

Birmingham air quality and health issue survey

October 2020



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Photo: Daily Mail

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Footsteps
Faiths for a Low Carbon Future



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1 Introduction

Over the past twelve months Footsteps has held a number of workshops and events relating to Birmingham adopting a 'circular economy' approach as part Birmingham's climate emergency declaration vision for just transition to a 'net zero carbon' city by 2030.

Poor air quality in Birmingham is largely a consequence of the City and its resident's over-dependence on fossil fuel powered transport, construction and manufacturing industry activities and a continued willingness to discharge pollutants into the atmosphere as part of the old 'linear' economy.

It is well known that air pollution has adverse health effects and shortens lives. Birmingham is a very unequal city and it well established that disadvantaged communities are most affected by the adverse effects of air pollution.

In the first half of 2020 the Covid-19 pandemic 'lock-down' resulted in a short-term improvement in air quality that was a new experience for many residents.

Against this background this *Birmingham air quality and health issue survey* aims to:

- Identify from available information some of the key issues involved
- Present the results from a survey of resident's experience of air quality improvements during the lock-down

Footsteps also seeks to engage with and draw young people into it work whenever possible. The survey of resident's experience of air quality was also an opportunity to provide Dylan Mustafa, a 6th form medical sciences student aspiring to study medicine, with a relevant volunteer project over the summer holidays. Aspiring medical students are normally expected to undertake voluntary work in a health-related organisation prior to applying to medical school, but Covid-19 restrictions are preventing this at this time.

The style of the report is based on Footsteps' Birmingham Climate Emergency - The Role for Faith Communities report published in September 2019.

The authors would like to thanks Dr Ewan Hamnett, Professor Roy Richards and others who helped navigate the way through the large amounts of research and other information available concerning the complex relationship between air quality, social deprivation and health impacts.

One survey respondent's comment on the need for the survey

Thank you for doing this work. Air quality is an important issue, and one that I think is all the better understood if contextualized as one of several negative and fundamentally unfair aspects of car culture, from traffic violence to unjust use of public space to lack of safety at schools during the school run to its class, race, and gender exclusions, etc.

Footsteps Air Quality and Health Issue survey

2 Birmingham's air pollution

2.1 What is Air Pollution

There are many different sources of air pollution, but in cities the main sources are associated with diesel and petrol vehicles, manufacturing and construction industry activity and the domestic burning fossil fuels and wood. Levels of pollution at particular locations and times are affected by weather conditions as wind can rapidly disperse pollutants. Local pollution levels can be much higher in still weather conditions.

What is Air Pollution?

Air pollution comes from a range of sources, including some nearby, like vehicles and other sources within the city, and some further afield. The proportion of pollution that reaches us from each source depends on the weather, the location, the time of day, and a number of other factors. Wherever you are, you'll breathe in some of this pollution.

There are several different pollutants, but the main ones which affect our health are nitrogen dioxide (NO₂) and particulates (PM₁₀ and PM_{2.5}). Road transport is the biggest source of both of these.

Air pollution concentrations depend on the emissions level and how the emissions are dispersed in the air. A combination of still air (low dispersal) and the morning rush hour (high emissions) mean the highest pollution levels are often in the morning. There's often a second smaller, more spread out peak in the late afternoon and evening too when people are travelling home.

Air pollution is different on different days, it's usually lower at the weekend than on weekdays

Birmingham City Council website – [Air Pollution](#)

2.2 Air quality monitoring and reporting

Birmingham Air Quality Issues

As air quality has a number of health impacts and affects in particular the most vulnerable in society: children and older people, and those with heart and lung conditions. The main air quality issue in Birmingham is elevated levels of nitrogen dioxide (NO₂), particularly within the City Centre area as a result of road traffic emissions. As a consequence, Birmingham was declared an Air Quality Management Area (AQMA) by central Government and required to make an annual air quality report (Birmingham City Council, 2019, p. 1).

How air quality is monitored

Air quality is monitored using two methods. Passive diffusion tubes that measure nitrogen dioxide and provide general indications of concentrations and trends of pollutants over a period of time. The tubes usually mounted to lamp posts or building frontages and changed monthly. Automatic monitoring station continuously measuring air pollution levels in central locations. These are a more costly method of air quality monitoring compared to the passive sampling using diffusion tubes. The information collected is, however, is more accurate. Air is continuously pumped into each analyser and the level of pollutant in the air is recorded. The pollution levels are stored by a data logger and accessed remotely by a computer and modem. (Lancaster City Council, 2020)

Birmingham uses the same two methods. A limited number of automatic monitoring stations are moved between sites and enabled monitoring to take place at 10 sites during

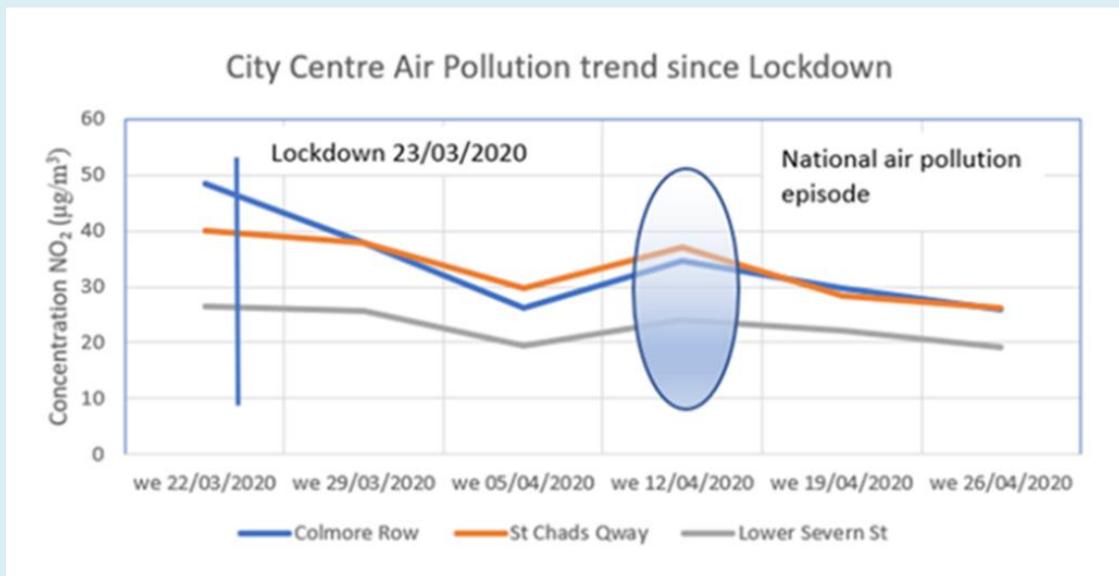
2018, the latest year for which information is publicly available. Two new automatic monitoring sites were established at key sites on the A38 in the city centre which will monitor nitrogen dioxide (NO₂) in the incoming Clean Air Zone. A further automatic monitoring site was established on Colmore Row in the City Centre monitoring NO₂ only and has been set up to assess the impact of changes to the bus routing in the area. Diffusion tubes were used to monitor NO₂ at 86 sites during 2018, mainly at central sites. (Birmingham City Council, 2019, p. 10)

Air Quality during the Covid-19 lockdown

As a result of the Covid-19 lockdown, traffic levels in April 2020 were around 30% of 'normal levels. As a consequence, there was a sharp reduction in air pollution for a short period of time. This survey seeks to capture the experience of Birmingham citizens of this window of cleaner air.

Birmingham Air Pollution in April 2020

The graph below details the weekly average pollutant concentrations from three city centre air pollution monitoring sites and shows the levels pre-lockdown, the reduction arising from the lockdown, and the continuing downward trend in April 2020. There was a national pollution episode from the 8th to 14th April, which appears to have coincided with a slight increase in concentrations, following which the downward trend has resumed.



There are a number of factors which influence pollution levels, especially the weather. However, a basic analysis of the data suggests an average reduction in pollution concentration (nitrogen dioxide) of approximately 36%.

How has the UK lockdown affected air pollution? (Birmingham City Council, 2020)

Air quality, health and inequality

Air quality is widely recognised as having health implications affecting both physical and mental health.

Global problem

Poor air quality is a global problem that affects both physical and mental health. It varies in cities in both time and space, and vulnerable urban dwellers are disproportionately affected depending on their age, gender, and occupation. Inadequate policies and countermeasures for poor air quality lead to damaging, and preventable, health inequalities.

Prof Francis Pope: Inaugural Lecture: Air Quality Inequality (Birmingham University, 2019)

Poor air quality leads to damaging, and preventable, health inequalities. On a number of measures, Birmingham has high levels of deprivation and inequality with 40% of the its citizens living in the 10% most deprived areas of England.

Specific health implications

In Birmingham it is likely that air pollution is second only to tobacco smoke in causing premature death (deaths before the age of 75). In the UK it is estimated that each year there are 40,000-50,000 deaths attributable to air pollution; in Birmingham based on current mortality, this equates to almost 900 deaths a year. Heart disease and stroke are the most common reasons for premature death attributable to air pollution, responsible for 80% of cases of premature death; lung diseases and lung cancer follow.

Birmingham Health Profile 2019 (Birmingham City Council, 2020, p. 22)

Birmingham – an equal city

High levels of deprivation and inequality

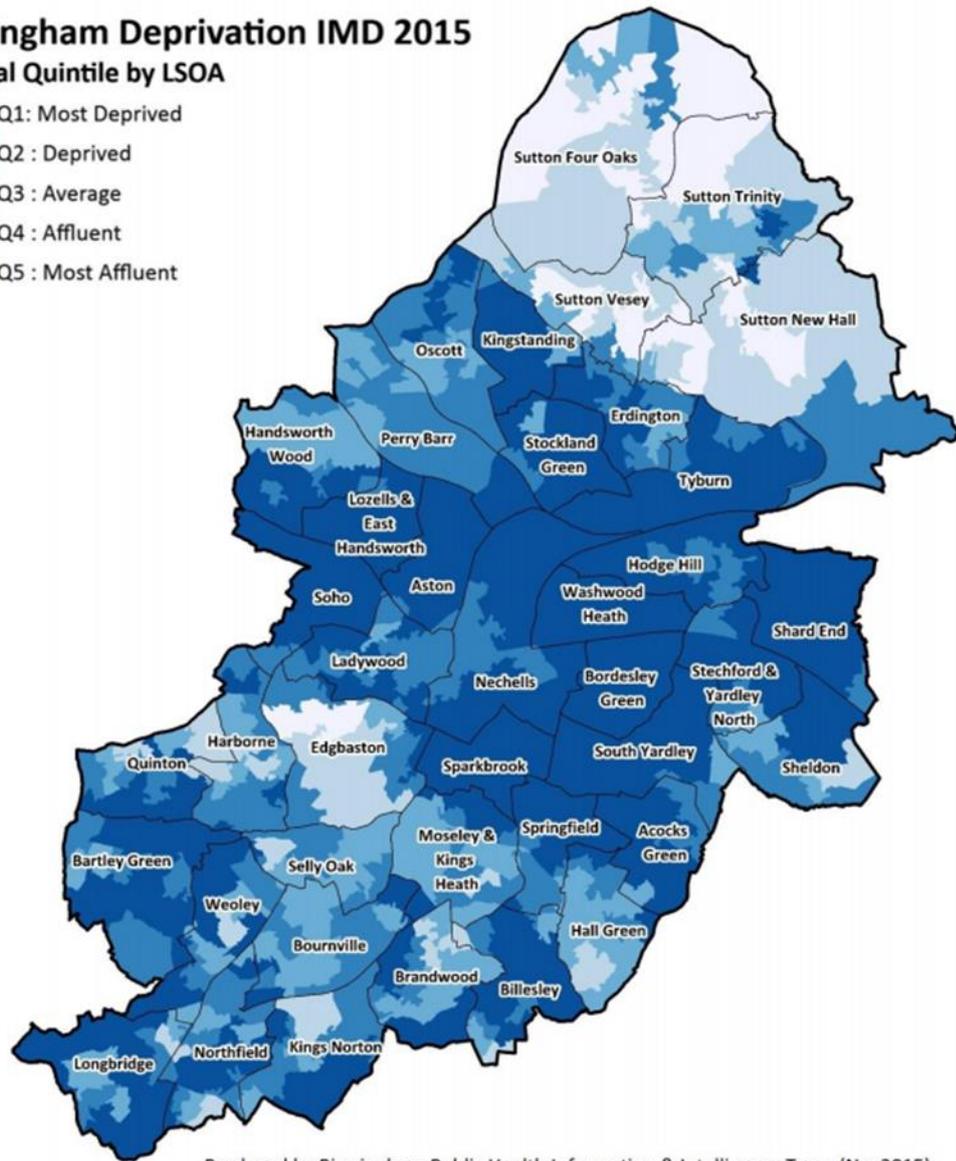
The Index of Multiple Deprivation (IMD) is a measure of the relative levels of deprivation at small area levels. Birmingham as a whole has high levels of deprivation with 40% of the population living in the 10% most deprived areas of England. The figure in the next box shows the local areas by their national rank, the darkest shading being the most deprived. Many areas within Birmingham are amongst the most deprived in the country. Inequality key indicators include

- 40% of Birmingham's population live in the most deprived decile areas in England (IMD2015).
- Life expectancy in Birmingham is lower than the national average. For males life expectancy at birth is 77.2 years (England 79.5) and females 81.9 years (England 83.1).
- Infant mortality is an area of concern: the rate was 7.5 per 1,000 live births during 2013 to 2015; this compares to 3.9 nationally.
- Hospital admissions for those aged 65+ years relating to mental health have increased by 25% since 2013.
- Birmingham ranks 17th out of 326 English local authorities for fuel poverty (high energy costs, low income).

(Birmingham City Council, 2020, p. 20)

Birmingham Deprivation IMD 2015

National Quintile by LSOA



Produced by Birmingham Public Health Information & Intelligence Team (Nov2015).
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3 Air pollution health impacts

3.1 Health effects of particulates

Harmful air pollutants

The size of particulate matter will determine where it will end up once you breathe it in. Larger particles may be trapped in your nose, while PM10 can reach your airways. Fine particles (PM2.5) may reach the breathing sacs deep in your lungs, and ultrafine particles may even cross into your blood stream. These particles can also carry toxic chemicals that are linked to cancer.

Particulate matter irritates your nose and throat and may be associated with more severe symptoms in people with asthma. It results in more people with lung conditions (COPD, asthma, bronchitis) and heart conditions (heart attacks, strokes) being admitted to hospital. It also causes early deaths from lung and heart disease.

There's also evidence that long-term exposure to particulate matter can contribute to the development of lung cancer and possibly asthma

Common and harmful outdoor pollutants (British Lung Foundation, 2020)

3.2 UK air pollution research

The Environmental Research Group (ERG), led by Professor Frank Kelly, at Imperial College London is a leading provider of air quality information and research in the UK. The ERG combines air pollution science, toxicology and epidemiology to determine the impacts of air pollution on health and the causal factors. We work closely with those responsible for air quality management to support policies and actions to minimise air pollution health effects. The ERG also supports and specialises in the work of the London Air Quality Network. (Imperial College London, 2020)

3.3 Complex relationships

There has been speculation that air pollution adds to Covid-19 vulnerability and Covid-19 infection and mortality rates are certainly higher in areas of economic and health deprivation. It is beyond the scope of this report to investigate these relationships in depth, but we have attempted to identify some of the issues involved. Obesity is also a significant factor.

Covid-19 Risk Factors

Obesity, race/ethnicity, and other correlated characteristics have emerged as high-profile risk factors for adverse coronavirus disease 2019 (COVID-19) associated outcomes, yet studies have not adequately disentangled their effects. (Tartof, 2020). An obvious confounding variable for pollution is poverty as poor areas are generally more polluted. Poorer areas also have higher prevalence of most chronic conditions and poor people are generally more obese. This difference in obesity is becoming much more marked in younger populations. The correlation between pollution and health has clearly been around for some time. The reason for both age and obesity being the principal risk factors is that both cohorts have much more inefficient immune systems

Personal communication

Dr Ewan Hamnet

It can be difficult to disentangle the effects from the perspective of an inner-city general practitioner.

Disentangling the effects

I was an inner-city GP until 2009, and was struck by the poor health of my patients. At that time, poor air quality was not generally known to be so damaging to health, but I'm sure must have contributed to high rates of heart disease, COPD and cancer. However, it is difficult, except in research projects, to disentangle the effects of poor air quality from those of poverty, stress, poor diet and smoking.

Survey respondent

3.4 Particulate toxicity

Toxic effects of particulates and Covid-19 virus

Most of the particulate pollution of concern in the UK is called PM2.5 and for suburban and city areas is made up mostly by diesel particles. These are 10 to 30 nanometres in size and are carbon particles containing a number of metal complexes on their surface. It is these metals, once released in the lung that can lead to inflammation in the alveolar region. It is possible that the particles or certainly their dissolved metals enter the blood stream and hit the heart as the next organ in line.

Covid is a nanometre sized particle/virus and the two lung pathology cases I have read on line from China suggest that the alveolus becomes inflamed, there are foamy macrophages, the epithelium (Type 1 and 2 cells) become damaged, this epithelium is replaced by cuboidal cells and fibroblasts infiltrate and scarring is a possibility. I would suggest these last two effects are very likely in patients given oxygen and put on ventilators. It is not known if Covid can pass a damaged lung epithelium and enter the blood stream to go directly to the heart but it is clear that patients with heart problems are in a high-risk group.

Personal communication

Professor Roy Richards, a founder member and former chair of the British Association for Lung Research

4 Survey Design

4.1 Aims and objectives

The aim of the survey was to investigate the views and experiences of air quality during the Covid-19 lockdown of a sample of citizens across Birmingham.

The survey objectives were to:

- Obtain information about citizen's air quality experience
- Elicit views on the links between air quality and health issues
- Collect sufficient information about respondents to look for correlations with geographical, ethnicity and faith factors
- Draw conclusions based on the views of grass root citizens
- To gain experience of carrying out small scale social research
- To provide a sixth form medical sciences student with a summer volunteer project

4.2 Methodology

The survey was carried out using a Survey Monkey questionnaire that was emailed out through Footsteps, Friends of the Earth and other similar networks. Respondents were invited to go to the Footsteps website where there was a link to the Survey Monkey questionnaire. The survey questions were limited to nine as the 'free' version of Survey Monkey was being used, but also to try and get a good response rate. The survey questions were discussed with project advisers and the questionnaire tested before going live on the Footsteps website.

4.3 Questions

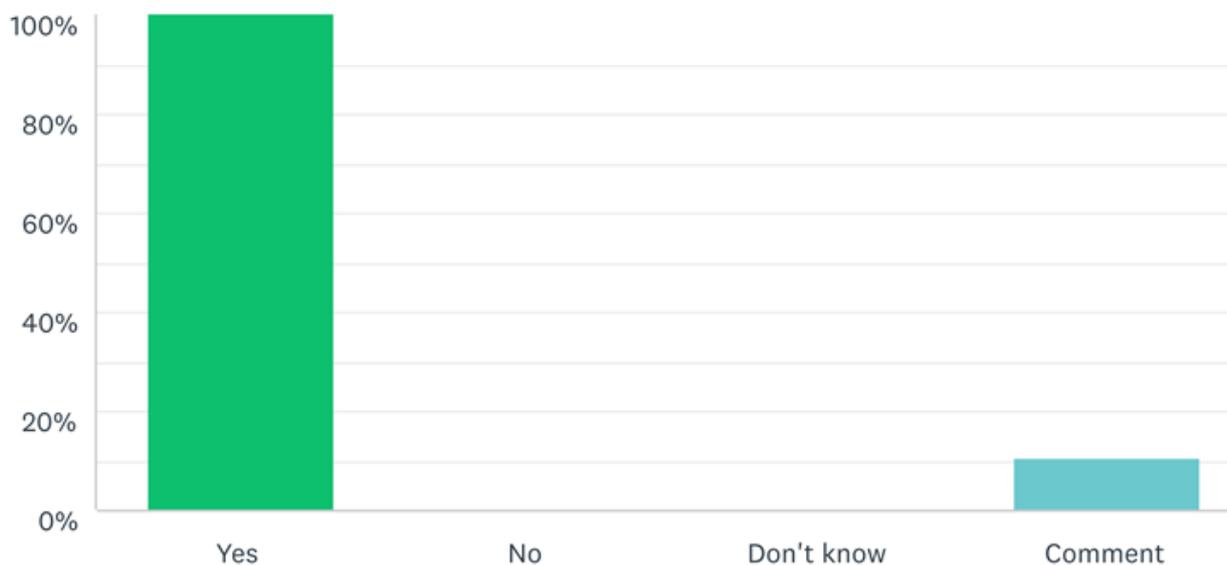
The survey questions used were:

- Do you think poor air quality is a health issue?
- How satisfied are you with the current air quality of your neighbourhood?
- Are there any breathing issues in your household?
- Was there an improvement in the air quality of your neighbourhood during the COVID-19 lockdown?
- Has the air quality got worse again since the end of lockdown?
- Where do you live?
- Do you identify with a particular faith?
- What is your ethnicity?
- Contact permission

5 Survey Results

5.1 Q1 Do you think poor air quality is a health issue?

All 38 respondents agreed that air quality is a health issue. One respondent commented that 'Given that you can sometimes taste the pollution in the air in this city, please take my response to be a strong yes.'



Respondents' comments on Q1 included

Given that you can sometimes taste the pollution in the air in this city, please take my response to be a strong "yes."

I was an inner-city GP until 2009, and was struck by the poor health of my patients. At that time, poor air quality was not generally known to be so damaging to health, but I'm sure must have contributed to high rates of heart disease, COPD and cancer. However, it is difficult, except in research projects, to disentangle the effects of poor air quality from those of poverty, stress, poor diet and smoking

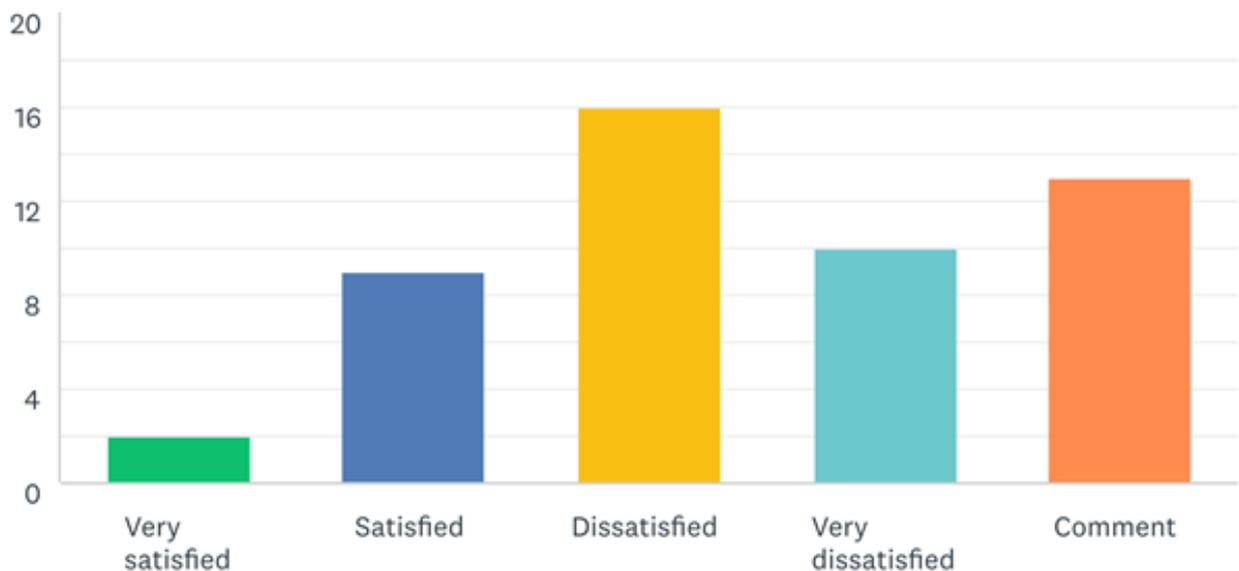
It is implicated in a number of diseases and makes chronic conditions worse

Impacts on people living near busy roads

5.2 Q2 How satisfied are you with the current air quality of your neighbourhood?

26 (68%) respondents indicated that they were dissatisfied or very dissatisfied air quality.

One respondent commented that although the actual levels of air pollution (in their neighborhood) are not as bad as they are in many other parts of the City, action is needed on a city-wide basis. Overall, the comments suggest that, in the first instance, respondents related the question to the causes of air pollution, especially traffic, rather than the health effects.



Respondents' comments on Q2 included

Side road, there isn't much traffic

The blocks of flats are generally at least 10 meters from the road, so it's not terrible for residents, but I am concerned when I walk on the road

It could be a lot worse and while traffic is a huge problem it is possible road danger from speeding poor driving bad parking which affect the quality of life!! That being said the actual levels of air pollution are not as bad as they are in many other parts of the City. Something to be grateful for BUT action is needed on a city-wide basis.

Just one symptom of car addiction.

Traffic is back to dreadful levels.

Vast amounts of dust and grit settle on cars. Is this from the Tyseley incinerator? How dangerous is it to breathe in all that dust?

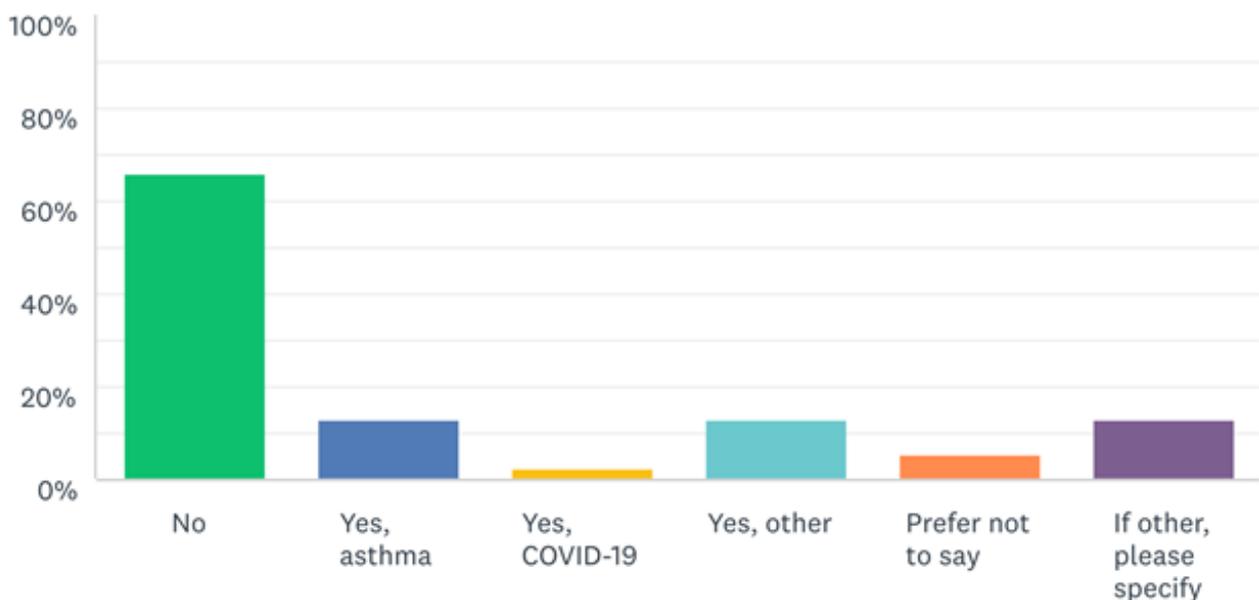
I would rather there were less cars collecting children from school each day on Forest Road

We live on a car free street which has made a huge difference in air quality.

We live in a cul de sac with a school at the one end. The Avenue is now a designated car free street, during school drop off and pick up times. This has improved air quality substantially, as the scenario of parents sitting in their cars, waiting for children to finish school, with the engines running has now ceased. It's been a win/win situation for the school, pupils and local residents.

5.3 Q3 Are there any breathing issues in your household?

Most (66%) of respondents did not have breathing issues in their household. This suggests that respondents' concerns about air quality are based more on the knowledge that the poor air quality is a cause of respiratory illnesses than health issues in their own household.



Respondents' comments on Q3 included

Chronic bronchitis

Not as far as we are aware but as with many of these issues there is the cumulative effects which could impact at any time.

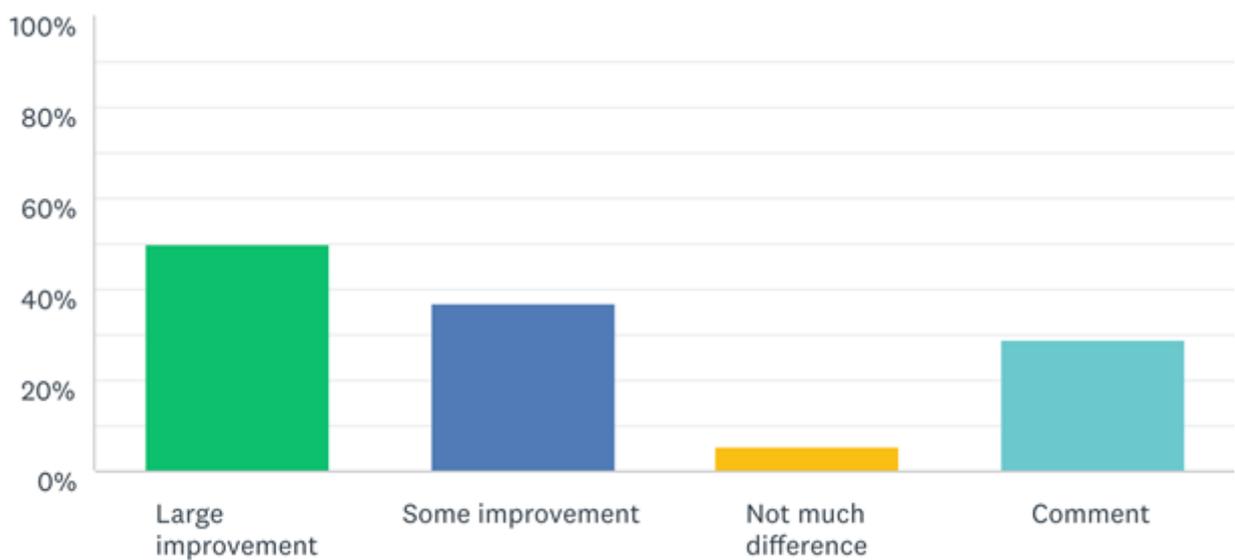
Eczema

"West Midlands Catarrh" I believe is the local GP's name for it!

5.4 Q4 Improvement in the air quality of your neighbourhood during the COVID-19 lockdown?

Almost all (92%) of the respondents agreed that there was an improvement in air quality during the COVID-19 lockdown with 50% indicating a large improvement.

The comments indicated that respondents connected the improvement with less traffic but some made links with quality of life benefits.



Respondents' comments on Q4 included

Many idling cars near shops on Vicarage Rd and still some traffic on main roads

For a while, yes. Now it's back to normal. I am noticing electric car sales are still strong, though, while normal car sales are now being hit by the recession

The drop in the level of traffic must have had an impact BUT given the above comments they would not have been as great as in other areas of the City one negative aspect was ever increasing speeds of those cars that are around and the increase in road danger

Hardly went out except once every two or three weeks. Didn't really notice a great difference. Was trying to keep isolated.

No chlorine type smell on still mornings.

Difficult to be sure without measuring

Yes, cleaner air, less noise - more bird song. Safer cycling.

My husband uses an inhaler. We walk usually in our local park, where there is no traffic; there is little traffic in the area. But the traffic is as dense as before COVID and the poorer air quality is noticeable

Was walking along the canals a lot in lockdown and noticed significant improvement

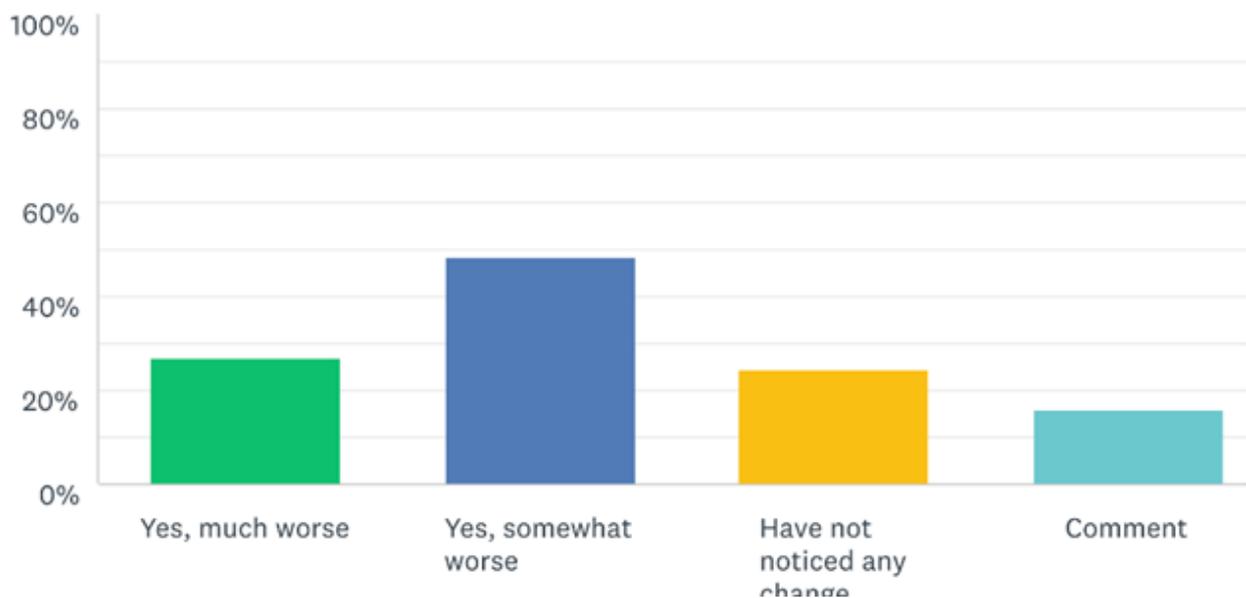
The air seemed fresh especially in the garden

Notices a sharp improvement in March - just like visiting Cornwall

5.5 Q5 Has the air quality got worse again since the end of lockdown?

Most (82%) respondents agreed that air quality had got worse or much worse since the end of lock down.

Again, the comments indicate that respondents linked the deterioration of air quality since the end of lock down with the increase in the amount of traffic on the roads.



Respondents' comments on Q5 included

To about the same to what it was before lockdown.

What has changed is the levels of traffic and as such air quality will have worsened BUT the level of traffic round here is nowhere near as bad as in other parts of the City

Well, the motorists are back, and since so many of them idle their car engines (often enough while parked on the pavement), it is definitely worse.

More cars have now come back onto the roads, as people are avoiding public transport.

Roads becoming very full, vehicles speeding

5.6 Q6 Where respondents lived

Respondents were asked to provide the postcode and indicate the neighborhood where they lived. The majority respondents came from the south-west of Birmingham.

The geographical pattern to the respondents probably reflects the way in which the organisations and supporter networks used to distribute the questionnaire are strongest in south-west Birmingham. To gather data from a wider range of Birmingham's communities, one would need to use different networks and research methods.

In this section, one respondent commented 'Thank you for doing this work. Air quality is an important issue, and one that I think is all the better understood if contextualized as one of several negative and fundamentally unfair aspects of car culture, from traffic violence to unjust use of public space to lack of safety at schools during the school run to its class, race, and gender

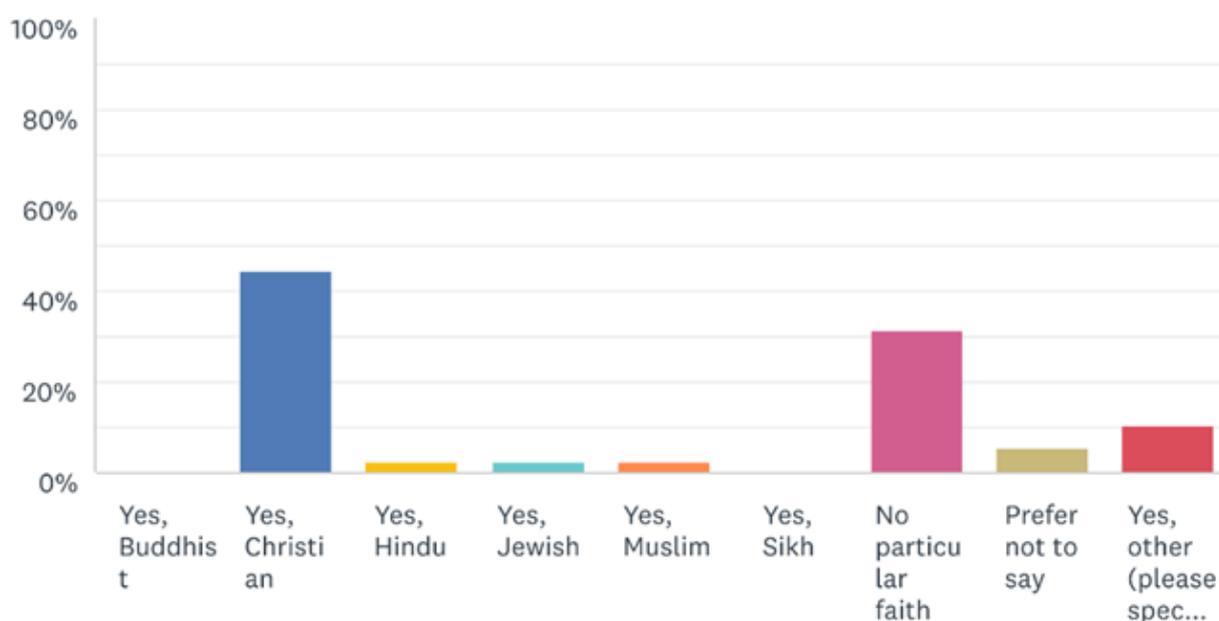


5.7 Q7. Respondents' faith identification

As Footsteps is an interfaith group seeking to bring faith communities together to address pressing climate and environmental challenges, respondents were asked if they identified with one of the six main Birmingham faith groups. Only two respondents preferred not to answer this question.

17 (45%) of respondents identified with the Christian faith and 12 (32%) with no particular faith. Single respondents identified with the Hindu, Jewish and Muslim faiths. Of the four respondents who identified with another faith, three identified as Quaker and one as Eco Socialist.

Census returns indicate that 22% of Birmingham's population as Muslim. This not reflected in responses to the survey.



5.8 Q8. Respondents' ethnicity identification

As there has been wide spread discussion in the press of the higher Covid-19 infection and mortality rates in Black, Black, Asian, and minority ethnic (BAME) communities, the survey asked respondents to self-identify their ethnicity.

All but one of the respondents self-identified their ethnicity. The responses provided a useful insight into how the respondents perceived their ethnicity. 32 out of 38 respondents described themselves as White, mainly as White British.

Respondents self-description of their ethnicity

White (2), White British (21), White UK born (1), White UK (1), White Non-British European (1), White Irish, (1), White European (2), White Caucasian, (1), White British/Irish (1)

European (1)

Indian, British Indian (1)

British-European/Middle -Eastern (1)

Born in UK, father born Germany of Polish & Mother UK from Dutch (1)

Prefer not to say (1)

5.9 Q 9. Contact permission

Most respondents provided their email addresses and requested a copy of the survey report.

6 Conclusions

6.1 Overall

Overall, we found that there was a general consensus amongst respondents that Birmingham's air quality is unsatisfactory and that the lockdown period saw many of the respondents noticing and appreciating the improvement in air quality. We can infer that the improvement in air quality during lockdown was due to the reduced number of motor vehicles on our roads. Many respondents appreciated and noticed the improvement in air quality experienced during lockdown resulting from fewer vehicles on roads.

This survey allows us, though, to reflect on the general dissatisfaction towards Birmingham's air quality, which was especially evident in some of the individual comments made by respondents.

Hopefully our efforts helped raise awareness of our city's poor air quality and inspire others to make life-style changes to help minimise air pollution and improve the future of Birmingham's air quality.

6.2 Methodology

Regarding methodology, we gathered data using an online questionnaire. The advantages of this was that it was quick and efficient. It is, however, evident that the demographics of our respondents doesn't match the demographics of Birmingham's population as a whole. Using more resources and a taking a more targeted approach, such as attempting to get answers using a clipboard and pen in public places or carefully recruited focus groups, might enable a researcher to have a greater range in the sample rather than the email questionnaire approach we used.

Respondents were given the opportunity to provide a comment when answering each question. The comments provided useful insights into respondents' thinking and experience and demonstrated the benefits of combining quantitative and qualitative methods when undertaking a research of this type.

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8 About the Authors

The views in this report are those of the authors and not necessarily those of Footsteps, Birmingham Council of Faiths or King Edward VI Camp Hill School for Boys.

Dylan Mustafa is a sixth form medical sciences student studying A Level Biology, Chemistry and Mathematics. Dylan is planning to attend medical school next year and undertook the project for Footsteps as a community-based volunteering project over his summer holiday.

Chris Martin is a co-founder of Footsteps and its representative on the Birmingham City Council Climate Emergency Taskforce. He is a member of Cotteridge Quaker Meeting and a keen gardener and allotment holder. He has lived in and worked around Birmingham for over 50 years, initially in the steel tube industry before moving into academic life. He originally studied natural sciences and economics and, in 2002, obtained a PhD in knowledge management in small businesses.



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