

## Warrington

### Joint Strategic Needs Assessment (JSNA)

### Air Quality and Health

February 2018

#### Version control

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1.0	Final version	

## **EXECUTIVE SUMMARY**

### **Introduction**

Air pollution is associated with a number of adverse health impacts. The quality of the air we breathe affects everyone in society but particularly affects the most vulnerable in society: children and older people, and those with existing health problems. There is also a strong link with inequality issues, because areas with poor air quality are also often located in more deprived areas.

Across the UK, it is estimated that 40,000 people die prematurely each year due to poor air quality. In addition poor air quality leads to a reduction in quality of life and wellbeing with increases in GP appointments and hospital admissions. In Warrington it is estimated that approximately 145 people per year die prematurely from poor air quality.

This chapter will present the areas with poor air quality and consider the health impacts from poor air quality within Warrington.

### **Summary of Key Issues**

- Warrington has two Air Quality Management Areas (AQMA) declared for exceedances in the national objective limit for annual mean nitrogen dioxide;
- Fine particulates, PM<sub>2.5</sub>, are not included within national legislation but concentrations across Warrington exceed the guidelines recommended by the World Health Organisation (WHO);
- There is a lack of data for PM<sub>2.5</sub> at hot spot locations close to the roadside;
- It is very difficult to demonstrate the direct impact air quality has on health outcomes within the Warrington population. This due to a combination of a lack of health data available within the specific AQMAs and the confidence to state that poor health is directly caused by poor air quality; however
- AQMAs are located within wards with poor health outcomes that could be exacerbated and/or caused by poor air quality;
- There is very little data available to measure local health impacts from nitrogen dioxide;
- Approximately 4% of all mortality in Warrington during 2015 was attributable to man-made particulate pollution.

### **Recommendations**

- Scope the possibility of developing a regional air quality and health monitoring dashboard with Public Health England and Champs Public Health Collaborative. The dashboard would look at exploring methods to assess local health impacts from NO<sub>2</sub>, assess impacts of poor air quality on vulnerable population groups and identify periods of poor air quality across the region;
- PM<sub>2.5</sub> data to be collected locally to assess worse case hot spot areas;
- Explore actions, within the Air Quality Action plan, to reduce exposure in areas with existing health problems;
- To link air quality actions with other complementary policies areas for example, mental health and planning.
- To establish an estimated population (by age group/gender) living within an AQMA.

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## 1) INTRODUCTION

Air quality is a measure of pollution in the air that has an adverse impact on human health and ecosystems. There are a number of different pollutants that have been identified as having health impacts. These include particulates (PM<sub>10</sub> and PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>) and ground level ozone (O<sub>3</sub>). The most important primary local air pollutants that impact upon health are fine particulate matter (PM<sub>2.5</sub>) and nitrogen dioxide (NO<sub>2</sub>).

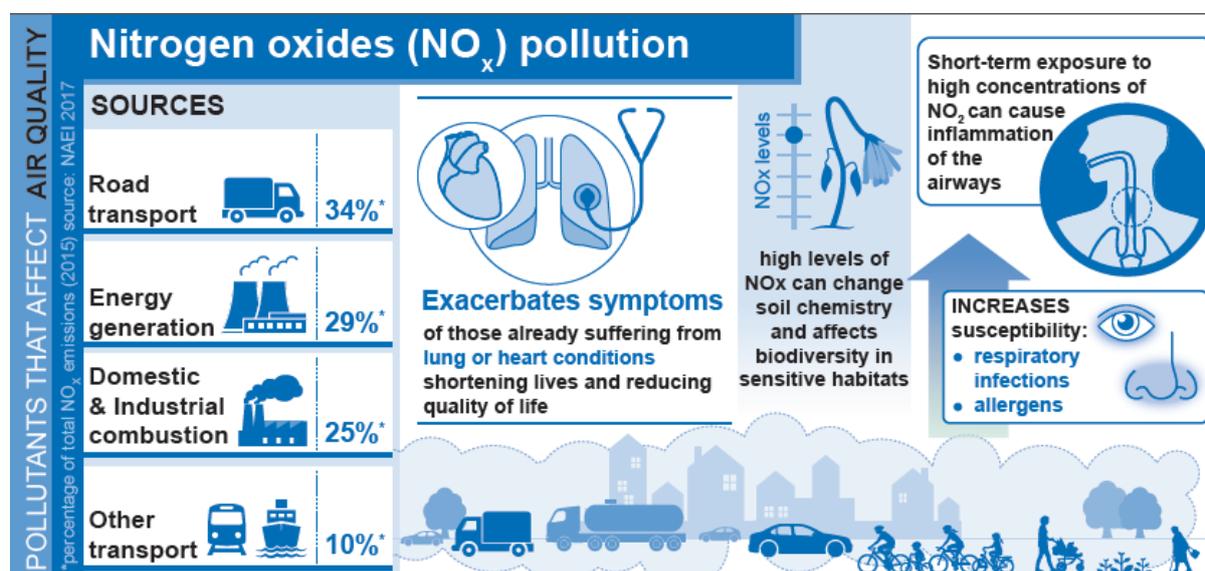
**Table 1: Air pollutants and their associated health effect** (Ghebrehewet, S et al, 2016)

Pollutant	Health Effects	Public Health Significance
PM <sub>10</sub>	Long term exposure increases all-cause mortality, particularly lung cancer and cardiovascular disease	May contain harmful chemicals and other particles (e.g. dust pollens, moulds)
PM <sub>2.5</sub>	As above; penetrates deeper into the body than PM <sub>10</sub>	Generated by human activity, may cause nearly 29,000 deaths in the UK and 340,000 life years lost. Predicts mortality better than PM <sub>10</sub>
NO <sub>2</sub>	Irritant to airways causing breathing problems	May cause 23,500 deaths in the UK (Defra 2015). Contributes to photochemical smog and ground ozone levels. Effect on mortality.

### Nitrogen Dioxide (NO<sub>2</sub>)

Air quality is the largest environmental risk to the public's health. The Committee on the Medical Effects of Air Pollutants (COMEAP) stated that evidence associating NO<sub>2</sub> with health effects has strengthened substantially over recent years (COMEAP, 2015). It is estimated that the effects of NO<sub>2</sub> on mortality are equivalent to 23,500 deaths in the UK annually (DEFRA, 2015).

**Figure 1: Sources and health impacts from nitrogen oxides** (Defra, 2017)

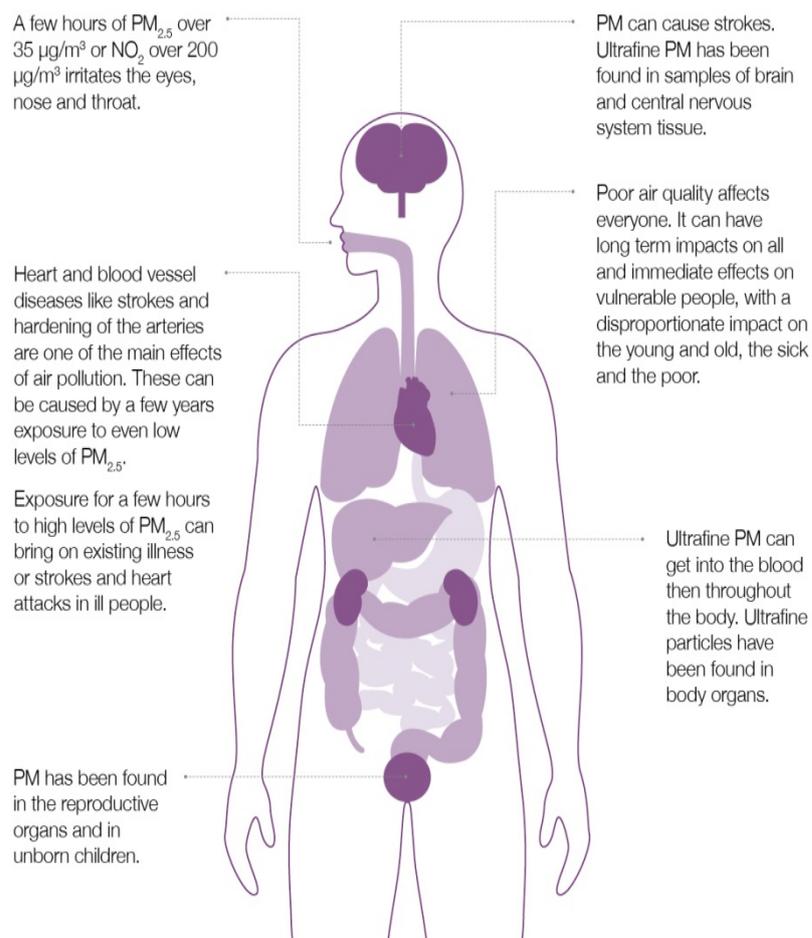


## Particulates (PM<sub>2.5</sub>)

Many of the sources of NO<sub>2</sub> are also sources of particulate matter (PM). The impact of exposure to fine particulate matter pollution (PM<sub>2.5</sub>) is estimated to have an effect on mortality equivalent to nearly 29,000 deaths in the UK and an estimated associated loss to the population of 340,000 life-years (PHE, 2014a). The combined impact of these two pollutants represents a significant public health challenge. Air pollution affects mortality from cardiovascular and respiratory conditions, including lung cancer.

On average poor air quality from PM<sub>2.5</sub> reduces the average persons' lifespan by 7 to 8 months, and as much as 9 years for people with existing health problems who live in poor air quality areas (COMEAP, 2010). In addition, exposure to poor air quality leads to restricted activity and increased GP appointments and hospital admissions (COMEAP 1998). The annual health cost to society of the impacts from PM<sub>2.5</sub> alone is predicted to be in the region of £9 to £19 billion per year, comparable to the costs from alcohol misuse (COMEAP, 2010).

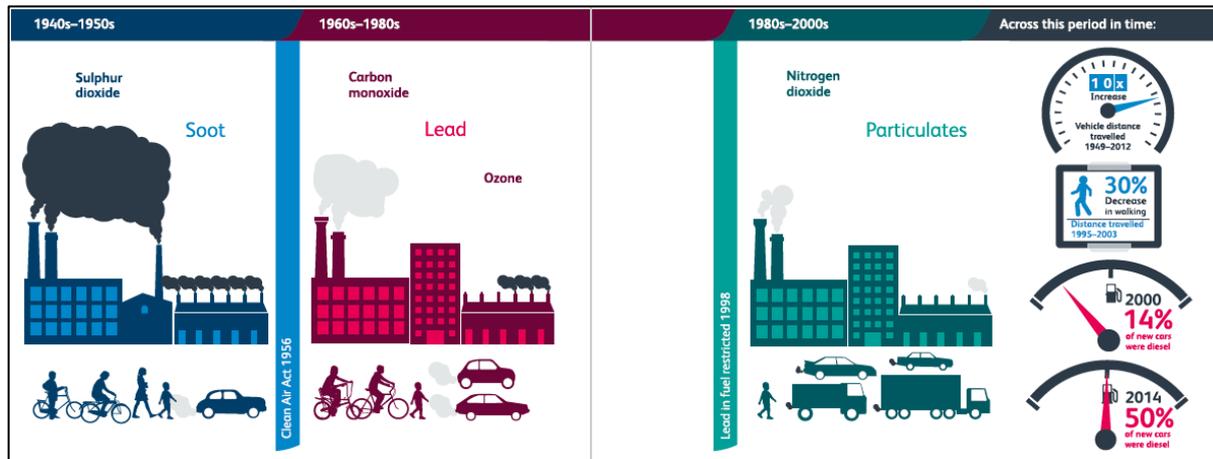
**Figure 2: PM<sub>2.5</sub> health effects (Defra, 2017)**



## 2) NATIONAL CONTEXT

Air pollution is not a new problem in the United Kingdom. In the 1950's 12,000 people were killed by the smog of London. Since then changes in the way we live have changed dramatically yet this has also changed the air pollution that we breathe. The problem has not gone away the exposure has just changed; the use of diesel cars has increased, people walk and cycle less. Figure 3 highlights the change in air pollutants over the past 70 years.

**Figure 3: Timeline of changes of air pollutants in society** (Royal College of Physicians, 2016)



Local authorities have a statutory duty, under the Environment Act 1995, to assess air quality within their areas and to compare against national objective limits which have been set for a number of pollutants based on health grounds. These objective limits were set at EU level by the Air Quality Directive 2008/50/EC, and set out in the Air Quality (Standards) Regulations 2010. The limits are set depending upon the type of receptor and the length of time for exposure. Where any objective is assessed as being likely to be exceeded, the Authority must designate an Air Quality Management Area (AQMA) and produce an Action Plan to try to improve the air quality. Across the UK there are currently 700 AQMAs declared, primarily for exceedance in the  $\text{NO}_2$  annual mean objective of  $40\mu\text{g}/\text{m}^3$ . For the annual mean objective level sensitive receptors are classed as residential, schools, care homes, children's nurseries and hospitals.

It is important to note that there is no set objective threshold limit set for  $\text{PM}_{2.5}$  as it is considered there will still be health impacts at low concentrations. A target value for an annual mean of  $25\mu\text{g}/\text{m}^3$ , rather than an absolute limit, was aimed to be met by 2020 with a target reduction of 15% in urban areas.

The World Health Organisation (WHO) produced guideline objectives (WHO, 2005) for certain pollutants. This recommends stricter limits for  $\text{PM}_{2.5}$  with a limit of  $10\mu\text{g}/\text{m}^3$  as an annual mean. An updated report (WHO, 2013) uses evidence showing associations between

PM<sub>2.5</sub> and mortality below this guideline value. This guideline limit is not included within UK legislation.

The Public Health Outcomes Framework (PHOF) is a Public Health England data tool, intended to focus public health action on increasing healthy life expectancy and reducing differences in life expectancy between communities. The tool uses indicators to assess improvements. Recognising the significant impact that poor air quality can have on health, the PHOF includes an indicator relating to fine particulate matter (PM<sub>2.5</sub>). Mortality rates associated with exposure to PM<sub>2.5</sub> are reported as an indicator within the Public Health Outcomes Framework. Across England the percentage of deaths in persons aged 30 years and above attributable to particulate air pollution has on the whole reduced slightly from 5.6% during 2010 to 4.7% during 2015.

### 3) WHO IS AT RISK AND WHY?

The Royal College of Physicians in 2016 produced the report ‘Every breath we take: the lifelong impact of air pollution’ which examined the impacts of exposure to air pollution over the course of a lifetime.

“Air pollution plays a role in many of the major health challenges of our day, and has been linked to cancer, asthma, stroke and heart disease, diabetes, obesity, and changes linked to dementia....This damage occurs across a lifetime, from a baby’s first weeks in the womb all the way through to the years of older age” (pp xii, Royal College of Physicians, 2016).

**Figure 4: Impact of air pollution over the life course (Royal College of Physicians, 2016)**



“Air pollution is harmful to everyone. However, some people suffer more than others because they:

- Live in deprived areas, which often have higher levels of air pollution;
- Live, learn or work near busy roads;
- Are more vulnerable because of their age or existing medical conditions”.

(pp xiii, Royal College of Physicians, 2016)

The WHO review of health aspects of air pollution (WHO, 2013) assessed recent studies. This showed “additional studies linking long-term exposure to PM<sub>2.5</sub> to several new health outcomes, including atherosclerosis, adverse birth outcomes and childhood respiratory disease; and emerging evidence that also suggests possible links between long-term PM<sub>2.5</sub> exposure and neurodevelopment and cognitive function, as well as other chronic disease conditions, such as diabetes (WHO, 2013).

### **Children and young people**

“As the levels of air pollution increase, so does the harmful effect on lung function. Children living in highly polluted areas are four times more likely to have reduced lung function in adulthood. Improving air quality for children has been shown to halt and reverse this effect” (pp 51, Royal College of Physicians, 2016).

Research has found that “young children who live in polluted areas have more coughs and wheezes” (pp 51, Royal College of Physicians, 2016), whilst “exposure to air pollution may affect mental and physical development in children” (pp 51, Royal College of Physicians, 2016). Evidence has shown that new cases of asthma, including new cases in children, are associated with outdoor air pollution (Royal College of Physicians, 2016).

High levels of air pollution have been linked to low birth weight and premature births (WHO, 2005).

### **Older People**

Evidence has found that “for older people, living near a busy road speeds up the rate of lung function decline that is associated with ageing” (pp 51, Royal College of Physicians, 2016). It has also been found that “exposure to air pollution may affect...thinking skills (cognition) in older people” (pp 51, Royal College of Physicians, 2016).

People who live near busy roads are more likely to get dementia, however more research is needed to be sure this is caused by air pollution (Global Action Plan, 2017a)

### **People with chronic health problems (including respiratory and CVD conditions)**

“Over the long term, breathing air pollution is linked to the development of cardiovascular disease in adults, including atherosclerosis (furring of the arteries). Once people have a heart condition, spikes in air pollution can make their symptoms worse, leading to more hospital admissions and deaths” (pp 51, Royal College of Physicians, 2016).

Long-term conditions such as asthma and type 2 diabetes have been associated with air pollution. “There is now consistent evidence that outdoor air pollution is associated with new-onset asthma across the life course.” (pp 57 Royal College of Physicians, 2016). Additionally “there is emerging evidence that exposure to air pollution is associated with new-onset type 2 diabetes in adults” (pp 57, Royal College of Physicians, 2016).

There is strong evidence that outdoor air pollution exposure is linked to lung cancer. “The evidence is so convincing that the International Agency for Research on Cancer has classified air pollution as a known cause of lung cancer. This condition is thought to take many years

to develop. Therefore, exposure in childhood could be linked to lung cancer in adults” (pp 51, Royal College of Physicians, 2016).

### **People living in deprived urban neighbourhoods**

“Air pollution is harmful to everyone. However, some people suffer more because they are:

- More likely to live in polluted areas;
- Exposed to higher levels of air pollution;
- More vulnerable to health problems caused by air pollution.

Some people face all of these disadvantages. Low income is one factor that can have such multiple effects. Poorer people are more likely to have existing medical conditions, and tend to live in areas where the outdoor and indoor environments, including the quality of the air, are not as healthy. Less access to decent housing, green spaces, jobs and healthy food all contribute to poor health. These stressful conditions may also affect the body’s response to air pollution. In some ways, it is a vicious circle. For example, research suggests that some chemicals in air pollution may be implicated in the development of obesity and we also know that obese people are more sensitive to air pollution” (pp 65, Royal College of Physicians, 2016).

## **4) THE LEVEL OF NEED IN WARRINGTON**

### **Air quality in Warrington**

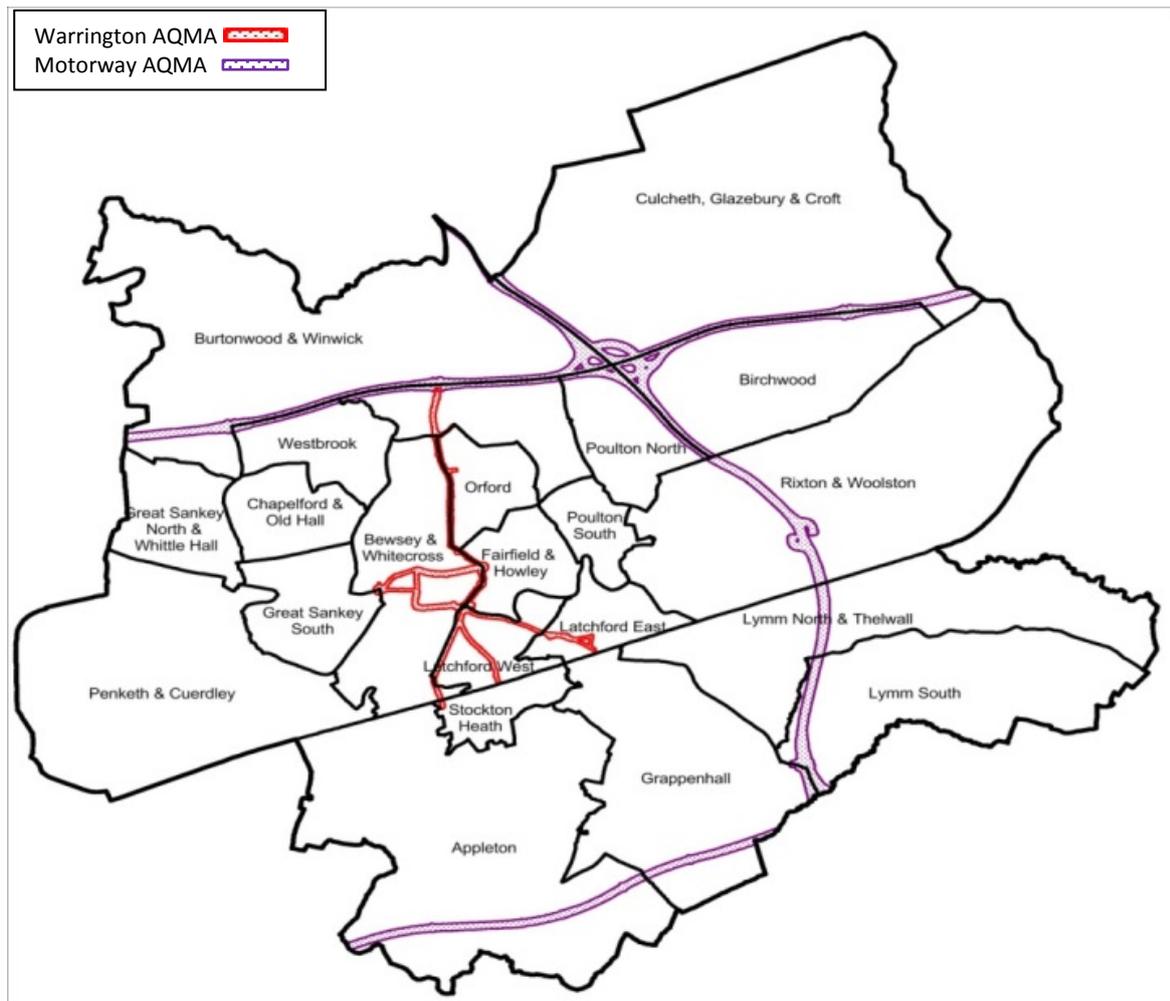
There are a number of major sources of pollution at local level namely transport, industrial and domestic heating. In addition to local sources, there are transboundary effects from regional, national and international sources that are outside the control of the local authority. For example there have been high pollution episodes due to forest fires in Scandinavia and from industry in northern Europe that has affected the UK and been measured in Warrington. The major source of pollution at a local level though has been assessed as related to transport, primarily road.

Air quality across the borough is assessed against national guidance and reported within Annual Status Reports (ASR). Warrington Borough Council carries out a targeted monitoring programme using a mix of diffusion tubes to assess nitrogen dioxide levels and with three real time monitoring sites. Two of the monitoring sites measure NO<sub>2</sub> at worse case roadside, whilst the third one is situated in a background site to measure NO<sub>2</sub>, PM10 and PM2.5. ASRs are publically available on the Council website at <https://www.warrington.gov.uk/airquality>.

The majority of Warrington has good air quality when compared with the national objectives, and our research has shown that the majority of the borough complies with all the pollutant objectives except for areas closest to major roads which exceed the objective limit for annual mean NO<sub>2</sub>. This has led Warrington Borough Council to designate two Air Quality Management Areas (AQMAs): one for a 50m distance around the motorway network; the second around the major roads that lead into, and around, the town centre.

Following designation of the second larger AQMA on 30 November 2016, an Air Quality Action Plan (AQAP) has been developed to improve NO<sub>2</sub> air quality levels. Updates on the actions in the AQAP are reported annually within the ASRs and submitted to the Department for Environment, Food and Rural Affairs (DEFRA) for appraisal. Whilst actions are designed to improve NO<sub>2</sub> levels there are expected to be benefits in reductions in PM<sub>2.5</sub> and air quality across the wider borough.

**Figure 5: Declared AQMA's in Warrington**



### Deprivation and air quality

Defra linked AQMAs (Defra 2006) to areas of high deprivation in England, therefore, AQMAs may be an effective means of reducing inequalities in the future, where actions are realised to improve levels. As it can be seen from figure 5 and figure 6 the designated AQMA within Warrington runs through the most deprived areas within the Borough.

**Figure 6: Indices of multiple deprivation**

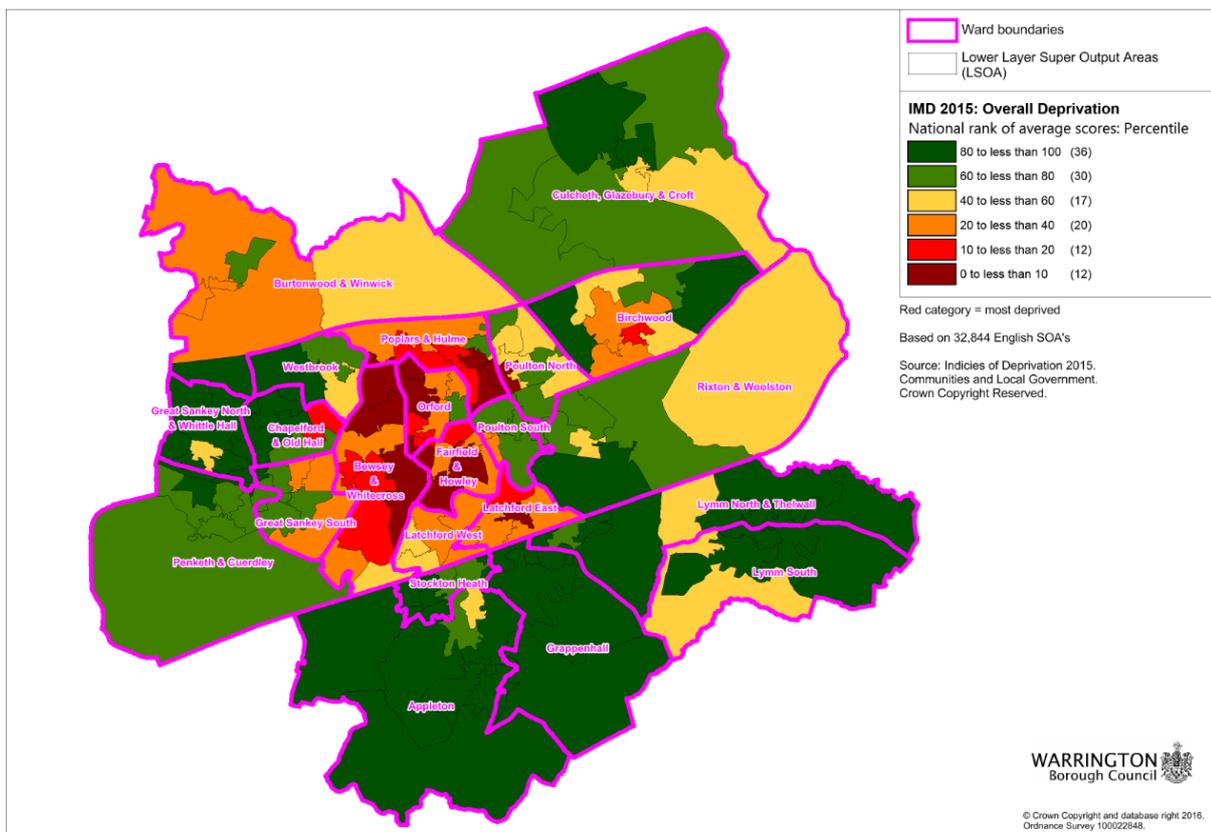


Figure 6 shows the indices of deprivation for Warrington. It is evident that the AQMAs in Warrington linked to the major roads falls primarily in high deprivation areas. Latchford West (572 homes), Bewsey & Whitecross (336 homes), Latchford East (229 homes) and Fairfield and Howley (103 homes) have the highest numbers of residential properties located within an AQMA (as presented in table 2).

### Level of exposure in AQMAs

Unfortunately it is not possible to state exactly how many people live within the designated AQMA areas at this time. This has been explored previously; however resident populations by age and gender are not mapped against individual households. An indicative assessment of potential population within AQMAs has been provided in table 2 by using 2015 ward profiles linked to 2011 census data and the number of residential properties within an AQMA. A further indicative split has been carried out to look at age related vulnerable groups; those under 16 and those above 65 years old. It is recommended that that this is explored further by using alternative data sources.

The following table presents the number of residential properties and estimated number of people who live within the AQMA.

It is important to note that the data in table 2 relates to AQMA areas and NO<sub>2</sub> only and does not take into account exposure to PM<sub>2.5</sub>. Health benefits can still be achieved by reducing levels further below the national objective limits set for NO<sub>2</sub>. Traffic pollution is expected to drop off rapidly from roadside but can be detected up to 200m away from the busiest A class roads, outside of current AQMAs.

**Table 2: Number of residential properties and estimation of population in AQMAs by ward**

Ward	Total no. of residential properties in ward	Total no. of residential properties in AQMAs	Total % in AQMAs	Ward population	Population in AQMA	Under 16 in AQMA	Over 65 in AQMA
Latchford West	3,877	572	14.8%	6,972	1,031	148	225
Bewsey & Whitecross	6,394	336	5.3%	12,936	686	153	64
Latchford East	4,249	229	5.4%	8,571	463	94	61
Fairfield & Howley	6,085	103	1.7%	13,373	227	42	31
Orford	5,409	73	1.4%	10,665	149	32	22
Poplars & Hulme	5,501	43	0.8%	10,686	85	19	11
Great Sankey South	4,777	27	0.6%	10,732	64	13	10
Stockton Heath	3,266	16	0.5%	6,420	32	6	6
Rixton & Woolston	4,098	10	0.2%	9,045	18	3	4
Lymm South	2,941	8	0.3%	7,058	21	4	4
Culcheth, Glazebury & Croft	4,949	6	0.1%	11,678	12	2	3
Birchwood	5,078	6	0.1%	10,680	11	2	2
Appleton	4,399	4	0.09%	10,633	10	2	2
Burtonwood & Winwick	2,746	1	0.04%	6,322	3	<1	<1
Poulton North	4,961	1	0.02%	10,141	2	<1	<1

## Health Impacts

It is very difficult to demonstrate that poor health outcomes have been directly influenced by poor outdoor air quality, especially at a local level as many other external and genetic factors shape health outcomes. The following section presents health data that is known to be affected by poor air pollution (as presented in section 3). The following analysis does not imply that poor air quality was the sole cause for the poor health outcome, but rather it may have been a contributing factor.

## **Children and young people**

### **Low birth weight**

Evidence has shown that air pollution has been linked to low birthweight and premature births. However, it is also known that low birth weight births can also indicate lifestyle issues of the mothers and/or issues with maternity services. During 2016 2.8% of babies born at full term (at least 37 weeks gestation) were defined as being of low birth weight (weight less than 2,500g) across England. In Warrington the percentage was similar at 2.7%, or 58 births (PHE, 2017).

Local analysis of low birth weight<sup>1</sup> births between 2013 and 2015 shows that 5.8% of babies born in Warrington were of low birth weight (less than 2,500g). Analysis at electoral ward level has shown that the percentages ranged from 4.2% in Great Sankey North and Whittle Hall, up to 7.3% in Bewsey and Whitecross; however it should be noted that no ward was statistically different to the overall Warrington average.

### **Respiratory health of children and young people**

As stated in the previous section, children living in areas with high levels of air pollution are at increased risk of developing respiratory health conditions. At a local level, there is very little information available detailing how many children and young people experience poor respiratory health, for example, the number with an asthma diagnosis.

On an annual basis data is published showing the percentage of patients registered at GP Practices who have received a diagnosis for specific long term health conditions. However, a limitation of this dataset is that it is not broken down by specific age group. The data published includes patients who have received a diagnosis of asthma, however the percentage of patients with asthma is for the whole population; it is not possible to present percentages for specific age groups.

The latest Quality and Outcomes Framework (QOF) data (2016/17) showed that 12,626 patients registered at a Warrington GP practice had received an asthma diagnosis, 6.22% of all patients; the percentage for Warrington is higher than England (5.94%). Looking within Warrington, the percentage of patients with an asthma diagnosis varied by GP practice; ranging from 4.58% up to 8.42%.

Public Health England monitors the rate of emergency hospital admissions due to asthma in children and young people aged under 19 years through their early years profiles. During 2016/17 there were 68 admissions made by children and young people from Warrington, this resulted in an admission rate (144.7 per 100,000) that was significantly lower than England (202.8 per 100,000).

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<sup>1</sup> The local analysis differs from analysis produced by Public Health England. Local data provided by ONS and NHS Digital does not include the number of weeks gestation at birth. Therefore, local analysis includes all births, regardless of gestation. The percentages produced by PHE should not be compared with local analysis.

### **People with chronic health problems (including respiratory and CVD conditions)**

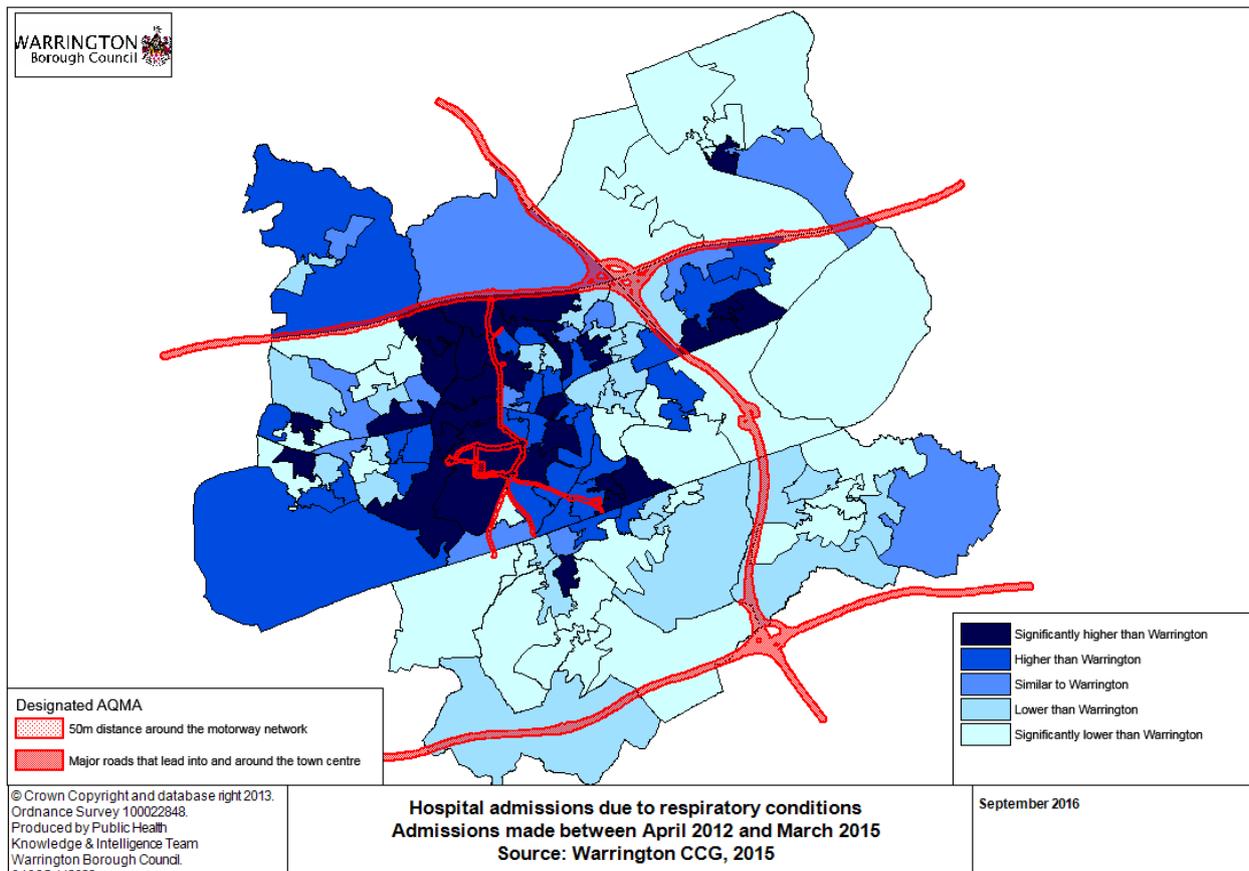
Air pollution is harmful to everyone, but those with pre-existing chronic health conditions are especially susceptible to the effects of poor air pollution. As presented in the previous section, the QOF release data on an annual basis showing the number of registered patients with a diagnosis of a long term health condition (LTC). Patients can appear on more than one register (co-morbidity). The dataset cannot determine what contribution or impact air pollution has (if any) on their LTC.

6.22% of patients registered at a Warrington GP practice had received an asthma diagnosis, slightly higher than England (5.94%); 1.85% (just over 3,750 patients) of Warrington patients had received a diagnosis of Chronic Obstructive Pulmonary Disease (COPD), very similar to the England percentage (1.87%). Just over 1% (1.13%; 1,326 patients) of 30 to 74 year olds had received a diagnosis of Cardiovascular Disease (CVD), lower than the England percentage of 1.17%. 6.81% of Warrington patients aged 17 years and above have been diagnosed with diabetes (both type 1 and 2), slightly higher than England (6.67%).

Hospital admissions data can be used to describe the level of health need in the population. The following map presents the rate of emergency hospital admissions due to respiratory conditions between April 2012 and March 2015 at LSOA level in Warrington. The map has been coloured to indicate the areas in Warrington that had higher, lower or similar admission rates when compared to the Warrington average. The map also presents the designated AQMA within Warrington. It should be noted that it is not possible to state the cause of the respiratory condition which led to the hospital admission. Air pollution may have been a contributory factor which led to the hospital admission; however other factors will also have led to the admission (e.g. smoking status, poorly controlled disease management, climate, home environment etc.).

The map illustrates that the rates of emergency hospital admission were highest in the central areas of Warrington; this includes areas such as Bewsey and Whitecross, Poplars and Hulme, Fairfield and Howley and Latchford East. Whilst air pollution may have been partly attributable to these admissions, it is also known that smoking rates are high in the central areas of Warrington.

**Figure 7: Hospital admissions due to respiratory condition**



### Older People

Lung function naturally declines as we age, however evidence has shown that living near to busy roads speeds up the rate of decline. Although more research is needed, people who live near to busy roads are more likely to develop dementia (Cheng et al, 2017).

At present there is no data collected that illustrates lung function of older people at a local authority level. Data collected through QOF has shown that 0.77% (just over 1,550) patients in Warrington have been diagnosed with dementia, a very similar proportion (0.76%) have been diagnosed across England. As mentioned previously the QOF dataset cannot determine what contribution or impact air pollution has (if any) on their diagnosis of dementia.

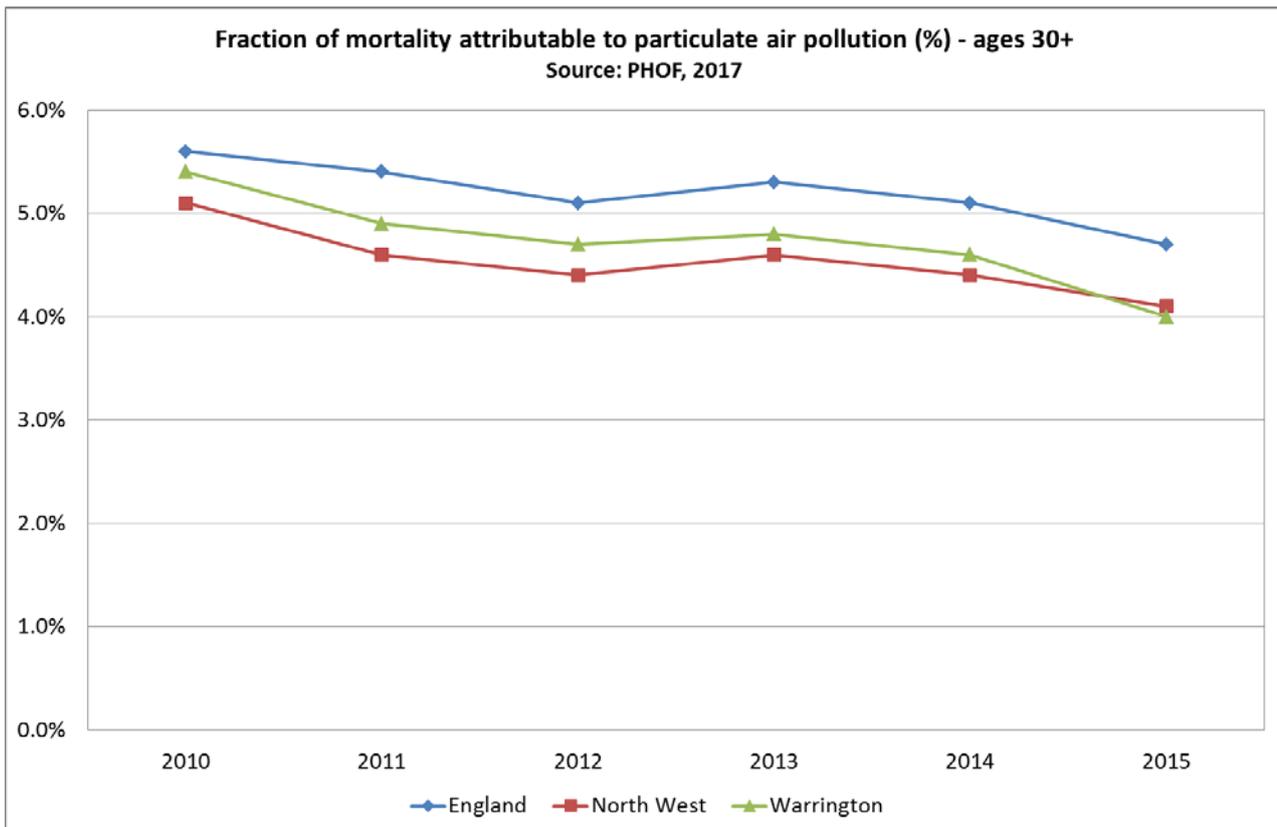
### Deaths

#### Public Health Outcomes Framework (PHOF)

As mentioned in section 2, the PHOF monitors the percentage of deaths in persons aged 30 and above where death was attributable to particulate air pollution PM<sub>2.5</sub>. The following chart illustrates that Warrington has seen a slight reduction in the percentage of deaths attributable to particulate air pollution. During 2010 5.4% of deaths were attributable, this

reduced to 4% in 2015. During this six year time period the number of deaths each year ranged from 77 up to 91 premature deaths associated to PM<sub>2.5</sub> air pollution. The 2015 percentage for Warrington was slightly lower than the North West (4.1%) and England (4.7%). Care should be taken on use of these figures as there will be a level of uncertainty due the indicator is based on modelled PM<sub>2.5</sub> levels across the borough as opposed to monitored concentrations, which for urban areas, as monitored at one site, are slightly higher.

**Figure 8: Fraction of mortality attributable to particulate PM<sub>2.5</sub> air pollution (%) - ages 30+**



There are no mortality figures for Warrington for exposure to NO<sub>2</sub>. By using the national figures (Defra, 2015) to estimate local mortality rates, there is an indication of a potential additional 65 premature deaths per year. It is estimated that total mortality from poor exposure could therefore be in the region of 145 people per year. A caveat has to be put on this figure as an estimation, and that further research is required to support a more qualitative assessment.

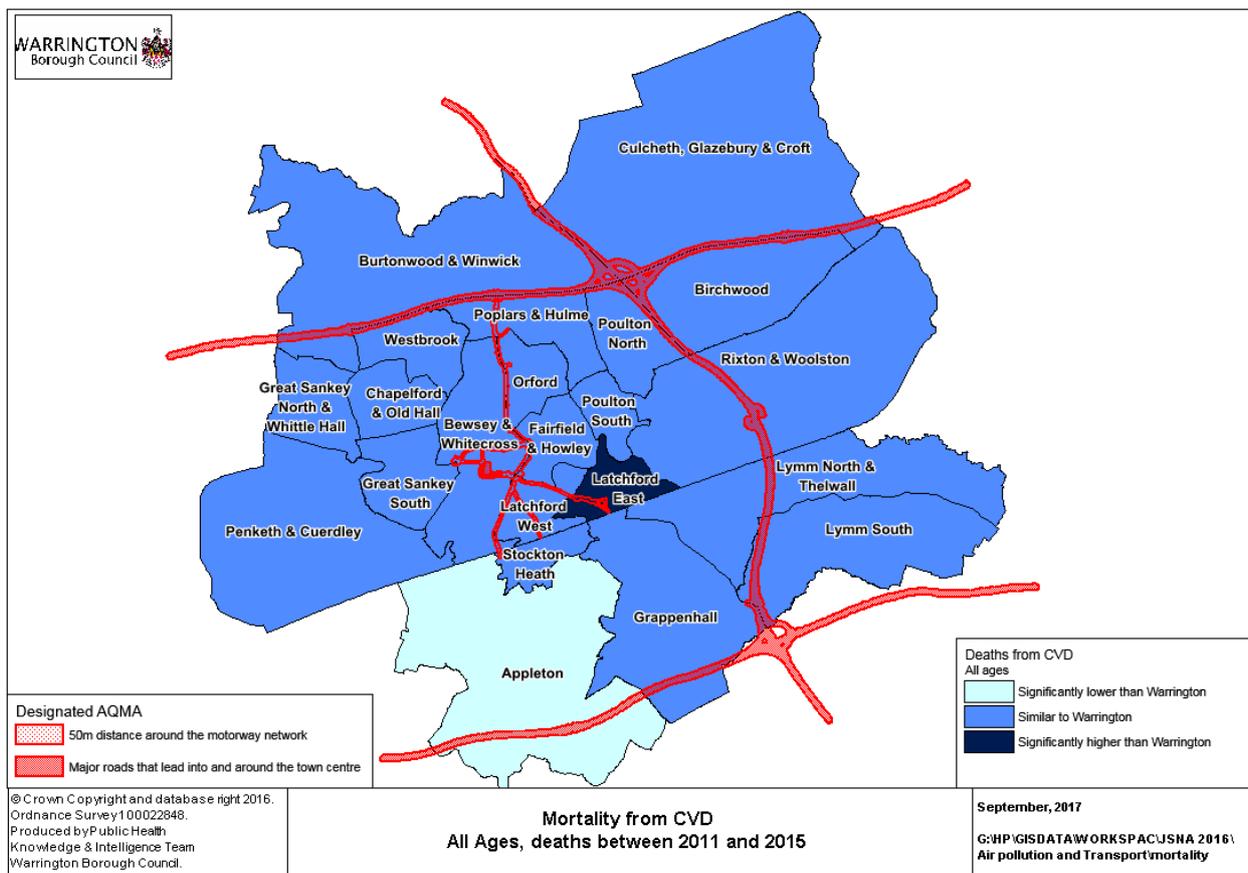
As described previously, poor air quality can contribute to poor health and eventual death. The following set of three maps present death rates at ward level across Warrington for specific conditions known to be linked to poor air quality. The maps present which wards had a mortality rate that was significantly better, significantly worse or similar to the Warrington average for deaths that were registered between 2011 and 2015. It cannot be assumed that air quality was the sole contributor to the death; it is known that the number and rate of deaths from cardiovascular disease, respiratory disease and lung cancer is

affected by age, lifestyle choices (smoking, diet, physical activity levels, alcohol consumption etc.), genetics, as well as environmental factors.

### Deaths from cardiovascular diseases (CVD)

In Warrington there are approximately 490 deaths each year due to CVD. The following map illustrates that the ward of Latchford East had a significantly higher mortality rate than the Warrington average, whilst the ward of Appleton had a mortality rate that was significantly lower. Both of these wards contain designated AQMAs.

**Figure 9: Mortality from cardiovascular diseases (CVD)**



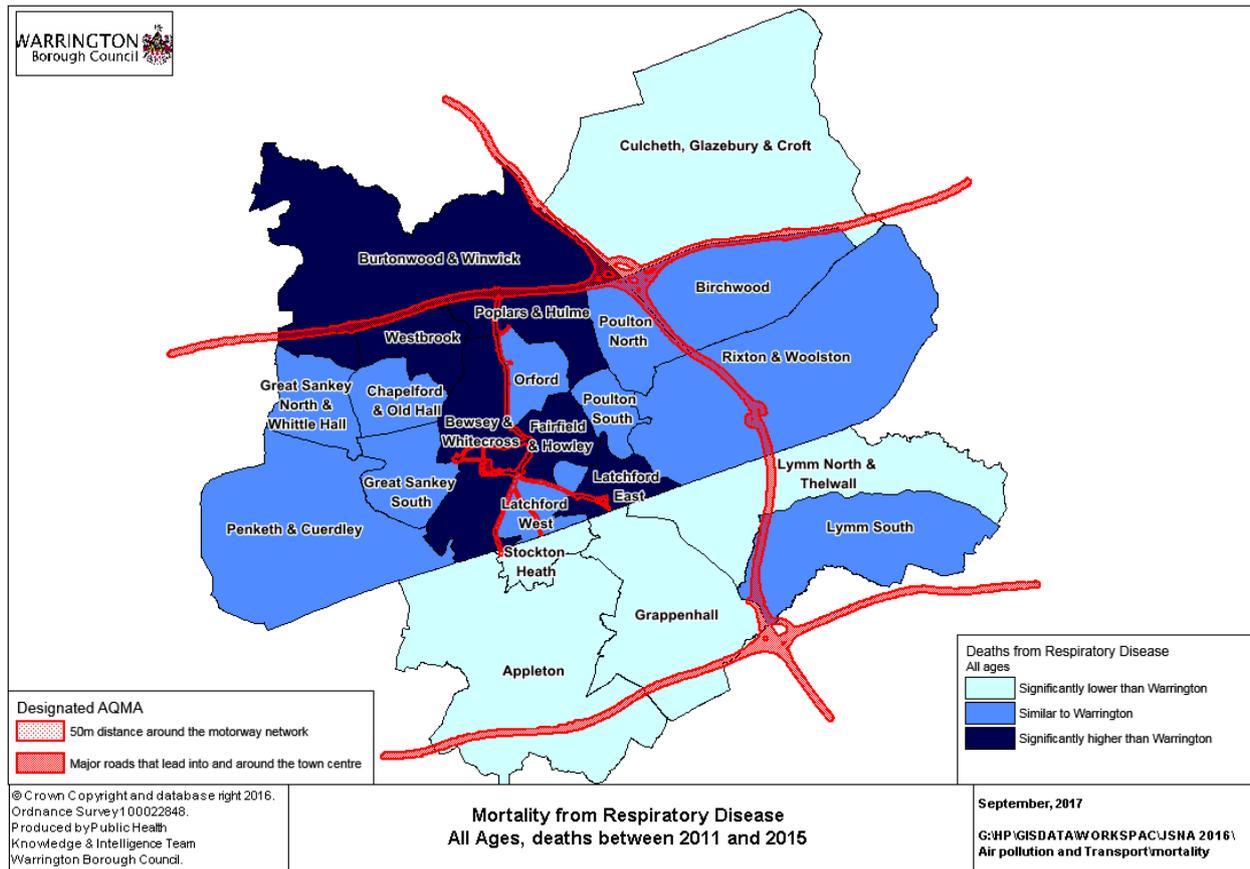
### Deaths from respiratory disease

On average each year in Warrington there are just over 280 deaths from respiratory disease. The wards coloured dark blue all had mortality rates that were significantly higher than the Warrington average; these include Burtonwood and Winwick, Westbrook, Poplars and Hulme, Bewsey and Whitecross, Fairfield and Howley, and Latchford East. Each of the wards listed above do have designated AQMA areas located nearby, however it is known from the most recent lifestyle survey that the percentage of adults who smoke was higher than the Warrington average in most the wards listed above. The higher rates of mortality for the

wards of Westbrook and Burtonwood and Winwick are likely to be elevated due to a number of care homes located in these wards<sup>2</sup>.

Deaths from respiratory diseases were significantly lower in the following wards: Culcheth, Glazebury and Croft, Lymm North and Thelwall, Grappenhall, Stockton Heath and Appleton.

**Figure 10: Mortality from respiratory diseases**



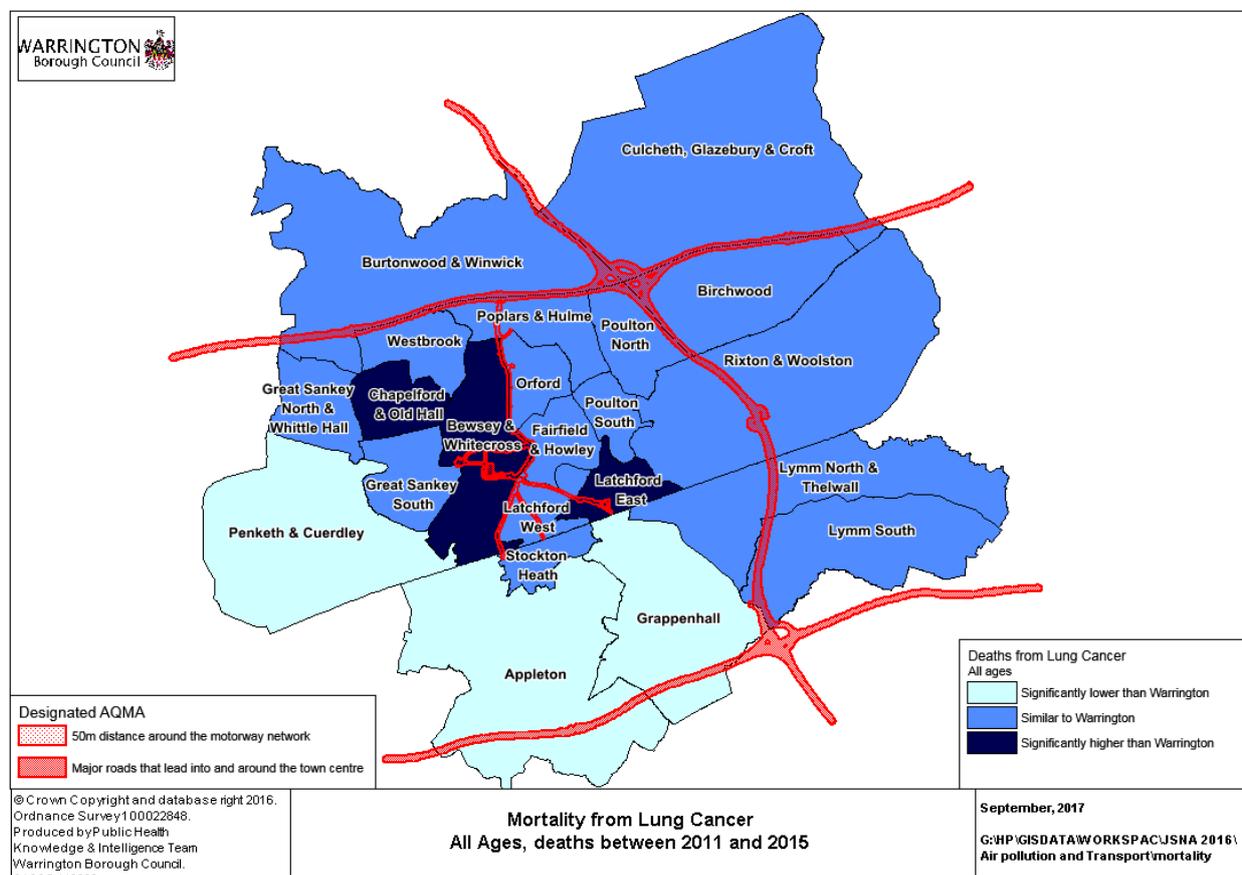
### Deaths from lung cancer

The link between tobacco and lung cancer was established more than 50 years ago, however recent evidence has shown that there is a link between air pollution and lung cancer, as presented in the previous section. Each year in Warrington there are approximately 130 deaths due to lung cancer. The following map illustrates that Bewsey and Whitecross, Latchford East and Chapelford and Old Hall all had mortality rate significantly higher than the Warrington average. It is known that both Latchford East and Bewsey and Whitecross have higher than average smoking rates, the high rate of mortality in Chapelford and Old Hall is likely to be high due to the number of care/nursing homes located in the ward (see footnote 2).

<sup>2</sup> When conducting mortality analysis at ward level, the size and structure of the population is taken into account when calculating mortality rates. Populations provided by ONS are used as part of the calculation; however, wards which contain a number of care/nursing homes tend to have higher mortality rates than expected for the area. This is because a number of older/unwell people die in these locations but the population estimates for these areas cannot take this into account when estimating the size of the population.

Deaths were significantly lower in Grappenhall, Appleton and Penketh and Cuerdley.

**Figure 11: Mortality from lung cancer**



Whilst there is large body of evidence nationally and internationally on the links between health and air quality, there remains very little information at a local level, other than the general PHOF for PM2.5 there is no information for NO2. To gather this information locally, it is recommended that a new monitoring system to be developed across a regional footprint initially which tracks the number and rate of emergency hospital admissions for conditions known to be affected by poor air quality, with additional analysis of known vulnerable groups and plotted against current routine monitoring of air quality.

### 5) CURRENT ACTIONS IN RELATION TO NEED

As part of Warrington Borough Council LAQM duties,, an Air Quality Action Plan (AQAP) has been produced which sets out a series of measures to try to improve NO<sub>2</sub> levels within current AQMAs. The measures though are expected to have wider benefits across the borough. Whilst the focus is on improving NO<sub>2</sub> concentrations, the measures are expected to reduce emissions of particulates thereby positively impacting upon the wider health and quality of life of residents and visitors to the borough.

The AQAP is considered to be a “live” working document and will be subject to an annual review, appraisal of progress and reporting to the Council’s Air Quality Programme Board, chaired by the Director of Public Health. Progress on measures set out will be reported on annually within the ASR. The AQAP and latest ASRs are available to view on the Council website [www.warrington.gov.uk/airquality](http://www.warrington.gov.uk/airquality)

## **6) EVIDENCE OF WHAT WORKS**

Air pollution is not specifically a UK issue and affects populations around the world. This has resulted in a number of actions in different countries to try to improve air quality.

In September 2015, Paris held a “car free Sunday” event which banned cars in the city centre for one day. This showed a reduction by up to 40% in nitrogen dioxide levels. ([www.paris.fr/journeesansmavoiture](http://www.paris.fr/journeesansmavoiture)) This event has now become annual and has been expanded to cover a wider area. In addition, in December 2016 during a peak in pollution levels in Paris lasting several days, a partial ban on cars in the city was introduced where only even number plates registration numbers were allowed.

In 1996 when the Olympic games took place in Atlanta USA, changes were made in transportation patterns including an integrated 24 hour a day public transport system, 1,000 additional buses, closure of the city centre to private cars and public warnings of potential traffic and air quality problems. There was a 28% drop in Ozone concentrations during the time of the games and 11-44% reduction in the number of acute asthma events (Friedman et al 2001).

In 2008 London established the world’s largest low emission zone restricting entry of the oldest and most polluting diesel vehicles including HGV’s, buses, coaches, larger vans and minibuses. It excluded cars and motorcycles. Results showed that for outcomes such as consultations for respiratory illnesses or prescriptions for asthma there was sufficient power to identify a 5% to 10% reduction in consultations for patients most exposed to the intervention compared with patients presumed to not be exposed to it (Kelly et al 2011).

Several studies have taken place focusing on traffic emission controlled related interventions all showing health related outcomes. Burr (2004) found decreases in PM concentration in congested streets improved rhinitis symptoms. Tonne et al (2008) also found decreases in PM concentration led to 63 years of life gained for PM reduction per 10 years. Cyrus et al (2014) found that the drop of PM concentration by 10% and 58% diesel particle accounted to 144 avoidable deaths per million.

Cesaroni et al (2011) carried out a study on the air quality and health impacts of two low emission zones in Rome, Italy. Results showed there was a decrease in air pollution concentrations and residents gained 3.4 days per person (921 years of life gained per 100,000) for NO<sub>2</sub> reduction.

A study carried out in Germany also identified that reducing roads to 20mph speed zones found a significant reduction in particulate matter (Dijkema et al, 2008).

The BBC carried out a piece of research to look at the difference in air quality during a street play session where cars are not permitted in the street<sup>3</sup>. They measured nitrogen Dioxide (NO<sub>2</sub>) levels. During the street play session the NO<sub>2</sub> levels were five times lower than on a normal afternoon where cars are permitted in the street.

Aside from interventions that focus on vehicles, there is also the use of vegetation to mitigate the effects of air pollution. Vegetation can intercept airborne particulate matter reducing concentrations in air which leads to the improvement of air quality. An Evidence Note produced by Forest Research (forestry.gov.uk) identified several studies that have shown the health benefits from using vegetation as a protective barrier. Mindell and Joffe (2004) and Tiwary (2009) both estimated a reduction in the number of premature deaths and a reduction in hospital admissions due to respiratory problems. Wong et al (2002) also identified epidemiological evidence that changes in air pollution impact on GP Consultations. In 2008 Lovasi et al carried out a study in New York focusing on asthma prevalence in 4-5 year olds. They found that the presence of street trees was associated with a 29% reduction in early childhood asthma. Goode (2006) also found that green roofs help to reduce air pollution.

Overall the studies carried out demonstrated that there are interventions that can reduce outdoor air pollution.

For Warrington Borough Council's AQAP a full public consultation was carried out for the proposals. This clearly showed strong support by the public for measures to improve local air quality. The main issues raised revolve around needing an enhanced efficient public transport system with more frequent services, widely available and affordable to encourage change in travel behaviour to reduce car usage. There was also strong support for green infrastructure as a means to reduce pollution levels. The consultation raised a number of concerns by residents surrounding increased house building and new employment areas that could increase traffic, making current air quality, and therefore health, worse. It is essential that through the local planning regime, local authorities take this into account so that growth plans are sustainable and with good design, linked to improvements in public transport, for air quality to be improved.

## **7) UNMET NEEDS AND SERVICE GAPS**

Local authorities, working together with the public, can implement measures to reduce exposure to air pollution as well as reducing polluting emissions through – for instance – active travel plans.

The AQAP sets out a series of measures to try to improve NO<sub>2</sub> concentrations within current AQMAs. This action plan is aimed predominately towards reducing traffic impacts. Whilst the focus is on AQMA designations for NO<sub>2</sub>, it is expected that there will be a complementary reduction in PM<sub>2.5</sub> levels. For each measure within the AQAP, it has been estimated what the improvement is expected to be for NO<sub>2</sub>. From previous work, it was

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<sup>3</sup> <http://playingout.net/pollution-and-play-playing-out-to-improve-air-quality/>

concluded that there is no one specific action that would improve air quality and that a series of complimentary actions are required.

Whilst air quality data can be collected through monitoring, there will remain an issue in a lack of knowledge and evidence to demonstrate those how air quality improvements translate to improvements in health.

## **8) RECOMMENDATIONS FOR ACTIONS**

The following recommendations are made:

- Scope the possibility of developing a regional air quality and health monitoring dashboard with Public Health England and Champs Public Health Collaborative. The dashboard would look at exploring methods to assess local health impacts from NO<sub>2</sub>, assess impacts of poor air quality on vulnerable population groups and identify periods of poor air quality across the region;
- PM<sub>2.5</sub> data to be collected locally to assess worse case hot spot areas;
- Explore actions, within the Air Quality Action plan, to reduce exposure in areas with existing health problems;
- To link air quality actions with other complementary policies areas for example, mental health and planning.
- To establish an estimated population (by age group/gender) living within an AQMA.

## **9) RECOMMENDATIONS FOR NEEDS ASSESSMENT WORK**

The following recommendation is made to gather more data and build up evidence:

1. Carry out a Health Needs Assessment focussing on the impact air quality has on population health in Warrington.

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## Glossary of terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQS	Air Quality Strategy
ASR	Air quality Annual Status Report
COMEAP	Committee on the Medical Effects of Air Pollutants
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
JSNA	Joint Needs Strategic Assessment
LAQM	Local Air Quality Management
LSOA	Lower Super Output Areas
NO <sub>2</sub>	Nitrogen Dioxide
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less

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