

THEME 01

Health concerns surrounding 5G

5G

PUBLIC HEALTH

TECHNOLOGICAL
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Fifth generation mobile communication technology will enter our lives in the coming years. While the telecom industry and tech companies praise its seemingly endless potential to deliver all sorts of high-quality digital services anywhere and anytime, a small army of critics warns us of the grave dangers associated with electromagnetic fields in general and 5G in particular. There may be some merit to their claims, but the debate is overshadowed by overly alarmist messages and outright conspiracy theories.

Our observations

- 5G technology will operate in multiple [frequency bands](#). In part, these overlap with current cellular technologies, but they will also include millimeter wave parts of the radio-frequency spectrum (which are currently used for radar applications and security scanners). In [Europe](#), 700 megahertz (42.9 cm waves), 3.5 gigahertz (8.5 cm) and 26 gigahertz (1.15 cm) will be used.
- Most concerns voiced in relation to 5G also apply to previous generations of network technology. Additional concerns relate to the use of higher frequencies, the higher number of base stations necessary (high frequency signals don't travel well) and the fact that 5G "beams" can be targeted at a specific device (as many as 64 per base antenna).
- According to an Accenture [report](#) covering the potential market of IOT data, by 2030, total revenue could reach \$4.4 billion with a total market value of \$3.6 trillion. In that case, more than 1 million organizations would be involved in trading a total amount of 12 exabytes of data.
- Proponents of 5G counter that the multitude of base stations will allow for the use of "weaker" signals that will have less impact (if any) and that the targeting of individual devices will significantly decrease overall exposure to radio frequencies.
- Internationally, [exposure limits](#) for electromagnetic fields (EMFs) vary between nations and even across the EU. Some of these countries (e.g. Italy, Switzerland) have stricter limits as a precautionary measure (i.e. as low as technically and economically feasible). [Russia](#) has even stricter limits and uses a different, USSR-era approach (i.e. accumulated "dose" instead of maximum exposure). Moreover, Russian medical literature appears to take health concerns over EMF more seriously than Western scientists do. The arrival of 5G has not affected global exposure limits (e.g. the [FCC](#) sees no reason to change them).
- Despite increasing use of mobile (data) communication networks, actual environmental levels of exposure have [remained](#) stable since 2012. This is due to more efficient technologies (i.e. doing the same with less powerful signals) and better control over power levels used.
- A 2017 survey of 2,450 residents of six European countries showed that [40 percent](#) of the respondents had "some concerns" about EMF, while 12 percent was "enduringly concerned" (frequently thinking and talking about EMF exposure).
- An unknown number of people claim to suffer from so-called electromagnetic hypersensitivity (EHS) and experience a range of non-specific symptoms when exposed to EMF (e.g. skin problems, fatigue, dizziness, nausea, heart palpitations). While the [WHO](#) concludes that these symptoms are real, it also concludes that there is no evidence of any relation to EMF. In controlled studies, subjects were not able to tell whether they were being exposed to EMF or not.
- *The New York Times*, in a recent article, pointed out how [RT America](#) spreads alarmist messages about the health risks of 5G. Supposedly it does so because Russia is behind in 5G tech development.



Connecting the dots

Fears surrounding EMFs are nothing new, but in the early days of cellphones and mobile data (i.e. UMTS) there was far less talk about negative effects, simply because most of us could not imagine the technology to be of any use anyway and there was little reason to be worried. Today, we are more easily convinced of the practical benefits of 5G, and its (utopian) promise of progress is accompanied by an equal amount of (dystopian) fear. The same happened with “revolutionary” technologies of the past, including steam engines, electricity, nuclear energy, biotechnology and nanotech; promise and fear have always been two sides of the same coin.

In the past, such concerns mostly related to possible futures in which technology developed well beyond our control (cf. Frankenstein’s monster). With EMFs, the situation is quite different, as we already live in a world full of cellular antennas and other emitters of radio frequencies. After two decades of cellular telephones, official accounts, e.g. from the FCC, WHO or Dutch RIVM, are quite clear: existing wireless communication technology doesn’t have any detrimental health effects, nor will 5G. Yet, similar to the debate on climate change, there is a small, but vocal group of skeptics who challenge these conclusions. This rather heterogeneous group consists of self-proclaimed victims of EMFs (with real, yet unexplained, symptoms), scientists and genuine conspiracy theorists. Their skepticism of official accounts is based on the symptoms of these victims and their general assumption that these are caused by EMFs. Studies which set out to test whether these symptoms can actually be attributed to EMFs have found no evidence, but skeptics refuse to accept these findings. Moreover, they argue that the focus of research, and regulation, has mainly been on the

thermal effects of EMFs (e.g. tissue heating up as a result of radio signals, similar to the working of a microwave oven). These effects are limited and will only be harmful in extreme cases. These skeptics, however, argue that several non-thermal biological effects are much more of a problem. These would be the result of EMFs interfering with biochemical processes inside our cells (or cell membranes) and could, according to some scientists (“led” by [Martin Pall](#)), lead to a range of problems, from damage to DNA to infertility and different forms of cancer. Pall even goes as far as claiming that current EMF exposure levels are the root cause of dropping reproduction rates in developed economies and today’s mental health crisis (e.g. depression, insomnia, etc.).

While there may be some (scientific) merit to these scientists’ claims, they have so far failed to convince mainstream scientists and this is, in part, caused by their overly alarmist (non-scientific) tone. And, even more so, they are overshadowed by nonsensical claims that resemble nothing but genuine conspiracy theories. One being a story of [dead birds dropping from trees](#) (in The Hague), supposedly because of a secret 5G trial nearby. Despite public concerns and skeptic scientists, the rollout of 5G is unlikely to be held back by health concerns. Nevertheless, both current skeptics and organizations formally responsible for public health in relation to EMF will continue to do research and monitor the development of exposure levels and possible health effects. Growing skepticism, possibly fueled by some kind of incident, could hamper the development of 5G networks in the future, but even so, it would be unlikely for societies to deny themselves the benefits that 5G will bring.

Implications

- It will be difficult to prove that there are no health problems attributable to EMFs. It could take years for any problems to develop into recognizable symptoms and in a world filled with EMF emitters it is near impossible to find a control group that is not exposed.. In the past we have seen many cases of innovations that turned out to be harmful years after their introduction (e.g. lead-additives in petrol, asbestos, DDT, [DES](#)), but there is no way of telling whether the same could ever apply to EMFs.
- Precautionary considerations will not lead to a ban (unlike the EU ban on genetically modified crops), but will be an inclination towards highly efficient 5G technology that minimizes EMF exposure for users and the wider environment. This could become a significant factor in the competition between technology providers, especially under pressure of (local) governments.