HOUSE OF COMMONS

Environmental Audit Committee

Oral evidence: Air Pollution in England, HC 1656

Wednesday 22 April 2026

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Watch the meeting

Members present: Mr Toby Perkins (Chair); Julia Buckley; Jonathan Davies; Carla Denyer; Barry Gardiner; Sarah Gibson; Chris Hinchliff; Manuela Perteghella; Martin Rhodes; Dr Roz Savage; Sammy Wilson.

Questions 63 - 96

Witnesses

I: Sir Stephen Holgate, Professor of Immunopharmacology, University of Southampton; Professor Roy Harrison, Queen Elizabeth II Centenary Professor of Environmental Health, University of Birmingham; and Professor Anna Hansell, Professor of Environmental Epidemiology, University of Leicester.

Examination of witnesses

Witnesses: Sir Stephen Holgate, Professor Roy Harrison and Professor Anna Hansell.

Q63 **Chair:** Welcome, everybody, to the latest meeting of the Environmental Audit Committee as part of our new study into air quality, with the 70th anniversary of the Clean Air Act. I am delighted to say that we have a distinguished panel in front of us today: Sir Stephen Holgate, Professor of Immunopharmacology at the University of Southampton, Professor Roy Harrison, the Queen Elizabeth II Centenary Professor of Environmental Health at the University of Birmingham, and Professor Anna Hansell, Professor of Environmental Epidemiology at the University of Leicester. I am very pleased to welcome all three of you.

I will start with you, Sir Stephen, and invite you to introduce yourself and your particular area of interest and expertise with regard to the study that we are doing today.

Sir Stephen Holgate: Thank you for inviting us. My name is Stephen Holgate. I am a research professor in the University of Southampton with a clinical background, interested in respiratory diseases such as bronchial asthma and COPD. I have had a long-time association with air quality and was the first chair of the Committee on the Medical Effects of Air Pollutants. I have recently just stepped down from six years of running the UKRI clean air champion activity for the clean air SPF research programme that the MRC and other parts of UKRI have been running.

Professor Hansell: Thank you for inviting me. I am a professor of environmental epidemiology at the University of Leicester with over 25 years' experience. I have done some of the longest running and largest epidemiological studies on air pollution and long-term effects on health. I was also clinically trained initially and a public health doctor. My other roles are chair of the Health Protection Research Unit in Chemical Threats and Hazards, which also includes air pollution and noise within its remit. I am the current chair of the Committee on the Medical Effects of Air Pollutants. I will try to distinguish in my evidence what is related to COMEAP and being chair of COMEAP and what are my individual opinions. I also need to credit the UKHSA team secretariat supporting COMEAP and the air quality department because we have discussed some of these questions and they have been quite helpful in their input in preparation.

Professor Harrison: My expertise complements that of your other two witnesses today. I am not medically qualified. I graduated initially as a chemist but I have become an atmospheric scientist. My work spans right through emissions. I work with engineers in the engine laboratory through atmospheric processes, chemical, physical and meteorological processes, to people's actual personal exposures. I work with people such as Stephen and Anna on health effects studies, and I have been an adviser to DEFRA and its predecessor Departments and to DHSC for somewhere approaching 40 years.

Q64 **Chair:** You are three extremely busy people evidently, which is great to hear. Sir Stephen, I will start with you. Some studies have estimated that approximately 48,000 premature adult deaths are attributable to $PM_{2.5}$ exposure. The updated report "A breath of fresh air" brought that estimate to around 30,000, which is quite a range. How certain can we be around the likely impacts on public health of poor air quality, and which is the most accurate estimate? What are the problems within our knowledge base so far?

Sir Stephen Holgate: Much of what I am going to say over the next 15 to 20 minutes or so, as we go into all this detail, is through the Royal College of Physicians report that we released in June of last year. The numbers that you have just quoted—the 30,000 in particular—have come out of that report.

In calculating this—and I have some real experts on my left—these are estimates. The first thing we have to understand about air quality, as was highlighted politically a couple of years ago, is that we really only have one single death from air pollution exposure, which was little Ella Kissi-Debrah and the story around her asthma. What air pollution does, especially with chronic exposure, is accelerate death from a variety of different causes. I will come back later to the different causes.

The way this is calculated is often through all-cause mortality—that is whatever has caused death—on the vertical axis versus the concentration of the particular pollutant along the horizontal axis of a graph where millions of people have been looked at across large areas of geography, whether it is in the United States, Europe or the United Kingdom. That leads to a relationship between the concentration of the pollutant on the horizontal against the number of people who are affected by this and the magnitude of the effect. From that one can derive an index. For example, for every 10 microgram increase in small particles, $PM_{2.5}$, it would be a 6% to 8% increase in mortality in a population.

Using that, then, and knowing what the population of the country is—for example, how many deaths there were, say 600,000, in the United Kingdom each year—you can work out where the number comes from with a 6% to 8% increase in mortality. That gives us the number. Of course there are very wide variations, and this is because of the technology that is used to measure them. Sometimes we use single pollutants, and sometimes combined pollutants, particularly particles and nitrogen dioxide, which are the two principal pollutants driving these statistics. There has also been updating of methodology in the calculations, and Anna and Roy will be able to expand on that, should you wish. There is quite complex statistical analysis that goes into all this, whether they are one pollution models or two pollution models and variations on all that.

At the end of the day, we are talking about 30,000 people having their lives shortened as a result of air pollution and the underlying mechanisms of that affect different diseases in different ways. Basically it is the

premature ageing of organs, whether it is the brain, the heart, the lung or whatever it is, brought on by this exposure.

Q65 **Chair:** Professor Hansell, we had the tragic death referred to there. I think it was widely said that this was the first time we had recognised an air pollution-related death on a coroner's report. However, as we heard there, huge numbers of deaths every year are attributable to this. Do you think that because it is not identified as a cause of death officially we treat this as a far more negligible problem than it really is? Should we be viewing this as the public health crisis that it would be if we had that detailed on 30,000 different death certificates every year?

Professor Hansell: I completely agree that we underestimate this. I sometimes use the analogy with cholesterol. People do not die of high cholesterol, but it has a huge impact on cardiovascular disease and probably dementia as well. Air pollution is like this chronic stressor, as Sir Stephen just said, exacerbating the risk of other diseases.

The mortality figures are going to depend on exactly how you calculate it, but within the ballpark range that we have calculated, 30,000 is quite a reasonable estimate. It certainly underestimates it just to look at mortality, because the more health outcomes we look at, the more impacts we see of air pollution.

The Committee on the Medical Effects of Air Pollutants recently commented on dementia and finds it likely that air pollution is exacerbating dementia. We know there are effects on lung cancer. We know there are effects on metabolic diseases such as diabetes and well-known effects on respiratory and cardiovascular systems. The harder we look, the more we find. Those have impacts on morbidity, costs to the health service and impacts on illness and productivity at work.

Q66 **Chair:** Sir Stephen, do you feel that policy has been framed more around achievability and cost rather than that public and environmental health imperative?

Sir Stephen Holgate: Absolutely, I do, and I think that has been the change in the last five to six years. This is a major public health issue we are talking about now. Just to give you one example, there is a Danish study of over 3 million people in the population of adults over the age of 30, and out of 840 deaths in the medical lexicon—all the different diseases—700 of them have now been linked to poor air quality. That is in Denmark, which is a pretty clean country compared with many European countries. That just gives you an indication. We are just scratching the surface, and the numbers we are dealing with at the moment are going to be a gross underestimate of the true damage that is being done by breathing poor quality air.

What we have witnessed over the years, looking back, is compromise. Of course it depends where you put a value on life. We now realise that air pollution is affecting pregnant women, and that babies are born smaller.

We are looking, as Anna says, at brain diseases that are appearing across the life course and a whole variety of conditions that are affecting the capability of society to be able to function. I think the connection has not been properly made that what we are talking about here is, for almost every chronic disease, an important contribution to it. It is disabling the population in its ability to be able to deliver its productivity maximally.

Q67 **Chair:** Professor Hansell, does the underestimate that we have potentially undermine the case to be made? If we are giving people an artificially low estimate of the number of people who are dying, are we not underplaying the true severity of this? How could this Committee—or how should we all—be working to ensure that this is given the level of awareness that it should be?

Professor Hansell: I have two comments on this. The first is that COMEAP is working to update our exposure response estimates based on new evidence. We have an ad hoc group on economics that is looking at costing and making some updates on costing, because we think that the current ways in which this is costed probably underestimate the issue.

The second issue is about how certain you want the evidence to be and whether you are looking at evidence that is beyond all reasonable doubt versus the likely or possible end of it. Within COMEAP we tend towards the beyond all reasonable doubt or balance of probabilities evidence so that we know that we have very robust evidence to give to policymakers. We could also look at possibles and say, "We think this is quite likely. The evidence base is still developing but we should take action now."

Q68 **Chair:** I think if you spoke to the general public about the causes of premature deaths, they might well identify smoking, they might identify drinking, and they would probably identify suicide and obesity. I suspect very few of them would identify air quality as a major cause of that. Yet while people will go to tremendous lengths to give up smoking and will take other steps to improve their health, they might be completely oblivious to the risks posed by air quality, both internally and externally. How great do you think the knowledge gap is among the general public, who actually have a chance to influence it?

Professor Hansell: There is a big knowledge gap. It was looked at in the DEFRA air quality information system review, and it was quite surprising how little people knew about air pollution health risks, their own contribution to air pollution and factors that might mitigate it. I think, Sir Stephen, you have also looked at this.

Sir Stephen Holgate: Yes. The Royal College of Physicians did an Ipsos survey last year looking at this. There was total ignorance. They all knew there was something bad about air pollution, but they did not know what and how and anything else. The other important thing is that this is different from tobacco smoking or drinking. Those are voluntary things that people can do to themselves. This is not voluntary, and those who have the least ability to cope with air pollution—people who live in poor

areas of our urban environments and even in rural environments and ethnic minority groups—are the ones who are most exposed, but contribute least. In a way, there is an equity issue here. This is very important and we must not forget that. I think policy has to start taking this seriously now in the parts of our environment where people live who do not have very much to be able to survive on.

Q69 **Dr Roz Savage:** Thank you very much to our panel for coming in today. This is a question to Professor Hansell first. The good news is that it looks like air pollution levels have been declining over the last eight-plus years. Based on that, would you expect to see a gradual decline in respiratory illnesses and hospital admissions in proportion to that decline in air pollution levels?

Professor Hansell: You would, and the UKHSA did some modelling of this, which it published a few years ago. It was looking at the air pollution in 2018 and it modelled forward to 2050. Its model suggested a fall of around a third in the air pollution levels would relate to—given the expanding size of the population—around a 25% drop in the number of deaths that could be attributed to air pollution. There is obviously a lot of uncertainty about how you model air pollution forward in time, but it does not go away. That is a key message from this: you do not lose the impact of air pollution. That is because air pollution has impacts right down to very low levels. We have not been able to find a threshold level beyond which there are no effects of air pollution.

Dr Roz Savage: That is very helpful, thank you. Would either of the other panellists like to come in on that question?

Sir Stephen Holgate: I will come in very briefly on this. One of the things that the public do not understand is that out there we have polluted air, and maybe in this building we have, but out of sight, out of mind. It is not like the 1950s when we had the smogs and all the rest of it, because people could recognise that. This is the problem we often have with this. It was the same of course when we had covid-19. You cannot see viruses, but people were falling ill and it caused a big problem.

One of the major issues about this is the fact that we are underestimating the exposure, and the reason why this is important is not because air pollution necessarily is getting worse, as you correctly pointed out—overall it is improving and that is great—but scientific knowledge about what diseases air pollution is influencing is increasing enormously. Now we know that it is quite a major driver of dementia—the acute severe forms of dementia, the early life forms of dementia and the more Alzheimer-type dementia. This is terribly important because any changes when you are 85 are too late. We have to make changes much earlier when these diseases start.

The Royal College of Physicians report emphasised that the life course, just as with tobacco smoking, is crucial. Things start in the uterus, and

then all the way through to the end of life we are getting the effects of this cumulative exposure. That is why we have to take it so much more seriously.

Q70 **Dr Roz Savage:** Thank you very much. I have a connected question to follow up on that. So far in the UK we have tended to look at one pollutant at a time and of course the real world does not work like that. There is a cumulative and possibly a compounding effect of multiple pollutants. Do you think it is time that the UK moved towards a more integrated strategy and looked at air pollution in a more holistic way?

Sir Stephen Holgate: I think, Roy, that you would be a very good person to answer on mixtures since you have thought a lot about it.

Professor Harrison: Indeed, yes; thank you, Stephen. We have tended to focus on individual pollutants based on our knowledge of the effects of those individual pollutants. Policy has been directed especially at fine particles, $PM_{2.5}$, and nitrogen dioxide because we have very strong evidence of the harms that result from exposure to those pollutants. I think that is understandable.

I am not entirely sure what you would imply by a more holistic approach. This involves tackling a whole wide range of sources, but one would not, for example, think it very beneficial to target carbon monoxide, whereas 50 years ago it was very important to target carbon monoxide. Now the levels are such that the effects on health, as far as we know, are very small compared with the other pollutants. I would not especially favour looking at other pollutants, but I think if we target those that we do know are creating harm, we will, along the way, probably also control those that we are less knowledgeable about.

We do have to watch out for unintended consequences; that can be important. One of the concerns of mine has been with policies towards net zero, some of which will benefit local air quality, but some of which may be deleterious to local air quality. It is a complex situation. I do not see how we could usefully look at it more holistically, but perhaps you could elaborate on that.

Q71 **Dr Roz Savage:** I am curious. Could you briefly give an example of how the net zero policies could lead to unintended consequences on air pollution?

Professor Harrison: Yes. I will give you two examples. One is that if natural gas were changed for hydrogen as a fuel for home heating, the evidence is that we would increase the emissions of oxides of nitrogen compared with using natural gas, methane, as a fuel. That is one.

Something I am very concerned about at the moment is that carbon sequestration processes—so prior to carbon removal and storage; it is the technique that is used for removing carbon dioxide from flue gases—use compounds called amines. These amines catalyse the formation of ultrafine particles in the air. If they are released during these processes,

they will lead to particle formation in the atmosphere, which would potentially be quite deleterious. There is a lot of uncertainty around it at the moment, but it is an issue that we are intensely researching.

Dr Roz Savage: That is very interesting, thank you.

Q72 **Sarah Gibson:** I have a specific issue with landfill sites, where regular smells of sulphides are not dangerous necessarily, but very prevalent. Of course that often comes with methane, which is not detectable and fits into your category of nobody knows it is happening. Is there an argument for localised pollution monitoring in areas that are susceptible to certain gases because works happen in the neighbourhood, such as landfill sites or military operations?

Professor Harrison: I think the issue you are referring to is the release of odorous compounds, sulphur compounds.

Sarah Gibson: There is methane coming out with it as well, which is obviously not detectable by the residents. It is the sulphurous compounds that they know about because they smell.

Professor Harrison: That is very true, but the methane is unlikely to be harming their health, whereas the sulphurous compounds may be, although we do not have very strong evidence on that. However, there is a strong suspicion that they will do. The concern over methane is because of its very strong global warming potential and the fact that it is exacerbating the warming of the lower atmosphere.

Q73 **Sarah Gibson:** We do not measure the sulphides either, do we?

Professor Harrison: No. Only in one case; we do not routinely monitor them. In the case of the Walleys Quarry landfill site in the midlands, there was quite intensive monitoring put in by the Environment Agency for hydrogen sulphide, although unfortunately it failed to calibrate its analysers properly so we do not have much useful data.

Sir Stephen Holgate: We have been talking very much about average concentrations of air pollutants. What you are talking about, which I think is amazingly important, is where people live and where they function and where they go to school and all that. In fact, the actual knowledge about local exposure is very limited. We now have technologies that can provide that information, not necessarily for the sulphurous compounds, but maybe for others. Canyons between buildings, for example—we have had some good examples in Wales recently of wood smoke and how it is trapped between buildings and between areas and people are becoming exposed to all that—would not register on the national statistics. Local monitoring and the engagement of local communities in their own air quality monitoring is going to be quite important for the future.

Professor Hansell: We are doing some work on that within the Health Protection Research Unit to try to improve hydrogen sulphide and compound detection from landfills, so I am happy to discuss that offline.

Sarah Gibson: Thank you.

Q74 **Chair:** Just before we move on, we were talking there about the reduction in recent years of air pollution levels. What are the key reasons why levels might be falling?

Sir Stephen Holgate: We are reducing emissions, which of course is what we should be focusing on. What we have not talked about at all is the relative toxic effects of the different pollutants. We talk about particles. Well, particles come in all shapes, sizes and flavours. It is the burning particles, the particles that are generated through anthropogenic burning activities, which are probably the most toxic. Wood burning is probably one of the most toxic among the particles that are emitted into the atmosphere.

The idea of connecting toxicology to the source of pollutants is an important one. What we need to do is not just identify the density and the concentration of particle pollution but what chemicals are packaged in those particles, because some are going to be more toxic than others and they are going to come from different sources. It is source control that is what we have to do to drive further improvements along.

Professor Harrison: On the issue of why our concentrations are falling, I think the primary reason is likely to be Dieselgate. As a result of Dieselgate, the emissions regulations were hugely tightened to include real world driving testing so that the manufacturers could no longer cheat. The emissions of NO_x from road traffic have fallen hugely. For many years we were seeing virtually no change in nitrogen dioxide in the air, and it was a little bit of a mystery as to why, because the vehicle technology was improving. It was because the manufacturers cheated and it appeared that it was improving but it wasn't really.

Now that it has improved as a result of the tightened regulations, we are seeing considerably less oxides of nitrogen emissions. That means less in the way of nitrate particles in the air as well as less nitrogen dioxide. Part of the improvement is because we import quite a lot of our particle pollution from the European mainland, and it is similarly reducing its nitrogen oxide emissions, so the import of particles has fallen as well as the local production of particles. There is a good news story there.

Q75 **Chair:** Great, thank you for that. Coming back to you, Professor Holgate, I wonder what the public messaging impact is of the revelations about wood burning. I think if we went back eight or 10 years, lots of people were told, "Get rid of your gas fires, get one of these wood burners and save the planet." They went out and got these wood burners and thought they were doing a good thing. Now they are being told, "You're public enemy No. 1 with your air pollutants." I remember not that long ago we said, "Get diesel cars. That's the way of being environmentally friendly," and then we said, "Oh no, don't have diesel cars." People eventually just start thinking, "What's the point? They tell me one thing one year and a few years later they tell me the opposite." Do you think we have a real

issue in terms of the public messaging on this?

Sir Stephen Holgate: Absolutely we have, and we got ourselves in a bit of a tangle over all this. There is no question about the toxicology of wood smoke pollution. It is a major issue. If you look at some of the statistics from Australia, Canada and North America with these forest fires, they have a horrendous effect on coronary heart disease, brain problems and so on. Of course they are not fires in people's houses; these are major exposures. However, very high levels of exposure over relatively short periods of time are having major health impacts. I am afraid we got ourselves in a tangle over this.

I think the wood stove industry in particular has been a very powerful lobbying group in this whole area. You can understand it from their point of view because it is their industry, but if we are serious about protecting human health, especially the health of children and young people, we have to address this. This is just not acceptable. On the one hand we are trying to get air pollution down outside by doing all the things that Roy has been talking about, but on the other hand we are burning wood willy-nilly. It may be socially unpopular, and I'm sorry it is socially unpopular—giving up smoking is also socially unpopular, if you are a smoker—but it can be done if we get the messaging right.

My view on this at the moment is that we have to rethink this whole area of the messaging. People have choices, and they will be able to make choices, but I think this is a local authority issue because they have the legal framework already to be able to intervene, should they wish to. As you know, they haven't because it is socially quite a difficult area for them to go into. You can understand it. I do think we have work to do here.

Q76 **Chair:** Are you advocating that we ban new wood burners or that we go into people's houses and tear them out?

Sir Stephen Holgate: Let's start by not putting new wood burners in houses to begin with. That would be a pretty good start. We have this huge building programme that is apparently taking place across the United Kingdom. We welcome that, but we do not want every house to have a wood burning stove in there. That would be an absolute disaster. We do need to do that, but to strip them out would be a whole second level.

Q77 **Sammy Wilson:** I note the answer you gave, that the wood burning industry was very effective and so on, but all these messages started off with expert advice to Government Ministers, who encouraged people, for example, to move away from petrol cars to diesel cars and move towards burning wood because it is renewable. If you cut a tree down, you put in another tree and it will grow and absorb carbon and everything else. Is it a danger that none of these messages will be taken seriously because different experts at different times will give different advice that is totally contradictory?

Professor Harrison: The problem is that there is a confusion in the public between globally acting air pollutants, which are those such as carbon dioxide and methane that are linked to climate change, and locally acting pollutants, which are those such as fine particles and nitrogen dioxide, which affect the health of the public. There is or there has in the past been a tension between policies that have been designed to alleviate climate change—mitigation policies—and those that are designed to improve local air quality.

In recognition of that, I chaired an advisory group for what was then the Department of the Environment, which reported in 1993 and said, "Do not allow the expansion of diesel cars because they will kill people through the air pollution emissions," but the Treasury incentivised diesels through the determination of vehicle tax on CO_2 emissions. The advice has been there, but there is clearly advice from two sides.

The same applies to wood burning, in the sense that in some circumstances wood burning may mitigate CO_2 emissions. I think it is questionable, but there are circumstances where it may, and that has overridden in the past the recognition that the emissions are highly toxic, as Sir Stephen has pointed out. I am disappointed that the current consultation that is going on with DEFRA is not looking at action on older wood burners, because those are much worse than the new ones.

Q78 **Manuela Perteghella:** My question is to Professor Roy Harrison first, but the rest of the panel can also contribute. It has been notoriously difficult to capture and monitor reliable data on ultrafine particulate matter. What advancements have been made to improve this technology and what benefits could be had by capturing this data?

Professor Harrison: The monitoring of ultrafine particles is very sparse indeed, essentially limited until recently to five sites. A sixth one has opened recently, but I do not know how long it is going to run for. That is not sufficient to understand the distribution of these particles in the atmosphere. Ideally we need to measure not only the number of the particles, but the size distribution of them if we are to understand their effects properly.

There is work going on to compare different types of measurement devices and I am hopeful that we may be able to introduce some cheaper devices. The current measurement stations—we run one in Birmingham—use instrumentation that costs around £100,000 in capital cost and has very high running costs associated with it. There is less expensive instrumentation. It is not as reliable, it does not give as much information and it is not as clearly harmonised with what is measured in some other countries, but it would be a way of greatly improving the geographic coverage of measurements.

Professor Hansell: Do you want me to comment on the health effects evidence?

Manuela Perteghella: Yes, please.

Professor Hansell: I am sure you are aware that the World Health Organisation air quality guidelines said this was a pollutant to watch. There are concerns about it. There is evidence that there are short-term effects on physiology, for example, heart rate variability, blood pressure and some more mixed evidence on respiratory hospital admissions, but the long-term evidence in long-term studies is not showing as clear an impact, which we do not fully understand. It may be that there are limited numbers of studies because we do not have the data to be able to do the epidemiological studies, so that is one potential factor.

It is not clear enough for us to consider in COMEAP at the moment and give you an exposure-response function for those long-term health effects or mortality and other outcomes. It is certainly one we are quite concerned about, particularly because we know from the toxicology that these particles enter very deep into the bloodstream and are carried all the way around the body.

Q79 **Manuela Perteghella:** From a health study point of view, do you need that data?

Professor Hansell: Yes. If you give us the data, we can do the studies.

Q80 **Manuela Perteghella:** Is enhanced UFP monitoring something that the UK could integrate into its existing monitoring network? If so, what would be required to do so?

Professor Harrison: If we used some of the monitoring devices that have come on to the market relatively recently, they could be integrated very easily into stations and could be operated by local government officers in the way that most local stations are currently operated.

Q81 **Martin Rhodes:** Professor Harrison, I want to ask around the tube, the London underground, to try to understand a bit more about the issues around air pollution within the tube system. Could you first say something in terms of what types of pollution we see in that system?

Professor Harrison: I am happy to answer your question, but COMEAP has written a report on this, so Anna may want to come in later. The pollutant that is a problem in the London underground is fine particulate matter. There are huge concentrations of particles, both fine and larger ones—referred to as coarse particles—but it is the fine particles for which we have by far the best evidence on health impacts, although there have been no suitable studies in the London underground or indeed in other metro systems that allow us to know the effects of relatively short exposures for most people travelling on the underground. The concentrations averaged across a journey can be typically several hundred micrograms per cubic metre, which compares with concentrations in London typically of less than 10 now and with a WHO guideline of 5 micrograms per cubic metre. The concentrations are huge,

but we do not have very much health evidence as to what effect they are having.

Professor Hansell: COMEAP produced a report in 2018 on this and made some recommendations for greater monitoring. One of the concerns is that particulates have quite high levels of metals, particularly iron, and we need some more evidence to fully understand the toxicity of those. There has been a study commissioned by Transport for London looking at occupational exposure. It certainly found that exposure differed between staff in different environments, so drivers do have highest exposures, but they did not find an exposure-response relationship with sickness absence, which is quite a blunt instrument to look at health effects. It is something that needs some more study. I would point out that people's time spent on the underground is relatively short, so we have short periods with high concentrations, and the effects of that compared with long-term, lower levels of exposure are less clear, as to their equivalences.

Q82 **Martin Rhodes:** In terms of health risks, are you saying that those people who work on the system, because they are in it for longer—depending on their role—are more at risk than passengers using the system?

Professor Hansell: We would expect that. It is not showing up in the health data as measured by sickness absences, but that is a blunt instrument, because if your health is affected, you might change your job.

Professor Harrison: I think we must be aware of the demographic though. The drivers of the trains are adults within a limited age range, but the passengers on the underground include the elderly, the sick, the young and the more vulnerable people in society. I do not think we can read an awful lot into the occupational data.

Q83 **Martin Rhodes:** You mentioned the type of pollutants that are there. What particular health risks would potentially present compared with the types and levels of pollutants that you see in an area of London?

Professor Harrison: I chaired a sub-group of Anna's committee that looked at the question of differential toxicity of particles, in other words, whether we have evidence that particles from diesel exhausts are more or less toxic than wood smoke particles and so on. Unfortunately, the evidence is just not sufficient for us to make that sort of judgment. The recommendation from the committee ultimately was that we should still depend upon $PM_{2.5}$ mass, so the mass of fine particles in the air, as the best policy relevant metric. If we evaluate the concentrations in the London underground on that basis, the mass of fine particles, as I referred to earlier, is huge compared with the ambient air outside.

Sir Stephen Holgate: There is good evidence that the metal components that have been referred to, which do not include only iron but cobalt and vanadium and other elements, have been detected in

human brains. There is a relationship between those magnetite particles and a decline in cognition linked to dementia. These are metal particles not necessarily in the underground, but coming off roads and from engines. There may be some very special characteristics about these metals that, as Roy says, do deserve in-depth studies. It is important.

Professor Hansell: The other concerns I have are around respiratory infections, looking at welders' exposures and occupational exposures and translating from there. We are also doing some work at Leicester looking at the impact on the microbiome, on the microbes that line the respiratory tract. We find that they react differently in the presence of air pollution, in a way that might make them more virulent and more likely to pick up antimicrobial resistance. Those are quite novel findings that are not just affecting us, but affecting the organisms that live on our surfaces.

Q84 **Martin Rhodes:** In terms of managing these risks, there is something about having an underground rail system that is a source of where the pollutants are coming from, but there is also the issue of how you then filter those pollutants out. Where do you think the main thrust of activity should be? Is it about trying to reduce the pollutants in the first place or is it about dealing with the pollutants that will inevitably come from that process taking place?

Chair: If I could ask you to keep the response relatively short.

Sir Stephen Holgate: The technology is already there to be able to extract these pollutants close to the tracks and the brakes where they are generated. It just has not been implemented. Transport for London has already done some very limited trials on this. I think it is ready to go, to be honest, but it does need a pilot study to demonstrate all the things that you have asked for.

Chair: Thank you very much. I am afraid we now have one vote, so we will suspend this session. Members will vote and then we will return and carry on. This sitting is suspended.

Sitting suspended for a Division in the House.

On resuming—

Chair: Welcome back, everybody. We have finished with the questions from Martin Rhodes so it is over to Sarah Gibson.

Q85 **Sarah Gibson:** Thank you all for your answers so far. Thinking again about something that was mentioned by Professor Holgate, which was to do with the elderly and children, but particularly given that people from underprivileged areas tend to live in areas with higher levels of pollution, what steps could the Government take to reduce the many risks that air pollution poses specifically for children and pregnant women?

Sir Stephen Holgate: First, we need to inform the public. We need a public health campaign in this area. If you ask Mr and Mrs Smith, they do

not have a clue what all this is about, and especially if you go into a maternity clinic they will not make any mention of it at all. Here we have all this amazing scientific evidence and there is no question about the health-related effects, yet the effort to get that information out to the broader public is almost zero. We must have this. We keep getting pushback on this saying, "No, we don't need a public health campaign. It's too expensive. We can't do it," but why would the public want to engage in all of this if we do not get the evidence in front of them in a way that they can deal with?

DEFRA has recently fortunately set up through AQIS—the Air Quality Information System, which Anna helped run a year or two ago—an air pollution awareness coalition, which is great. It is getting everybody together to agree the messages and all the rest of it, but then we need to get out there to deliver it to the public. I would implore that we cannot just pretend this is no longer a health-related issue. It is extraordinary that it is still regarded as an environment issue. Of course it is important for the environment, we all understand that, but this is health that we are trying to argue for and yet health is not dealing with this. It is being dealt with through DEFRA and through environment. Of course Chris Whitty and others within health are helping enormously, but we need more on that.

As for focusing on inequalities, what we are talking about here are the social determinants of health and this incredible widening gap between those who have and those who don't have. Air pollution is just feeding into that, whether it is smoking, poor diet or lousy housing. Whatever it is, it is feeding into that, but it is a very significant contributor to that. I would like to strongly suggest that apart from information, the local councils, which are having to deal with this, should start taking this quite seriously. There is a lot they could do locally if they got on with it, at least in providing the public with alternative routes for the way in which they can move around. They could think about their transport, the ventilation of their schools and the ventilation of social housing. Especially with the death of that little boy, we know that housing is a big issue.

I think there are things that could be done, but we need simple messages. We need to get them out there, but we need the work to do it. I would very much like, if you do not mind, Chair, to ask this Committee to think about that as one of your recommendations. We need to get the profile of this area out to the public in a much more tangible manner than is currently the situation.

Q86 **Sarah Gibson:** Do you think that perhaps the Government are not pushing it, because it is different? I can give you a message that says, "Smoking is dangerous for you. You could stop smoking. That would improve your health," but if I say to you, "Your air pollution is dangerous because you live on the wrong side of the city. Move to Mayfair and you will be better off," there is not a lot that you can do about that. Is it that

the Government are not promoting this as an issue because in fact, even if the public were more aware of the issues around air pollution, the solution is so difficult?

Sir Stephen Holgate: We have had some wonderful experiments done out there. The Ultra Low Emission Zone, which was so unpopular in London, has transformed the City of London and London. I am from Southampton. I come to London and it is a lovely place to visit and walk around now, so there are added benefits. I see children playing in the streets and so on; we are beginning to see the health gains. There have been some marvellous studies conducted around the Ultra Low Emission Zone, around Bradford and some of the work that has been done up there. We can show the public that if you make these changes they may be superficially awkward to begin with, but the long-term gains are phenomenal and the quality of life generally will expand in those communities that have this focus put on them.

Professor Hansell: We have talked about specific actions for children and pregnant women. I think the best action the Government can take is to set ambitious targets so that everybody benefits. That is going to have the most benefit across the whole population and specifically for our vulnerable groups.

Q87 **Sarah Gibson:** Which targets would you like to see them set?

Professor Hansell: I could start with $PM_{2.5}$, but I would look at the air quality guidelines that have been issued by the World Health Organisation. They are a superb guide, not just looking at $PM_{2.5}$ but looking at other pollutants. We should aim to meet those.

Sir Stephen Holgate: A new Clean Air Act would be wonderful.

Sarah Gibson: Thank you very much. That is a very clear ask of the Committee.

Q88 **Julia Buckley:** Following on from that, there is already evidence out there about the variable levels to which this is experienced in different geographies. To what extent does someone's postcode, whether they live in an urban or a rural area, lead to the results and the level of their exposure?

Professor Harrison: DEFRA's air quality expert group looked at the disparities in exposure across the UK. It is not an entirely simple picture in that some areas that are very affluent—for example, the centre of London—do have very high air pollutant levels relative to other parts of the country or other parts of London. Overall we do tend to pollute those areas most where there is the most deprivation, so there certainly is a major levelling-up issue there, but it is slightly more complex than it might appear at first sight.

Q89 **Julia Buckley:** Are you suggesting that deprivation levels are more of a factor than urban or rural?

Professor Harrison: That is a difficult one because I do not know much about deprivation in rural areas. Living in a rural area myself, I think there is quite a lot of deprivation in rural areas. The differentials in concentrations of particles between urban and rural areas are now very small for rather complex reasons that I will not take up the time of the Committee with. The exposure differentials for particles are not that large between rural and urban dwellers now. Again, for quite complex atmospheric chemistry reasons, the rural dwellers are exposed to more ozone than the urban dwellers—less nitrogen dioxide, but more ozone. Ozone is also harmful to health; ground-level ozone is harmful to health. It is a very complex picture.

Q90 **Julia Buckley:** That is fascinating. It sounds to me that economic geography is more important than density of geography, but that still leads to the same dilemma for policymakers. How do we make policy across devolved nations and countries where we have this different experience for different populations?

Sir Stephen Holgate: This is getting to the core of the issue because here we are about to design a whole load of new towns all over the country. If we do not build health into the planning of all of these—and air quality is a major one, not the only one but a major one—then we are going to miss an opportunity. Likewise, there have been major changes to traffic handling in some of our towns and cities, such as Bath and Bradford-on-Avon and those sorts of areas, and it has made a huge difference.

Of course one of the things that is difficult for local councils is to go against the grain of convenience. Of course convenience could be improved if we had public transport and advocated for personal transport in a much more positive way than we are currently doing. We are only a small island. We do not need to be driving vehicles all over the place. It does not make a lot of sense, to be frank with you. We do have an infrastructure that has proven that public transport is very effective when it works well. You talked about the underground a few minutes ago, which is a good example of public transport.

The main issue here—it is a bit like covid-19—is getting the information to those communities in a way where they have a voice to be able to express themselves. I am talking about the silent part of our communities as well as the inequality side of it. We need to do more to bring this out. We need to be culturally aware as well as being aware of the big age differences that you have talked about. My own personal view on all of this as I start to grow a bit older now is that we should target a lot of what we are doing now at the next generation. It must be about children—about pregnancy and early life and what happens to this next generation, which is what we are now thinking about in terms of air quality.

Q91 **Julia Buckley:** It sounds like if we were encouraging you to bring forward recommendations for Ministers, you would be talking about two

different mechanisms, one around looking at existing populations and what can be done around transport policy, and a separate one looking to the future around planning. Would that be a good summary?

Sir Stephen Holgate: Yes. The "health in all" attitude is wonderful and of course we do have health impact assessments on very big projects such as airports and all the rest of it, but with local housing it does not become part of the equation at all. We need to get health professionals on the planning committees, and local authorities need to connect much better with their public health organisations to enable this "health in all" attitude to promulgate and spread so that it has an impact.

Q92 **Julia Buckley:** Are you suggesting that there should be a statutory consulting team that could feed into proposals for new developments or that could be consulted on new towns? Give us some suggestions that we can feed back.

Sir Stephen Holgate: Those are wonderful suggestions, thank you. These are exactly the things that should be done. When we have planning committees, we have all sorts of representations on them but we do not have strong public health recommendations. If we are talking about air pollution, we must have the public health people making the case. This is about getting the information out there through the public health campaign that I have been talking about—why we need it and why we need to get the information out—so people realise the magnitude of the things we are talking about here.

Let me just give one example. In Bradford, 30% of the hospital admissions during the winter pressures were attributed to poor air quality. These are not small numbers; we are talking about a large impact on a complex system. I genuinely think that we need to get local authorities much more involved in this and empower them to do it. At the moment they just say, "Oh, we have other things on our plate. We don't want to be bothered with this," but they must be bothered with it because it is the future.

Q93 **Julia Buckley:** It sounds like we need to send a strong message to MHCLG about the role that it could take in leading local authorities. You did touch on the new towns. Do you see an opportunity there for doing something at scale?

Sir Stephen Holgate: Wonderful, what an opportunity—we have seen what they have been doing in Spain, for example, where they design cities around not only air quality but quality of life, so green spaces, and the climate change agenda. It is getting those two things—air quality and climate change—to come together, not fight against each other, which is what we were talking about earlier on. It is designing our towns and new developments such that it augments all of that. I see a great opportunity here for growth. This is a new way of doing things, to make our green places more attractive as we start to get new housing and new industries coming forward.

Q94 **Julia Buckley:** So we could propose you as an adviser to MHCLG on that topic.

Sir Stephen Holgate: I would love to, thank you.

Professor Hansell: There are some efforts to try to make this information more available to local authorities. The UKHSA has recently launched an air quality and health dashboard for England for local authorities to use. One of the problems in local authorities is that we have regulatory limits and we need to get air pollution lower than those in some cases. People are focused on the regulatory limits and it is harder to get local authorities interested in reducing air pollution levels more generally.

I just wanted to pick up on this idea of resilience and healthy places, which Stephen started to introduce. The issue is not just that you have higher air pollution exposure in more deprived areas, but that those areas are more susceptible to the impacts of air pollution. You can also think more generally about how we can try to reduce the heat stress, how we can improve green space access, how we can improve healthcare in those areas and how we can improve diet, all of which will add some resilience to the adverse effects of air pollution. It is not just what you are exposed to; it is also the resilience of the community.

Professor Harrison: I support what Anna has just said. She has pretty much said what I would have said. The new towns are a fantastic opportunity to get things right and to be entirely strategic about it, not just to go on doing things the way we have done them—not very well—for the last 30 years. Let us do it properly.

Julia Buckley: What an excellent suggestion.

Q95 **Chris Hinchliff:** Following up on those points, it is great to hear about the opportunities relating to new towns. I think we all know that even with the new towns going ahead, that is not how the majority of development in this country will happen. This Committee did a very important inquiry on housing development and environmental sustainability where we talked about the presumption in favour of sustainable development, which is how a lot of housing in this country gets approved. The Minister's view, when he came in front of us, was that that policy was working effectively—in other words, that the majority of development in this country is being delivered sustainably.

Given everything you have just said about the importance of thinking about development in terms of health and air quality in particular, not necessarily from a planning policy expertise point of view, but looking at it anecdotally from what you see, do you think the majority of development in our country is being planned sustainably from the perspective of health and air quality?

Sir Stephen Holgate: The simple answer is no. I am just looking at my own community where I live, Romsey, and the housing developments

there. What tends to happen is that the houses go up first and then secondarily they think about the infrastructure and the design. Each of the organisations, all these separate companies, are competing to have their housing put in these different places. It is a ragtag and a mess and there is no strategic thinking. It is absolutely shameful. The public and the community get very upset by it, for obvious reasons. I do not know who is enabling this so-called competitive marketplace, but it is a shambles and it is not working. I think it needs to be addressed with "health in all" being at the centre of this so that we have a healthy environment, healthy children, healthy older people and a nice place to live. That tends not to be the focus of the attention in the way our current housing is going up.

Q96 **Chris Hinchliff:** Thank you, Professor Holgate. For others on the panel, would you say that in the housing developments that you see we are effectively planning to minimise risks to air quality?

Professor Harrison: In my locality, absolutely not. We are seeing major developments going up in places where they are going to exacerbate traffic problems massively. They are not building adequate green space into the development. I would say very clearly it is not, in my view, sustainable.

Professor Hansell: It is not something that I have direct experience of, but we have been discussing the impacts of new developments and of retrofitting on indoor air quality and we have some concerns. You try to fix one problem, but you have not thought that it could cause other problems. We are trying to fix the climate change issue and resilience, but then you end up with worse air quality indoors. Those things need to be considered together.

Chair: Professor Sir Stephen Holgate, Professor Harrison and Professor Hansell, thank you very much indeed for the evidence you have provided. It has been an excellent start to this new inquiry and an excellent scene setter. With that, I will bring this first panel to a close.

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