



Lightaware is a charity based in Scotland  
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Professor Dame Sally C Davies FRS FMedSci  
Chief Medical Officer  
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By email: sally.davies@dh.gsi.gov.uk

Dear Professor Dame Sally Davies

My name is John Lincoln and I am a trustee of the charity LightAware, a Scottish charity with a global reach (see [www.lightaware.org](http://www.lightaware.org)). Our charity is dedicated to raising awareness of the effects of artificial lighting on human health and wellbeing.

I read, with great interest your March 2018 report '*Chief Medical Officer annual report 2017: health impacts of all pollution – what do we know?*', particularly the section of on light pollution. We are pleased to see that the health effects of lighting are beginning to be acknowledged by public health professionals and by the UK government. Although we greatly welcome the report, there are one or two areas where we would have welcomed the inclusion of additional information, and these are included in our response below.

Our lighting environment has changed fast in recent years, with the EU ban on incandescent lighting, and the move to modern fluorescent and LED as the dominant forms of lighting. LightAware has been contacted by people from different parts of Europe, and from across the world who are made ill by LED and fluorescent lighting. New lighting technologies can exacerbate conditions including lupus, autism, XP, seborrheic eczema, migraine and others, as well as affecting people who have no previous condition. Symptoms include debilitating and lasting headache, migraine, eye pain, skin burning, skin rash, nausea and vomiting, trouble thinking clearly, dizziness, anxiety, distress and depression.

This change is having a devastating effect on the lives of people who are unable to tolerate the new lighting technologies. A programme of progressively banning more types of lighting has followed, culminating in the ban in 2020 of much fluorescent lighting. This means that, after 2020, LED will be the prominent, and possibly the only form of lighting available both in domestic and commercial settings. This can only worsen the long-term outlook for people unable to tolerate this lighting.

Light sensitivity has become a serious social exclusion issue. Put simply, the current lighting environment functionally disables those unable to tolerate it. The ubiquity of this lighting leaves sufferers unable to access most locations. As well as education, recreation and health facilities, this includes transport and workplaces. Increasingly, for sufferers, access to the outdoor realm is also limited by LED outdoor lighting such as street lighting, shop signs and displays, and car headlights.

This exclusion could be avoided through greater awareness, action to facilitate peoples' access needs, and the protection of the law. There are already examples of good practice, and with proper support and information, so much more could be achieved.

In addition, the response of the medical profession to people with light sensitivity has been inconsistent, while some GPs and neurologists have been very supportive and helpful, others seem to be completely unaware of the issues.

In addition, with the phasing out of alternative forms of lighting, we feel that a greater research effort is required to investigate the long-term health impacts of this emerging technology. We know that LED lighting produces physiological effects and it would seem unwise to make this the only form of lighting available without knowing its long-term health impacts.

LightAware would like to meet with you to discuss practical ways to help people who are sensitive to lighting. We would very much welcome the opportunity to begin a dialogue with you to look at this serious but often overlooked situation.

Yours sincerely

**John Lincoln**

Dr John Lincoln

Trustee, LightAware

## LightAware's response to the 2018 PHE Report (Section on lighting Pollution)

### **2nd paragraph** (-- *"Fluorescent lamps provided one health concern" --*)

As well as UV potential health concerns with fluorescent lighting, there is also the issue of flicker. The adverse impact of this on people with light sensitivity is also well known, e.g. photosensitive epilepsy and photosensitive migraines. Modern fluorescent lamps are designed with a high flicker frequency which is meant to eliminate the adverse symptoms, but some people are also sensitive to high frequency flicker. Another issue with fluorescent lamps is their spectral composition which triggers symptoms in some people, e.g. photosensitive migraines due to an elevated sensitivity to both red and blue light.

### **3rd Paragraph** (-- *"Ideally, light should be controlled so that it only illuminates the areas where it is required" --*)

The light from LED lamps is often too focused on a relatively small area causing problems with glare, high contrasts and localised high light intensity.

### **3rd Paragraph** (-- *"LEDs, coupled with well-designed optical systems, provide an opportunity to control light distribution, specifically to ensure that light goes onto the surface to be illuminated and not, for example, into the sky" --*)

LED street lighting can provide illumination that is direct and intense, causing glare and discomfort. Highly focused light can trigger severe symptoms in light sensitive people and exacerbate existing sensitivities to blue light, irregular spectral content, intensity and flicker. The practice of using optical systems to limit dispersion and focus the light from LEDs, can also cause problems for light sensitive people. For example, the "zebra effect" of alternating patches of intense light and darkness can trigger flicker-type symptoms on roads lit by LED lamps.

### **Paragraph 5** (-- *"Therefore, it is likely that bright light, of almost any wavelength, could have an impact" --*)

Experience and research would suggest that blue-rich light disturbs circadian rhythms the most.

### **Paragraph 6** (-- *"An extreme example is daylight-running lights on cars. These are clearly visible to other road users and pedestrians. At night, if they do not dim, they can be very dazzling and more so for young children (who have higher transmission of light through to the retina) and older people (who will suffer from scattering of the light, particularly in the lens of the eye" --*)

Even during the daytime, LED Daytime Running Lights (DRLs) on cars are often too intense, harsh and dazzling. Their colour temperature is often too high which exacerbates discomfort. Even if dimmed at night, LED DRLs could still prove to be a problem for motorists and pedestrians. In rural areas this can cause an uncomfortably intense contrast against the surrounding light and can cause distraction and safety problems for motorists and pedestrians.

### **Paragraph 7** (-- *"Some streetlight luminaires have LED sources that can be seen physically projecting below the luminaire, becoming a glare source or light pollution" --*)

The problem with glare and discomfort from LED street lighting, is not only posed by lamps with protruding LEDs, but also from those where LEDs are flush with the lamp head. As a person approaches, even LEDs that are flush against the lamp head can be dazzling as they enter a person's peripheral vision (which is more sensitive to visual stimuli).

**Paragraph 7** (*-- "The light spectrum may be enriched in the blue, which may be beneficial for keeping drivers alert, but many people will find the light uncomfortable. High levels of blue light are known to cause damage to the retina in the eye." --*)

Blue light is not only a problem for eyes but is also known to be a migraine trigger for many who suffer from photosensitive migraines. This is also backed up by research supported by Migraine Action. Other medical conditions which are aggravated by blue light sources, include lupus and insomnia.

**Paragraph 7** (*-- "This only tends to be a problem for blue LEDs and not for white-light LED sources containing a blue LED and a yellow phosphor" --*)

We have found that some people also experience discomfort, eye pain, headaches, migraines and a range of other ill health symptoms triggered by white LEDs.

**Paragraph 7** (*-- "It is possible to have LED street lighting that directs the light only to the areas that need to be illuminated, minimising the light that goes in the sky" --*)

Despite using optical systems to shine light directly down onto the street surface with minimal dispersion, sky glow can increase with the use of LED street lights because light from high CCT LED street lights scatters and reflects more than that from sodium lamps.

**Paragraph 7** (*-- "...where warmer colours are likely to be more appropriate for populated areas." --*)

Warmer coloured street lights are not just more appropriate for populated areas, but also for more rural areas to reduce ecological impact. We believe that high CCT LED lighting is not appropriate for street lighting.

**Paragraph 8** (*-- "Aside from the wavelength and brightness, there may be another impact of LED lighting. Some of the LED sources assessed by Public Health England and others vary in illuminance at a frequency of 100 hertz. At the extreme, the LEDs switch on and off 100 times per second. This is of concern for several reasons. Some people seem to be very sensitive to this light modulation, resulting in headaches, migraine and less specific feelings of malaise." --*)

We support the conclusions in this paragraph - one of the biggest problems with LEDs is that their flicker is often substantially worse than competing artificial lighting technologies. They are "instant off, instant on" and a lack of "residual glow" during the very brief "off periods" means that they are on and off between 0 and full intensity many times a second. This causes a whole range of adverse symptoms in people from eye pain and eye fatigue to headaches, migraines and even seizures.

Although it is feasible to produce LED lamps with no flicker at all, such lamps are (currently) less efficient and more expensive. It would be helpful if the UK Government could take steps to encourage manufacturers to eliminate flicker from LED lighting.