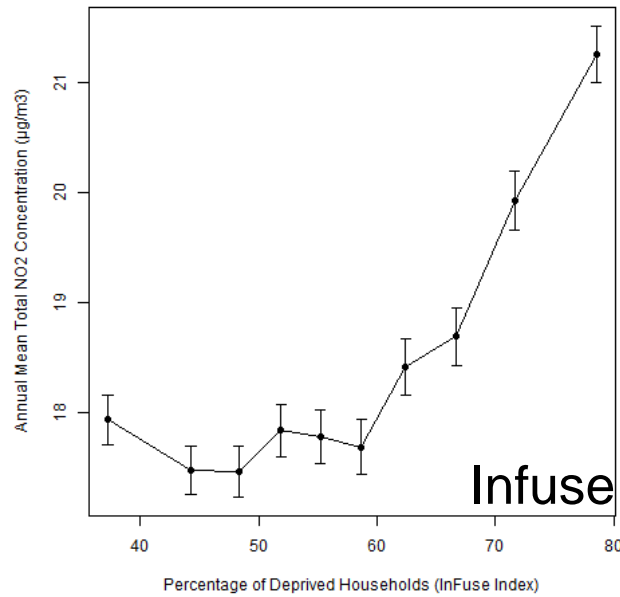
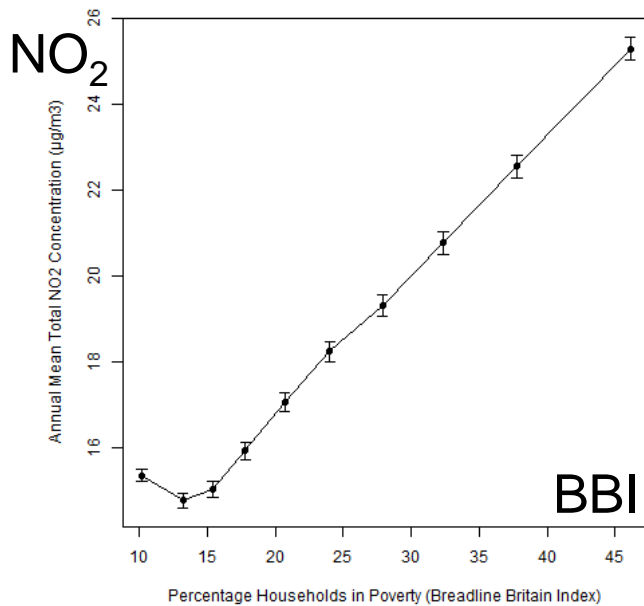
Ward (2011)



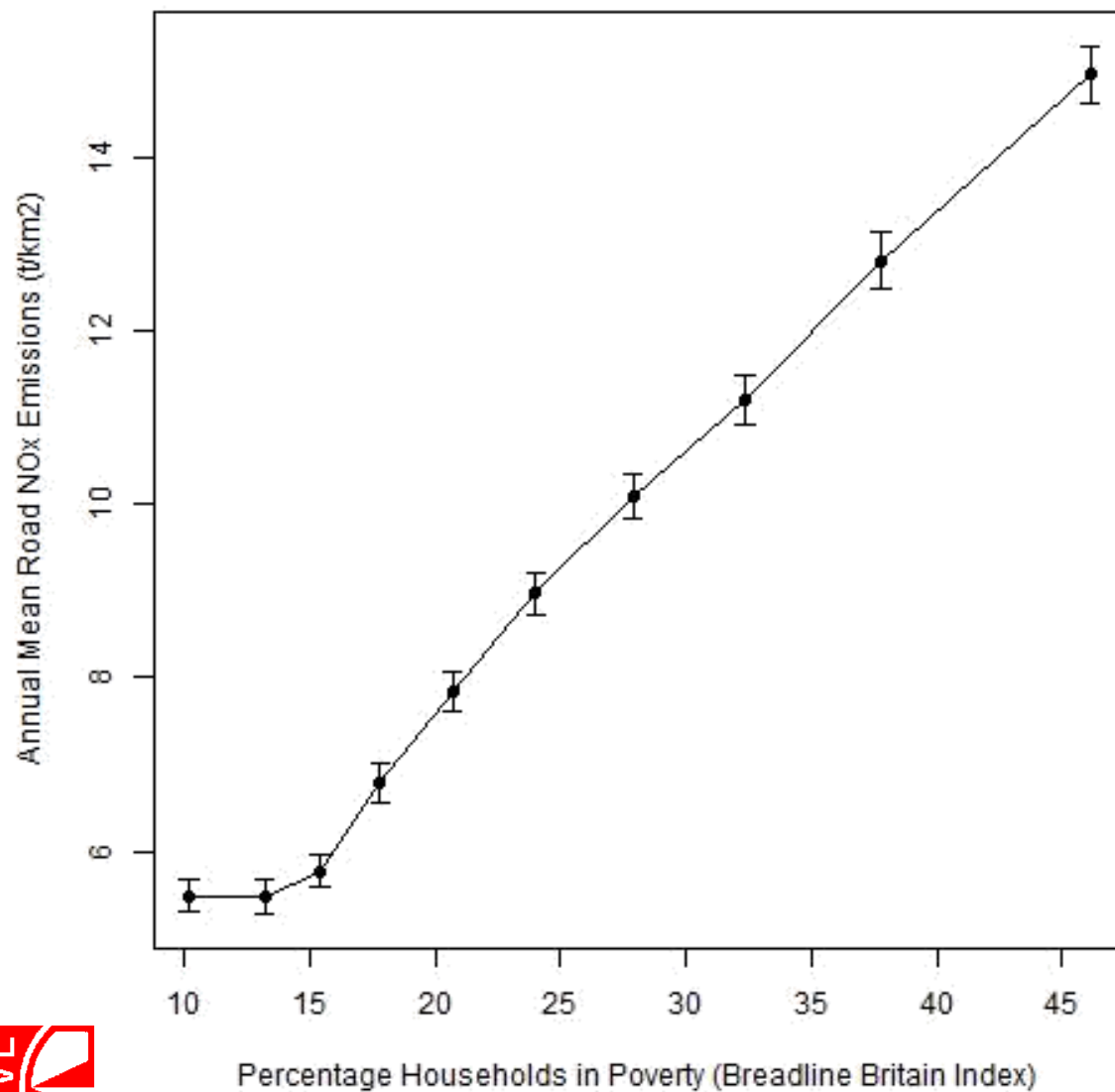
Ward (M&D, 2003)



Compare BBI with Infuse and Experian



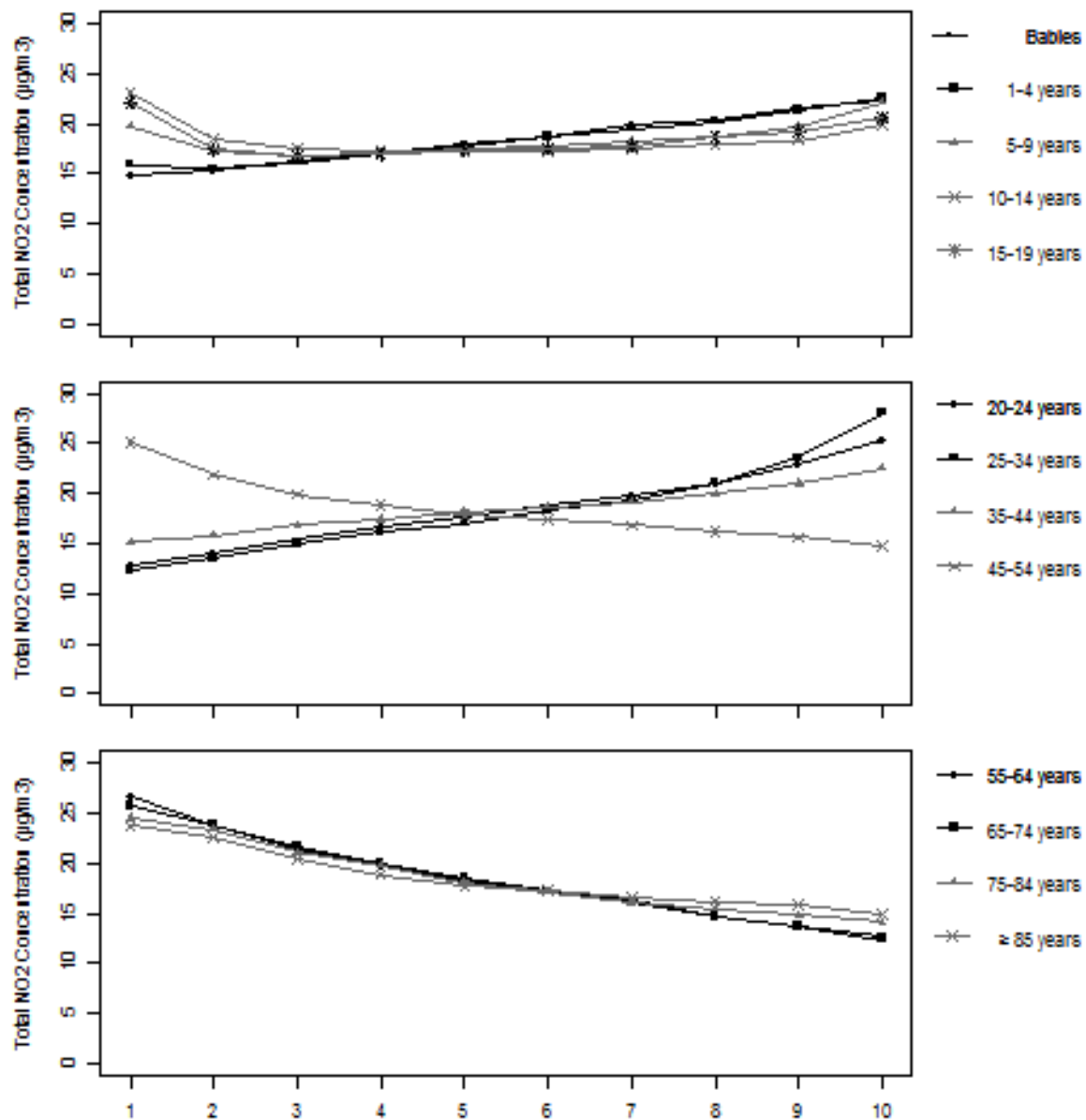
NOx Emissions from Roads



Air Pollution and Age



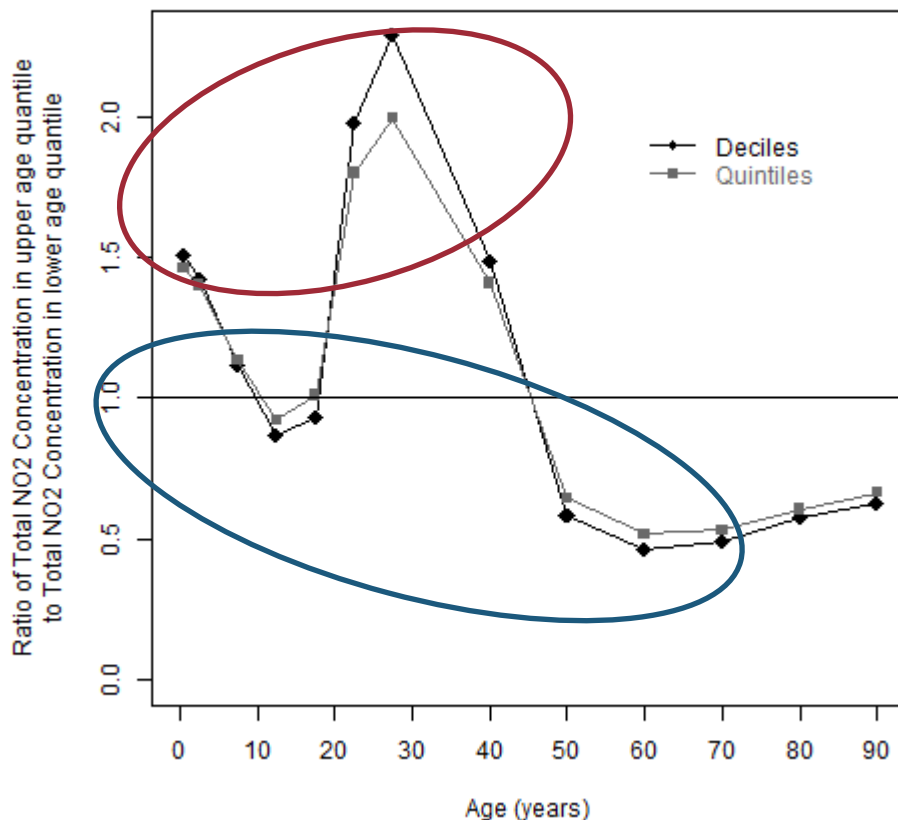
Exposure by Age



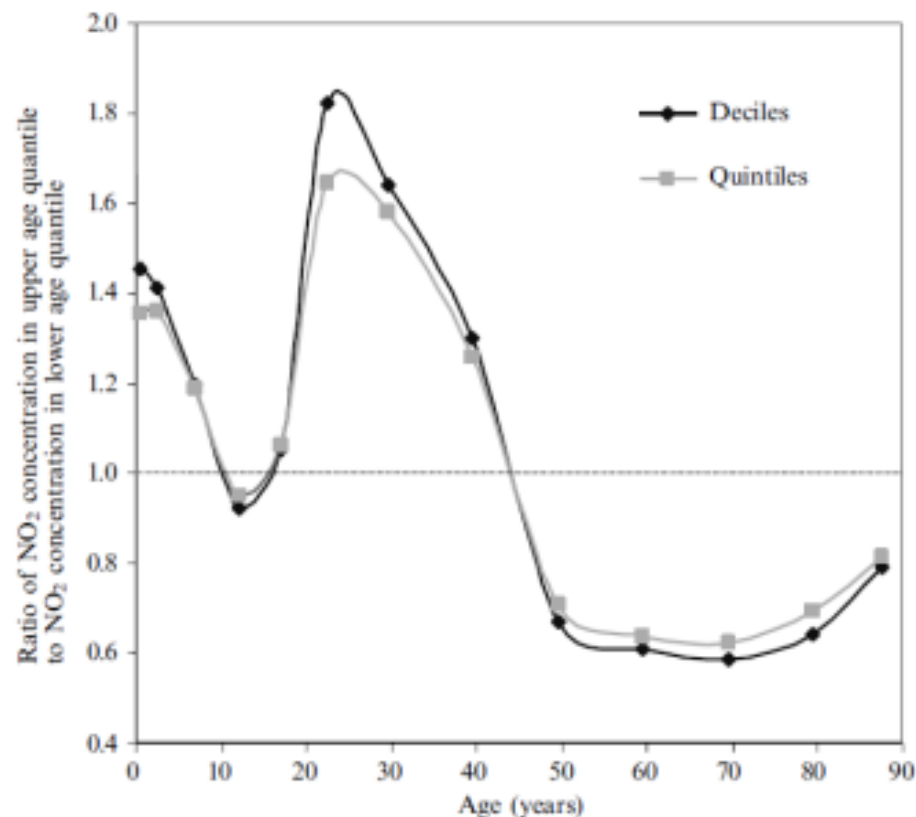


Ratio of Highest to Lowest Quantiles

Total NO₂ Concentrations



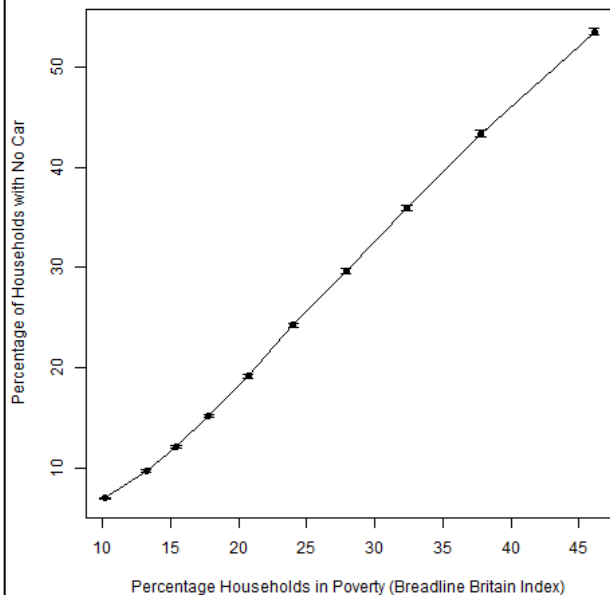
M&D NO₂ concentrations



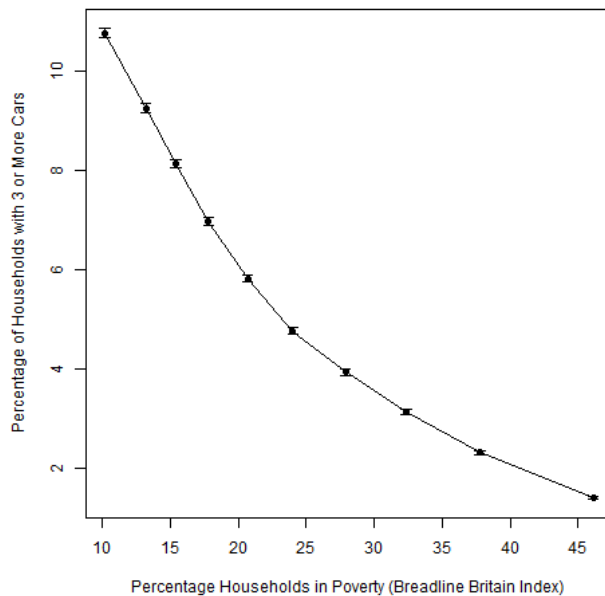
Car Ownership

Car Ownership and Poverty

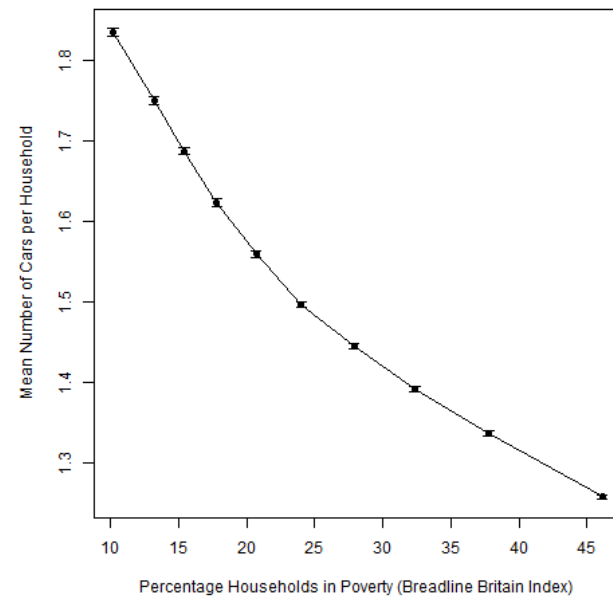
% HHs with No Car



% HHs with ≥ 3 Cars



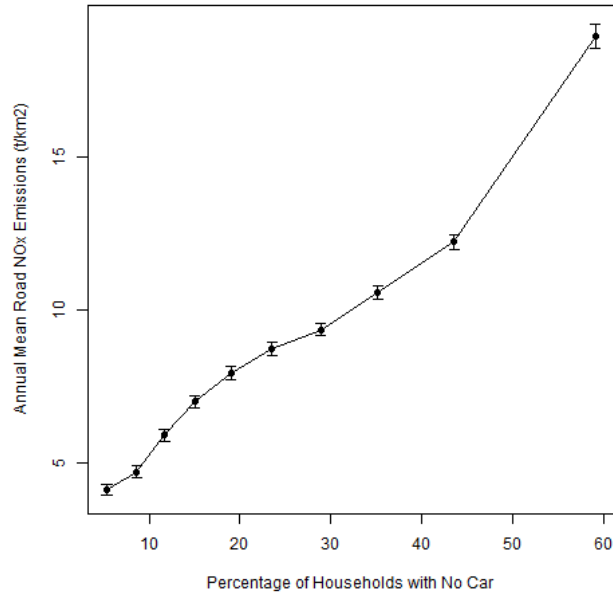
Mean No. Cars per HH*



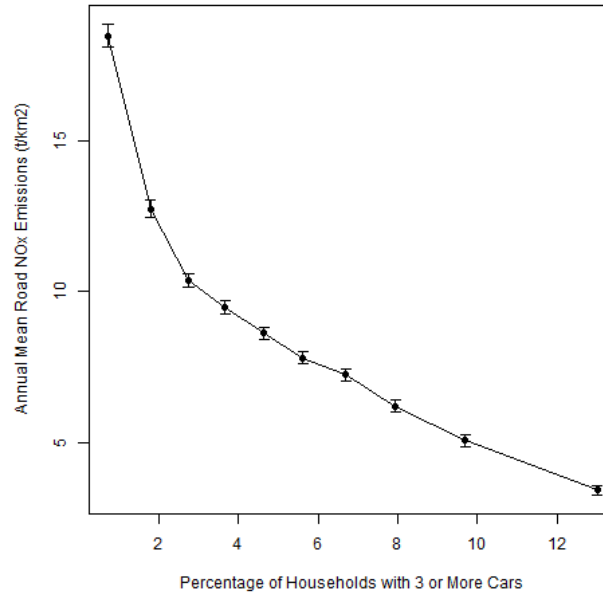
* For households with cars

Car Ownership and Pollution

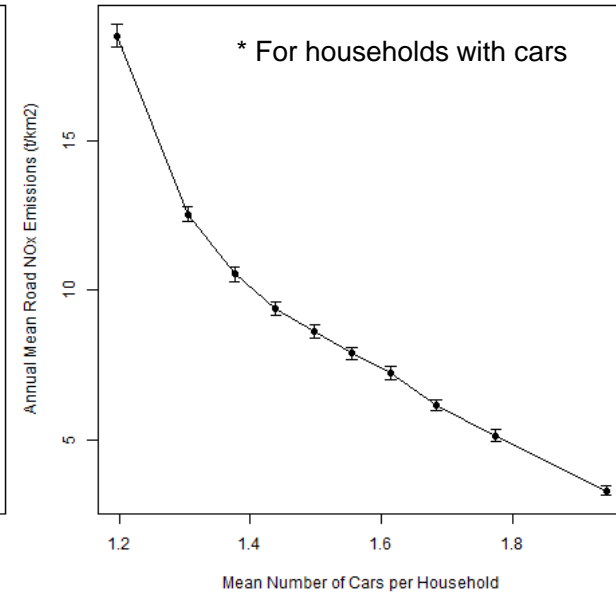
% HHs No Car



% HHs ≥ 3 Cars

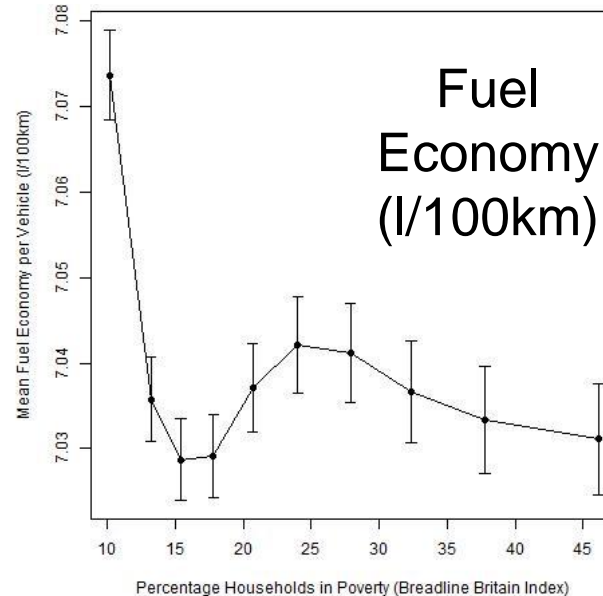
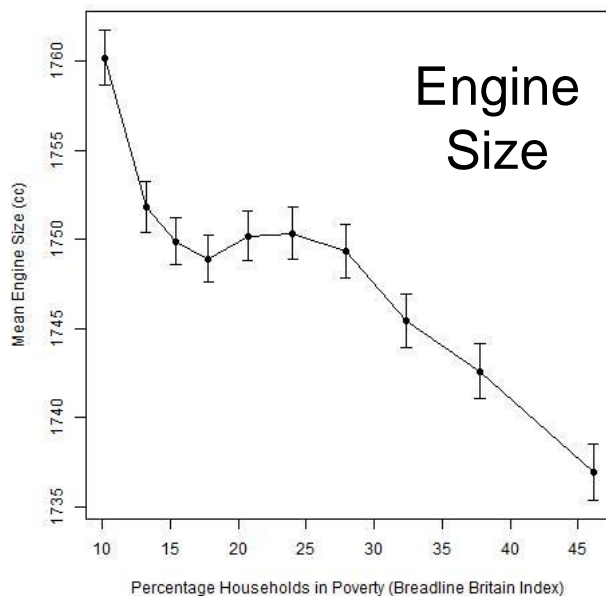
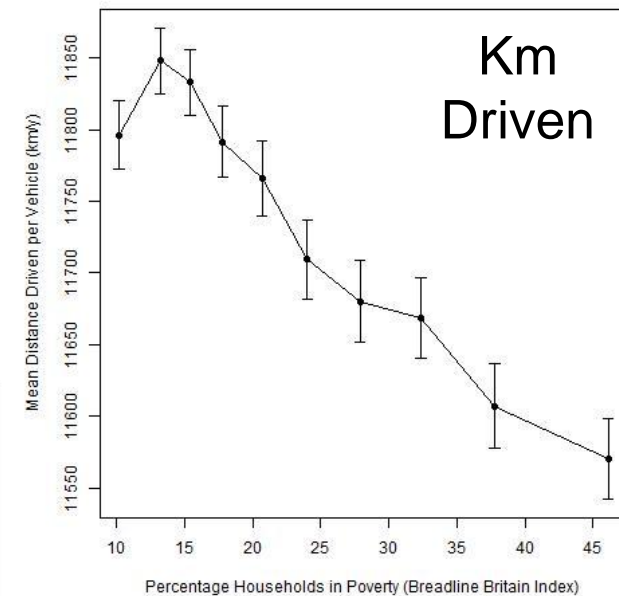
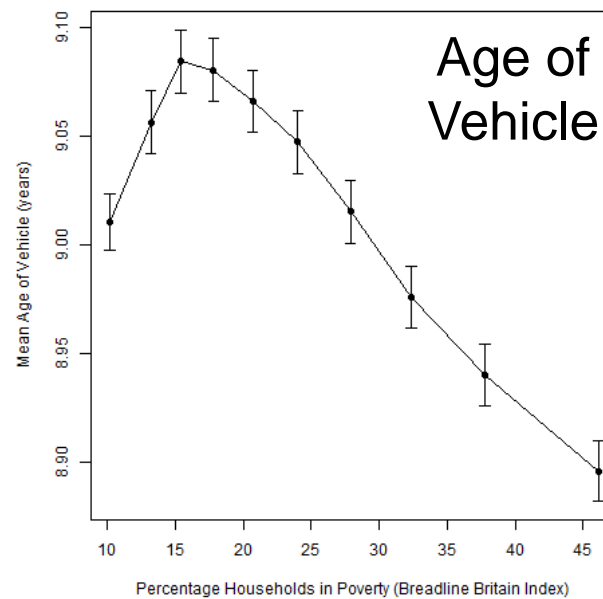
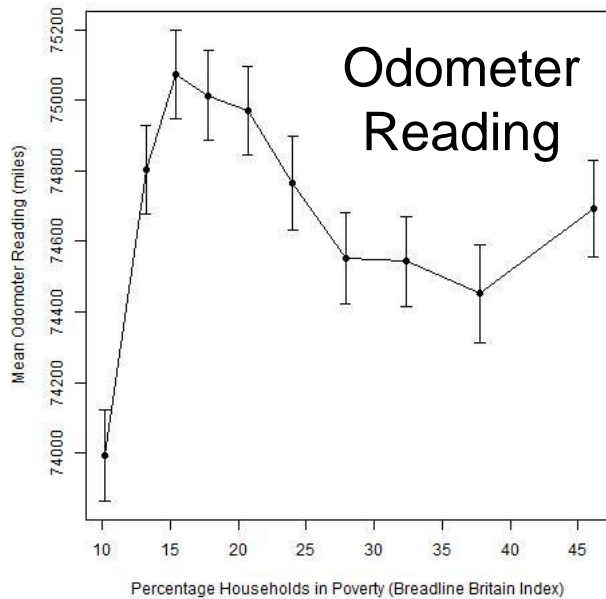


Cars per HH*



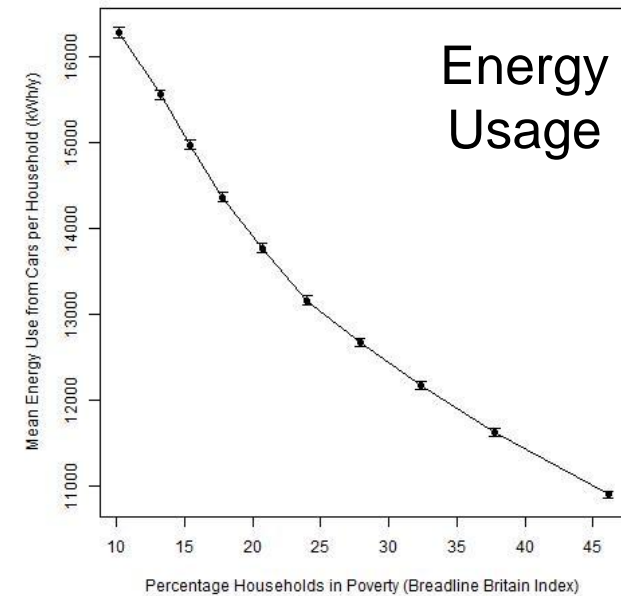
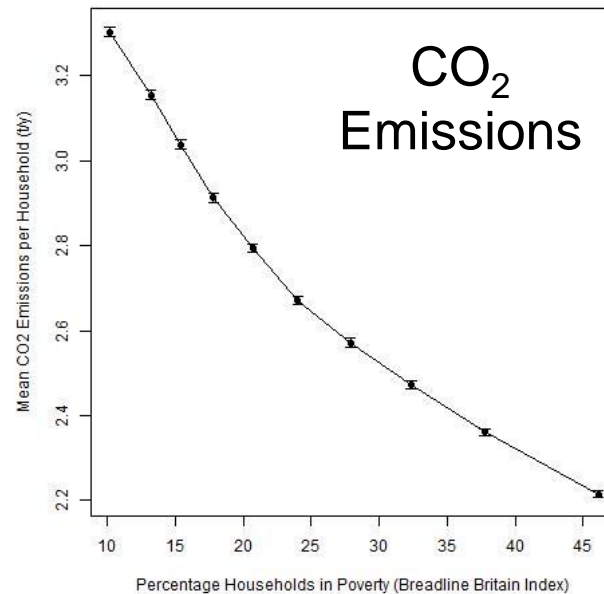
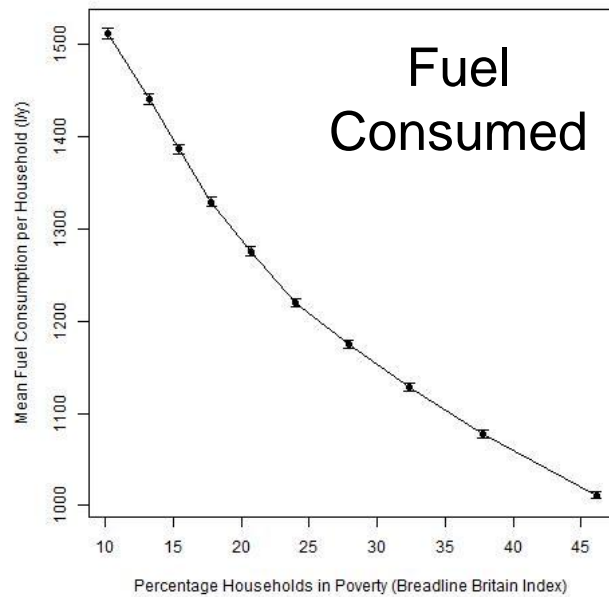
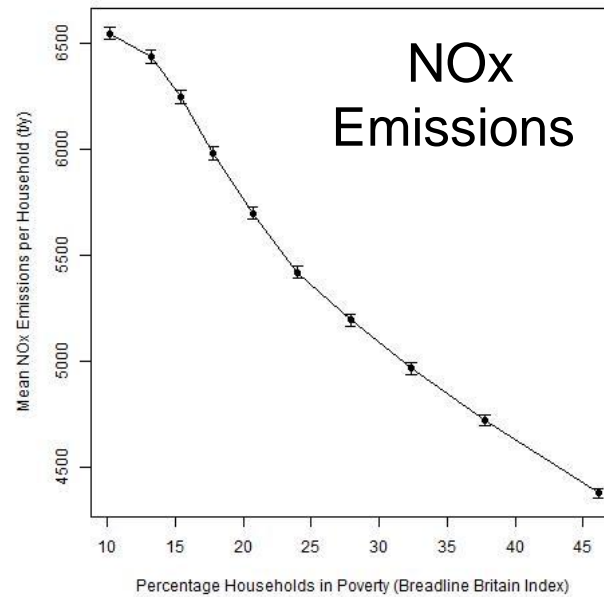
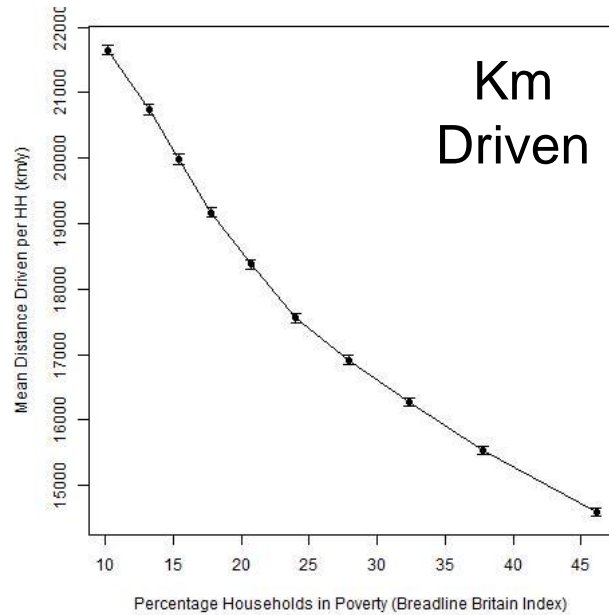
MOT data - Vehicles

Variation in Vehicle Parameters (MOT)



Vehicle Impacts per Household*

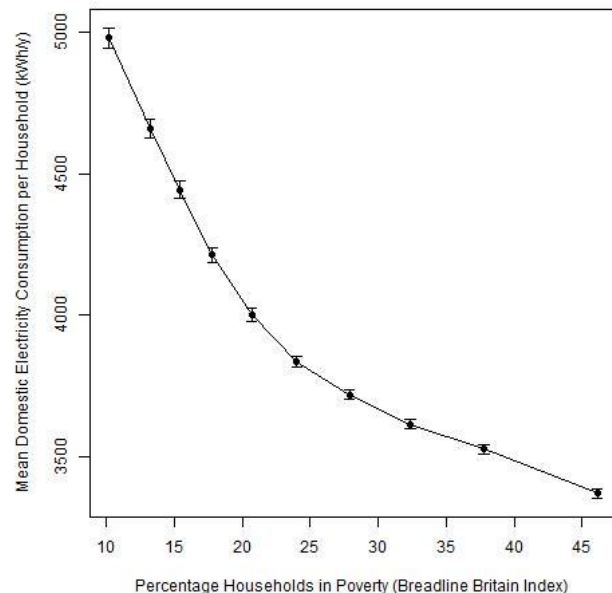
*for those households with cars



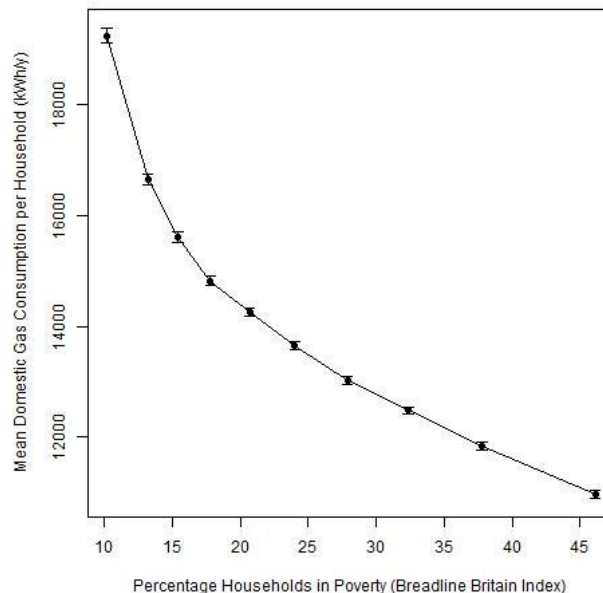
DECC data – Domestic Energy Usage

Domestic Energy Use per Household

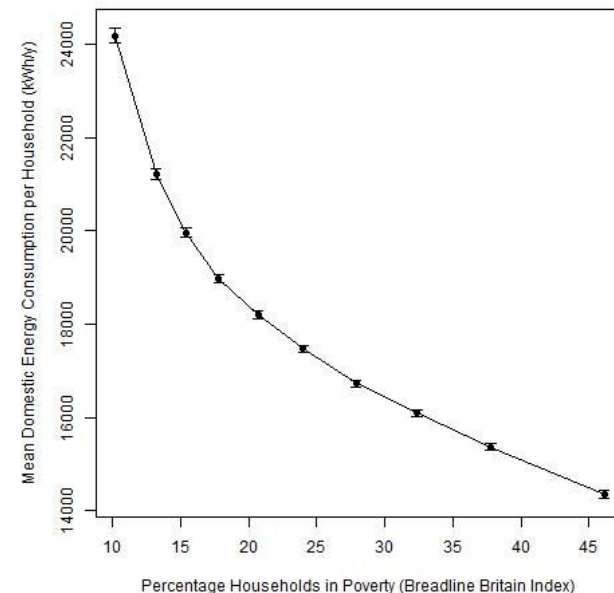
Electricity



Gas



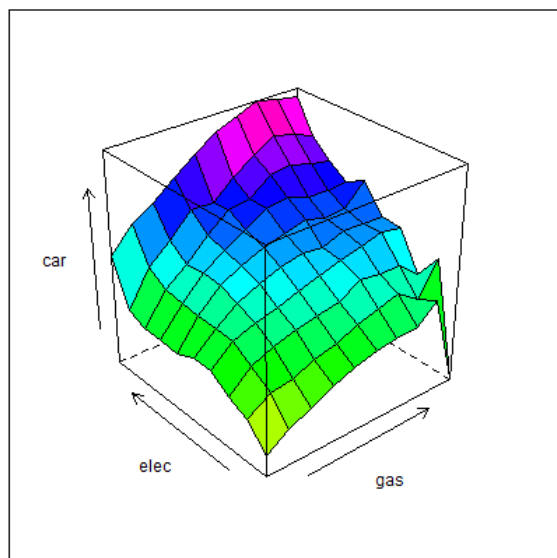
Total Domestic Energy



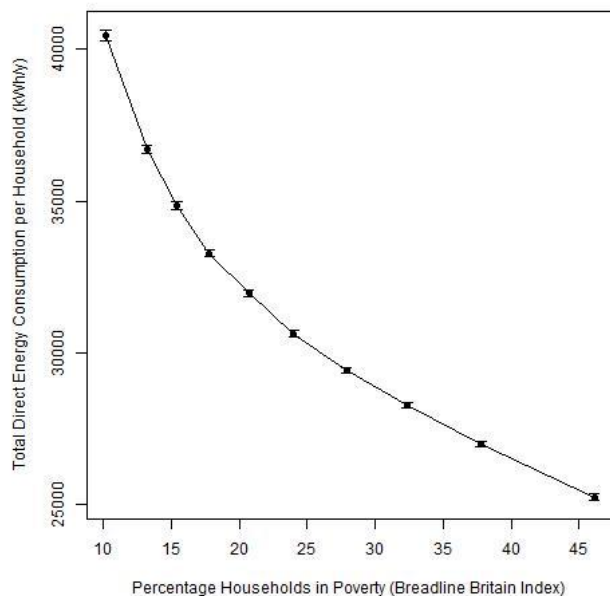
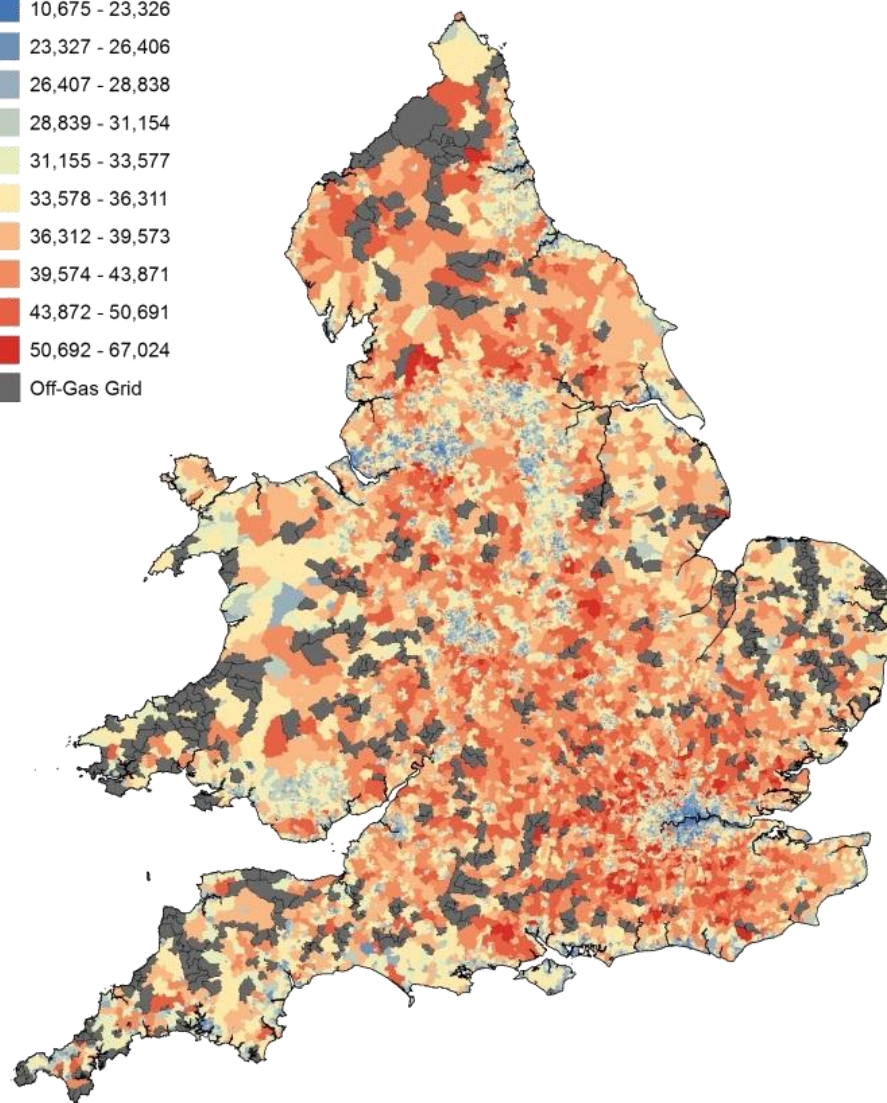
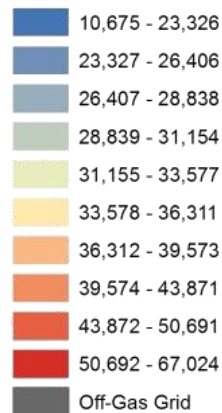


Total Direct Energy Use per Household

**Average Household Energy Usage
by Electricity, Gas and Car**



**Mean Total Household Energy Usage
(kWh/y)**



The 'Diesel Betrayal'

The Telegraph

Diesel car drivers 'betrayed' as EU cracks down on Britain over air pollution

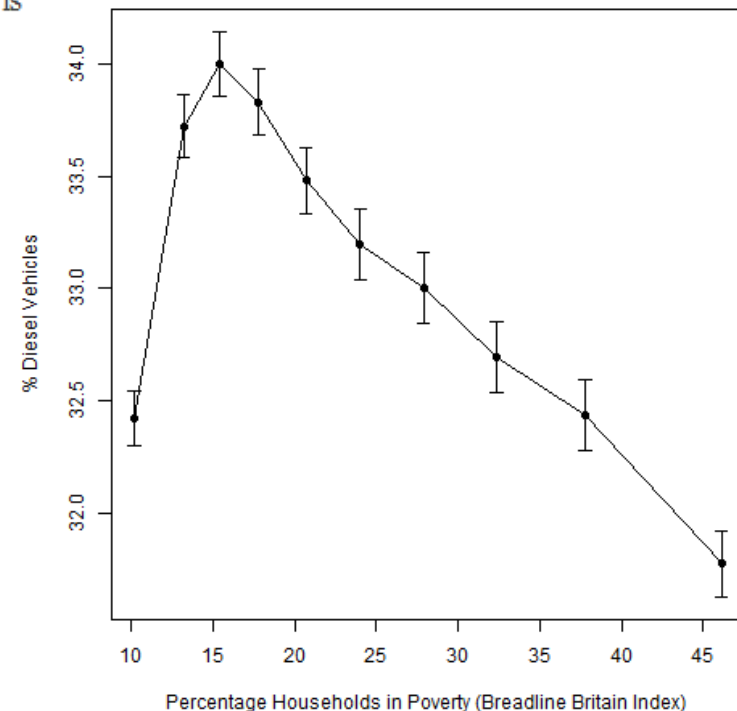
As Britain is sued by the European Commission for breaching pollution limits, drivers of diesel motor vehicles are warned that they face higher costs

Diesel drivers should be fuming

Boris Johnson's proposals that diesel vehicles should pay an extra congestion charge is final proof that the petrol alternative is flawed

Newspaper readership by social class				
	AB	C1	C2	DE
GB (%)	24	27	21	28
The Times (%)	53	30	8	8
Financial Times (%)	58	33	8	6
Daily Telegraph (%)	52	30	10	9
The Guardian (%)	55	31	7	10
The Independent (%)	46	36	8	10
Daily Mail (%)	26	33	21	19
Daily Express (%)	23	32	24	21
The Daily Mirror (%)	11	23	27	39
The Sun (%)	8	22	29	41
Daily Star (%)	5	17	35	42
None (%)	22	28	21	29

Source: MORI aggregates 2004. Base: c10,000 interviews with GB residents 15+



Key Conclusions

- HHs in poverty (BBI) are much more likely to be exposed to higher NO₂ concentrations than HHs not in poverty, particularly relating to road traffic sources.
- LSOAs with highest proportions of HHs in poverty have access to fewer cars, travel the least, consume the least fuel, generate the least emissions and use least energy from road traffic and domestic sources.
- LSOAs with a high proportion of under-5s are exposed to 1.5 times more NO₂ than LSOAs with few small children and suffer almost twice as much impact from vehicles (using Road NO_x emissions as a proxy).
- LSOAs with a high proportion of young adults (in their 20s) are exposed to more than twice as much NO₂ and up to 5 times as much impact from vehicles as LSOAs with few young adults.

Summary

- There appear to be significant differentials in both exposure to air pollution and other impacts of traffic between those areas with the most HHs in poverty and those with least and also those with small children and young adults.
- Affluent HHs appear to be generating the greatest proportion of pollution from road traffic to which the least affluent are subjected.
- HHs in poverty have the lowest total direct energy usage.
- These datasets have a significant potential for examining the distributional impacts of energy and pollution related policies.

Thank you for your attention.

Any Questions?

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- <http://www1.uwe.ac.uk/et/research/aqmrc>
- <http://www1.uwe.ac.uk/et/research/aqmrc/research/projects/researchcouncilprojects/vehicleownership/trends.aspx>