Indoor Air Quality



INCIDENT

In a far-reaching human rights case, Ella Kissi-Debrah could become the first person to have toxic air given as their cause of death – and finally make this silent killer visible

From a tiny office on the top floor of the old town hall in Catford, south-east London, Rosamund Kissi-Debrah is leading a campaign to push air pollution on to the political agenda as never before. It has been claimed for years that pollution caused by motor vehicles, especially diesel cars, buses and lorries, is a killer, with talk of tens of thousands of premature deaths. But the number was always abstract, the identities of the dead unknown. Now, for the first time, campaigners have the name of a young victim they say died as a direct result of air pollution: Ella Roberta Kissi-Debrah, Rosamund's daughter, and if they can prove it they believe an invisible killer will become all too real.

Ella, who suffered from severe asthma, died in 2013 at the age of nine. She had been suffering asthma-related seizures like the one which killed her for three years. Kissi-Debrah says her daughter, who grew up and went to school close to the busy South Circular Road in Lewisham, had cough syncope – a condition usually associated with long-distance lorry drivers who'd been driving for decades. "I couldn't work out why a nine-year-old child should have that," she tells me.

While Ella was alive, Kissi-Debrah sought a medical explanation for the condition. Now she is convinced it was related to air pollution, arguing that her daughter's lungs had been weakened over the course of her short life, with pollution spikes then triggering the attacks that repeatedly hospitalised her in the final three years. "When she first became ill, I just went to the GP and got normal antibiotics and thought 'a few days and that will be it'," recalls Kissi-Debrah. "But she developed this cough and it was really strange-sounding, like a whooping cough."

The cough persisted. On the third visit to the surgery the doctor referred her to a specialist, and eventually Great Ormond Street took over Ella's treatment. "By New Year's Eve 2010 she was in intensive care," says Kissi-Debrah. "It now turns out that all we were doing for the next two years was maintaining her. She would have times when the cough disappeared, but it was never long enough."

Kissi-Debrah contends that the damage her daughter suffered to her lungs in the early years of her life condemned her to death.

Supported by the human rights lawyer Jocelyn Cockburn, Kissi-Debrah is pressing for a new inquest into her daughter's death that for the first time would make it explicit that pollution was the cause. To get a second inquest, they will need to show there is new evidence that was not taken into account at the original investigation in 2014. Step forward Stephen Holgate, professor of immunopharmacology at the University of Southampton, who has taken a fresh look at Ella's medical records and concluded there is a "real prospect that without illegal levels of air pollution Ella would not have died".

NEED TO KNOW

Indoor air is a lot worse than outdoor air. Many health symptoms experienced by workers are caused by indoor air pollution, which is precisely why it's essential to keep the air inside your commercial building clean and safe. This not only promotes comfort among your employees but also protects their health.

Definition – Indoor Air Quality (IAQ)

Indoor air quality describes how the air inside a building or facility affects a person's health, comfort, and ability to work. It's a major concern to businesses, employees, and rental managers because indoor air can have a huge impact on the well-being and productivity of employees.

What causes poor (IAQ)?

Indoor air pollution is perhaps one of the most underrated health concerns in commercial and institutional buildings. And it isn't hard to see why. Outdoor air, when heavily polluted, can be easily noticed (dark smoke, toxic smell, and bitter taste). But indoor air is different. It hides behind the cool and comforting air blown by the AC and the calming smell of air fresheners. And because people don't see it, it's easy to dismiss the fact that it exists.

What makes indoor air polluted?

There are hundreds of air pollutants commonly found in homes and commercial facilities. Which include the following:

- **Cigarette smoke**

Even if you or your employees do not smoke inside the building, cigarette smoke can linger on the smoker's skin and clothes. That's why when a smoker enters the office, you could smell it right away. Cigarette smoke contains more than 4000 chemical compounds, most of which are highly toxic and detrimental to the respiratory system.

- **Dust**

Dust and other environmental pollutants such as mites contribute to indoor air pollution. Without sufficient ventilation, these tiny pollutants can easily circulate around your office, triggering allergy **symptoms in some people.**

· Mold and mildew

When the temperature outside drops and the indoor air is heated, condensation can form around windows, causing moisture. High moisture content in indoor air provides the perfect environment for mold and mildew to thrive. Furthermore, if you have water damage issues in the office, there’s a very high chance that mold and mildew are present too.

· Chemical pollutants

Building materials, office equipment; furniture, wall and floor coverings, upholstery, and virtually every commercially manufactured item in your workplace emit chemical pollutants. They include polybrominated biphenyl (PBB), polychlorinated biphenyl (PCB), polyurethane, formaldehyde, and VOCs.

Why has IAQ become so important?

- Public awareness of issues which can affect the workplace environment, which have been linked to poor indoor air quality;
- Investigations into indoor pollution;
- A growing number of ventilation hygiene organizations using pressure selling tactics to persuade facilities managers to buy ductwork cleaning services; and
- Changes in the way we work and where we work, which have given rise to concern over indoor air quality, particularly in call centers.

How do you establish whether indoor air quality is good or inferior?

To monitor this, **Indoor Air Quality** should be conducted:

- Outside air: Types and amounts of dust, bacteria and gases should be measured prior to being filtered, heated or chilled. This will act as a benchmark to demonstrate that the air inside your building is at least equal to the air outside.
- Indoor air: Dust and bacteria should be measured in the workplace, to ensure that the filters are removing the majority of the contaminants from the outside air.
- Ventilation rates should also be measured, to ensure that they are satisfactory and are therefore removing contaminants such as carbon dioxide (which at high levels can cause lethargy).
- Specific gases, such as carbon monoxide and carbon dioxide, should be monitored to ensure that the levels present are within the occupational exposure limits established by HSE.

Detection – IAQ

The approaches taken to detect possible indoor air quality issues vary among organizations, but they normally include the following steps:

- Inspection of the ventilation system to see if a sufficient amount of outdoor air is taken in and properly distributed throughout the area and if the filtration systems are working.
- Ruling out possible triggers of symptoms such as thermal comfort, noise, ergonomics, poor lighting, etc.
- Testing for the presence of air pollutants (mold, asbestos, carbon

monoxide, other chemicals, and toxic gases). This can be done using air testing kits. Samples are then submitted to the lab for analysis.

Health Effects of IAQ

- Symptoms related to poor IAQ are varied, depending on the type of contaminant. They can easily be mistaken for symptoms of other illnesses. The usual clue is that people feel ill while inside the building, and the symptoms go away shortly after leaving the building.
- Symptoms such as headaches, fatigue, trouble concentrating, and irritation of the eyes, nose, throat, and lungs are typical. Also, some diseases have been linked to specific air contaminants or indoor environments, such as asthma with damp indoor environments.
- Whenever excessive moisture is present within the workplace, bacteria, mold, and fungi can grow and can lead to respiratory issues such as allergic reactions, asthma, coughing, wheezing, shortness of breath, sinus congestion, sneezing, nasal congestion, and sinusitis. Asthma is both caused by and worsened by dampness in the building.
- OSHA suggests that a proactive approach be taken to address IAQ concerns. Failure to respond expeditiously and effectively to IAQ concerns can quickly lead to more numerous or serious adverse health issues.

BUSINESS / REGULATION

The Environmental Protection Agency's (EPA) Air Quality Index identifies the ranges that constitute "good," "very unhealthy," or "hazardous" air, based on the levels of fine particulate matter in the air that are small enough to seep deep inside the lungs. To address these issues, the EPA suggests certain measures to fight indoor air pollution like purchasing brand new HVAC systems or energy-efficient appliances. It's a rather useless list of bullet points, though: Many people do not have the funds readily available to make these investments.

Both **California and New Jersey** have taken specific steps to address indoor air quality problems. The **California Air Resources Board** first implemented regulations in 2005 after University of California scientists conducted studies about the relationships between indoor and outdoor air. They found that "indoor air pollution is not currently well addressed by governments at the national, state, or local level," and that household air cleaners are often leaders in harmful emissions to the ozone layer. Yet the state hasn't done much since. The Air Resources Board website says that the most effective way to limit indoor air pollution is to "minimize the release of indoor pollutants in the first place." That observation really doesn't help homeowners.

New Jersey regulates indoor air quality in "buildings occupied by public employees during regular work hours." When asked about indoor air regulatory developments on homes, a New Jersey Department of Health spokesman directed the *Prospect* to the workplace air quality regulations—which were implemented in 2007.

Several studies by the U.S. **Environmental Protection Agency (EPA)** regarded indoor air pollution as a major problem. While most commercial buildings don't have severe issues, even the most well-maintained buildings can have episodes of poor indoor air.

According to the **EPA**, poor indoor air quality can lead to productivity problems and increased absences among employees. It is estimated that all these health consequences cost the government billions of dollars each year due to medical care and productivity loss.

Legislative Requirements

Under the Health & Safety at Work Act etc. 1974 and the Occupiers Liability Act 1984, an employer has a duty of care to ensure that a safe and healthy environment is provided. The Approved Code of Practice accompanying the Workplace (Health, Safety and Welfare) Regulations, states that indoor air quality should be at least equal to, but ideally better than, the air outside your building. HSE document EH40 contains a list of maximum exposure limits and occupational exposure standards for specific gases as required by the Control of Substances Hazardous to Health (COSHH) Regulations.

Regulation 6 of the workplace (Health, Safety and Welfare) Regulations states that: "Effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air." The ACOP also states that "The air which is introduced should, as far as possible, be free of any impurity which is likely to be offensive or cause ill health". Regulation 7 relates to 'Temperature in indoor workplaces' and Regulation 8 states that "lighting should be sufficient to enable people to work, use facilities without experiencing eye-strain, and safely move from place to place".

Although the **Workplace Regulations** state that ventilation systems should be kept clean, they DO NOT state the frequency at which they should be cleaned. As long as you can demonstrate to the enforcement agencies that you are monitoring the quality of the air (and that your indoor air quality is good), you will be complying with these Regulations. **OSHA** responds to questions about standards with letters of interpretation**. OSHA's letters of interpretation** specifically addressing IAQ issue can be found in Other Resources. The **General Duty Clause of the OSHA Act** (the law that created OSHA) requires employers to provide workers with a safe workplace that does not have any known hazards that cause or are likely to cause death or serious injury.

Takeaway

The number of people suffering from illness linked to poor air quality is unlikely to decline without decisive regulatory measure by federal and state officials. For now, most people are at the mercy of airborne chemicals and toxic fumes interacting in ways that are difficult for the average person to understand or control—which means Americans will have to follow Benjamin Franklin's suggestion to open the window, if possible, just to be safe.

STATISTICS

About 200,000 Americans are thought to die from air pollution each year, but scientists previously couldn't pinpoint the specific causes of death for almost half of those people.

The new research reviewed the medical records of veterans who died and compared them with the air pollution levels in their zip codes. They focused on PM 2.5, or inhalable particulate matter pollution that is 2.5 micrometers or smaller – a

fraction of the width of a human hair.

They linked nine causes of death with the pollution: cardiovascular disease, cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease, dementia, type 2 diabetes, hypertension, lung cancer and pneumonia.

Three of those conditions were newly identified associations: **chronic kidney disease, hypertension and dementia.**

Miles Keogh, the executive director of a group that represents state and local air regulators, said: “We know people are harmed from exposure levels lower than the [current standards].

“The question is whether the trade-offs for society are worth it. If only a few people are harmed, maybe society accepts the risk,” Keogh said. “But when a study shows 99% of death occurring at exposure levels below that threshold, that should make us look much harder at whether the threshold protects people effectively enough.”

Because scientists cannot ethically expose subjects to air pollution and test the results, they must rely on existing epidemiological data. Veterans offered a massive source of detailed records held by the federal government.

In the United States, indoor pollutants like radon, the second-leading cause of lung cancer, cause an estimated 20,000 deaths each year. Yet the hazards posed by these silent-but-deadly cocktails of chemical pollutants in many indoor environments have been largely underregulated and underreported compared to outdoor air issues. Federal and state officials have not moved as aggressively on indoor air quality as they have on outdoor air pollution even though Americans spend 90 percent of their time indoors, often in airtight environments.

Indoor pollution costs California $50 billion each year in medical expenses, lost worker productivity, and premature deaths. In 2013, World Health Organization experts estimated that California should plan for over 200 new cancer cases as a result of carcinogens from indoor air contaminants (primarily VOCs). Los Angeles is one of the most car-clogged cities in America and a leader in carbon emissions, but consumer and household products have surpassed transportation as the dominant source of VOCs in the city.

RECOMMENDATION

Based on findings here are recommendations below.

1. Maintain a communication system with employees for when building-related issues arise. Make sure to provide information on response actions to all employees, including posting exposure and environmental assessment reports. If not already formed, consider starting a health and safety committee that consists of employees, management, and maintenance. This can help increase communication between Page 18 Health Hazard Evaluation Report 2018-0046-3346 employees and management and help alleviate concerns.
2. Evaluate your existing housekeeping program with attention to keeping horizontal surfaces dust-free and carpet cleanliness. a. Vacuum the carpet regularly with a vacuum equipped with a HEPA filter. Ensure HEPA vacuums are well-maintained and the HEPA filters are changed according to the

manufacturer’s recommendations. b. Use a damp cloth or mop on nonporous surfaces rather than dry materials to clean up dust. This prevents dust from becoming airborne and resettling.
3. Follow the manufacturer’s recommended maintenance schedules for the HVAC system, including replacing air filters, checking drip pans, ensuring thermostats are in working order, and checking and cleaning ventilation system dampers to ensure proper functioning.
4. Maintain indoor temperature and relative humidity levels according to the guidelines discussed.
5. Routinely inspect the building for water intrusion and damage and correct these upon discovery. During and after heavy rains, walk through the building and check for water incursion.
6. Identify any potential sources of dampness or mold through visual inspection and make proper repairs to prevent further problems from occurring.
7. If dampness or mold is not identified during visual inspections but is suspected because of musty odors or continued health complaints, consider other methods (e.g., infrared camera or borescope) to look for hidden problems.
8. Monitor repaired areas to ensure repairs and remedial actions are effective.
9. Keep a record of when and where mold or water-damaged materials are discovered and what has been done to promptly fix the underlying problem leading to the water damage.
10. Evaluate the content or enforcement of current rules or policies surrounding personal workspaces that could be contributing to indoor environmental quality concerns, including:
11. Acceptable locations for employee food preparation, storage, and consumption, including personal refrigerators and microwaves.
12. Employee fish tanks.
13. Fragrances in the workplace.
14. Establish an individualized management plan to relocate employees (such as at home or a remote site) who are still suffering from health implications even after response actions have been taken.
15. Encourage employees to report new, persistent, or worsening symptoms, particularly those with a work-related pattern, to their healthcare providers and, as instructed by their employer, to a designated individual at their workplace.

PREVENTION

How can one prevent the ill effects of IAQ?

For now, most people are at the mercy of airborne chemicals and toxic fumes interacting in ways that are difficult for the average person to understand or control—which means Americans will have to follow Benjamin Franklin’s suggestion to open the window, if possible, just to be safe.

A preventative maintenance program includes:

- Ensure good quality and regular inspections of all critical components of the ventilation system.
- Regular inspections of all critical components of the ventilation system; regular inspections for conditions such as water leaks or stagnant water

pools that would promote the growth of micro-organisms;
- Correction of any deficiencies found; repair or replacement of malfunctioning components, such as filters and belts, and cleaning of air distribution systems, ducts and dampers;
- Adequate treatment of open-water systems associated with ventilation systems, such as cooling towers and humidifiers;
- And maintenance of furnaces, space heaters and water heaters to ensure proper burning and exhausting of waste gases.

The bottom line of appropriate prevention is to maintain a clean workplace.

Conclusion

Indoor air quality should be one of the most important concerns in your workplace as it directly affects the overall health and wellbeing of your staff and employees. Poor IAQ can increase the risk of many health problems, from respiratory illnesses to infections. It can even compromise your mental health.