Assessment for the seasonality of Covid-19 should focus on ultraviolet radiation and not 'warmer days'

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Much attention has been paid on news reports, publications, preprints and white papers to contain the Covid-19 pandemic in 2020, caused by SARS-CoV-2 [1]. The rather misplaced claim that this is a new, highly infectious and extremely contagious virus in the human-to-human transmission chain is reflected by the name of the pandemic, not reminiscent of SARS [2]. The naming of the disease has obfuscated its similarity and kinship to SARS for the public, with an initial lukewarm response as the disease started spreading globally. Arguably, if Covid-19 had been named SARS-2, the responses may have been stronger and more efficient [3]. This is all history. Now, there is an acute need for swift, simple measures that can limit global contagion [4].

There have been multiple reports and, admittedly, a hope that Covid-19 might exhibit a seasonal pattern related to the common flu, that will slow down the spread of the epidemic [5]. In fact, the initial confusion of flu-like symptoms might have contributed to this propitious hypothesis [6]. A host of studies have examined seasonal fluctuations and regional climatic parameters that include temperature, humidity [7, 8], wind force/direction (as a proxy for airborne spread) [9] and other factors [10]. Yet, no strong correlations with temperature have been found [11]. Press releases that follow these studies state that seasonality can be a significant factor with summer days approaching. However, at the time of writing and the appearance of these reports, Northern and Southern hemispheres are at the Spring Equinox, therefore confounding any real-time analysis and derivation of solid conclusions that connect the epidemic with seasonal fluctuations, to a significant effect [12].

Sunlight, as the proxy and key element of seasonality, emits at infrared (IR), visible and ultraviolet (UV) wavelengths: while IR is responsible for heat transmission with low-energy electromagnetic (EM) waves, UV is responsible for 'tanning' at high-energy EM waves – even at low temperatures, e.g. both at high altitude and high latitudes. Therefore, seasonality of transmissibility should take into account UV emission (typically UV-A or -B for sunlight), hinting at the deployment of artificial UV-C rays (UV-C is absorbed by the atmosphere and the ozone layer). In addition, it should be noted that extensive UV exposure can occur even in overcast skies, as this EM wavelength can penetrate water-droplet clouds. In all, there should be more focus on the effects of UV radiation in connection to seasonality, as a critical parameter that might slow virus transmission in open spaces under natural light and solar UV (-A/-B) exposure as the days get longer, as well as in built environments with artificial sources of UV (-C) light that can be installed to eliminate the spread of infectious viral particles in public spaces. Examples from China include the use of UV to eradicate SARS-CoV-2 from banknotes, buses and hospitals. Indeed, studies on SARS-CoV report inactivation using 254nm UV light, heat or chemicals [13].

It is well-known, of course, that high-energy UV light (i.e. UV-C) affects nucleic acids (DNA, RNA) in a detrimental fashion for organisms, including viruses and bacteria – with ssRNA viruses being more sensitive than other viral types [14]. Germicidal UV is standard practice deployed in cell culture rooms, sterilization protocols in the food industry, and elsewhere [15, 16]. Studies with the H1N1 influenza virus report inactivation with low doses of 222nm UV light [17]. It is not known how resilient SARS-CoV-2 can be under strong, short-wave UV, yet application of technologies such as appropriate LED or UV-arrays, no matter how expensive, can find targeted use in crowded spots, such as mass transport systems – today, or tomorrow.

Regarding seasonality, our guide should be coronavirus epidemiology in general [18] and the SARS and MERS outbreaks and their containment in particular – and not the flu. In the case of SARS and MERS, these epidemics did not spread widely due to containment and mitigation strategies (including limited quarantine, not comparable to the scale we are experiencing today globally) [18]. Seasonal fluctuation was limited in latitudes as low as 20 degrees (in Saudi Arabia, and high temperatures – although most of the infections happened within hospitals), and more variable at 40 degrees (e.g. in South Korea). We need to know how SARS-CoV-2 responds to multiple weapons at our disposal and what its viability is on surfaces [19], by assessing stability under UV light.

Perhaps seasonal fluctuation will be an important factor that can limit the disease and the reason may not be high temperatures, as the press keeps on reporting, but potentially sustained UV daylight, as shown in similar comparative studies [20]. One slight element of evidence is that, until the Spring Equinox 2020, Covid-19 was imported into the Southern Hemisphere but did not achieve epidemic status rapidly, until very recently. It is difficult to compare epidemic spread, with 90% of the human population residing in the Northern Hemisphere – but as days are getting longer at Northern latitudes, there is a glimmer of hope there, for a decccelerating pace of transmission in the open. Artificial means to irradiate public spaces might be an option.

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