Findings of the New Hampshire Commission on Wireless Radiation

December 10, 2024

Presented To:
The Charlemont, MA Board of Health

Kent Chamberlin, Ph.D.
Professor & Chair Emeritus
Fulbright Distinguished Chair
Dept. of Electrical & Computer Engr.
University of New Hampshire

International Commission on the Biological Effects of Electromagnetic Radiation

Environmental Health Trust

Your Presenter's Brief Bio

Dr. Chamberlin is the Past-Chair and Professor Emeritus in the Department of Electrical and Computer Engineering at the University of New Hampshire. In his more than forty years in academia, he has performed research for over twenty-five sponsors, including the National Science Foundation. He has received two Fulbright awards, including the prestigious Fulbright Distinguished Chair. He has also served as an Associate Editor for the Institute for Electrical & Electronics Engineers (IEEE), and he regularly performs reviews for them and other technical and scientific publications.

Dr. Chamberlin served on the New Hampshire State Commission that was convened through legislation to explore the impacts of wireless radiation. Since serving on the commission, he has been active in carrying out the recommendations of the commission by working with legislators and community groups around the world. Dr. Chamberlin is a founding member of the International Commission on the Biological Effects of Electromagnetic Fields, which is an international group of renown scientists with expertise in radiation and biological effects. He is President of the Environmental Health Trust. Last Summer he engaged in a speaking tour in Europe where he presented the findings of the New Hampshire Commission to groups that included the Royal Society of Medicine in London. It is notable that he is the Chair of a local School Board and is aware of the realities and responsibilities of managing a school.

Conflict-of-Interest Declaration

- I am not being compensated in any way for giving my presentation about the findings of the New Hampshire Commission
- I am speaking to you today citizen-to-citizen in an effort to promote the safer use of wireless radiation

Covered in this Presentation

- Answer the question about the harms of wireless radiation
  - The New Hampshire Commission on the Health and Environmental Impacts of Wireless Radiation
- How wireless radiation guidelines were set
- The role of government regulatory bodies in protecting us
- Security issues
- Q&A

NH Commission on the Health and Environmental Impacts of 5G and Wireless Technology

- The Commission was convened through bipartisan legislation that was passed by both houses of the legislature and signed by the Governor
- The 13 Commission members had backgrounds that included medicine, physics, toxicology, electromagnetics, epidemiology, biostatistics, occupational health, public health policy, business, and law

Some of the Questions Posed to the Commission

- Why does the insurance industry recognize wireless radiation as a risk, but will not insure for damages caused by it?
- Why have the many hundreds of peer-reviewed studies showing harm from wireless radiation been ignored by the FCC?
- Why are FCC guidelines based solely on thermal effects, when non-thermal effects have been well documented?
- Why did the World Health Organization classify wireless radiation as a possible carcinogen, and why is that fact being ignored by the FCC?

Sources of Information for the Findings of the Commission

- Peer-reviewed and Commission-vetted, publications
- Regulatory agencies (FCC, FDA, EPA).
  - They were invited to meet with the commission, but they did not, nor did they provide sufficient answers to our questions.
- Outside experts: all presenters except one provided clear evidence that wireless radiation poses a threat to human health and the environment
  - The presenter who did not acknowledge those risks was the presenter from the telecommunications industry; he was also the only person paid to present

Outcome of Peer-Reviewed Literature Review

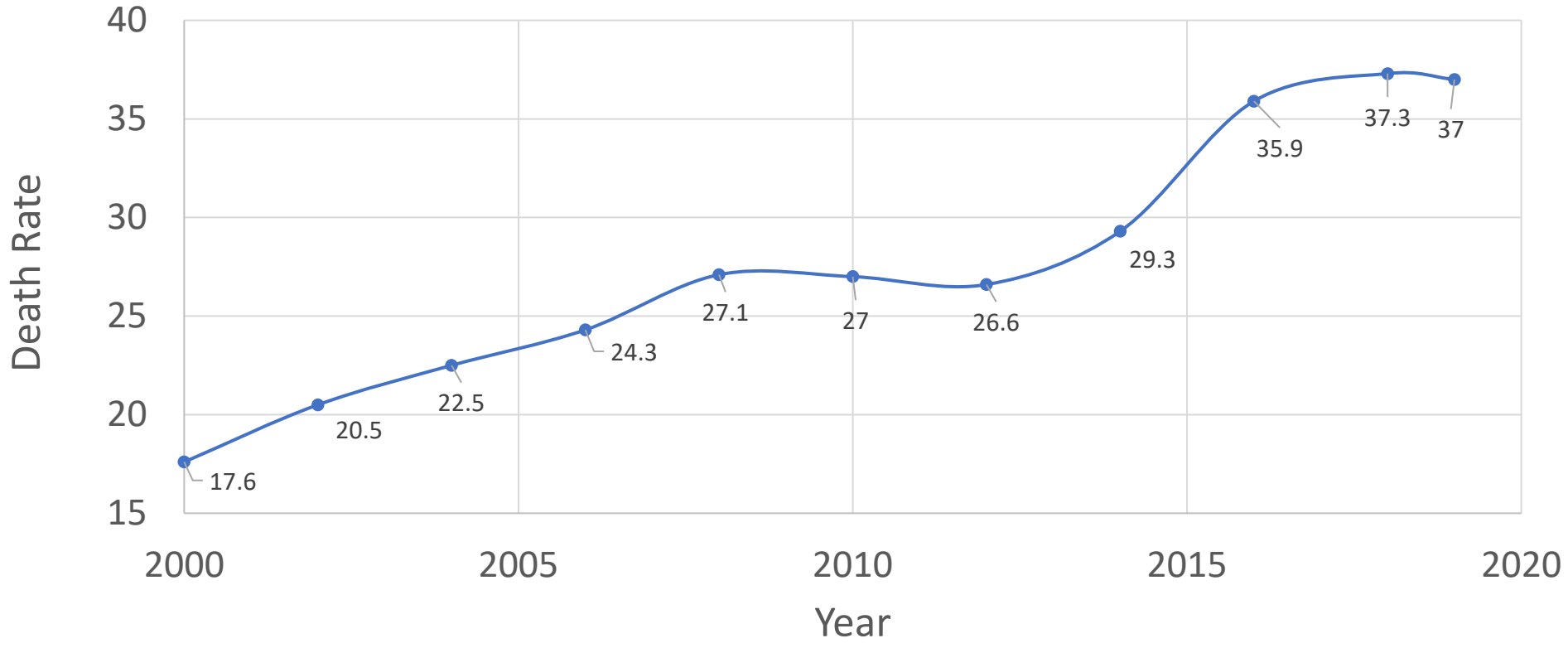
- We identified hundreds of top-tier publications that showed harm from low-level wireless radiation exposure.
- The vast majority of peer-reviewed publications showed effects from exposure (Henry Lai 2020).
  - 240 out of 261 (91%) of studies showed free radical (oxidative damage) effects resulting from low-level RFR exposure
  - The International Agency for Research on Cancer (IARC) has identified oxidative stress (which can lead to genotoxicity and carcinogenicity) as a common characteristic of several human carcinogens

Oxidative Effects, Primary Mechanism for Wireless Radiation Harm

As noted on the previous slide, the primary mechanisms by which exposure causes harm are oxidative changes, which can lead to an increase in free radicals. Those free radicals can lead to chronic inflammation and many of harmful outcomes including:

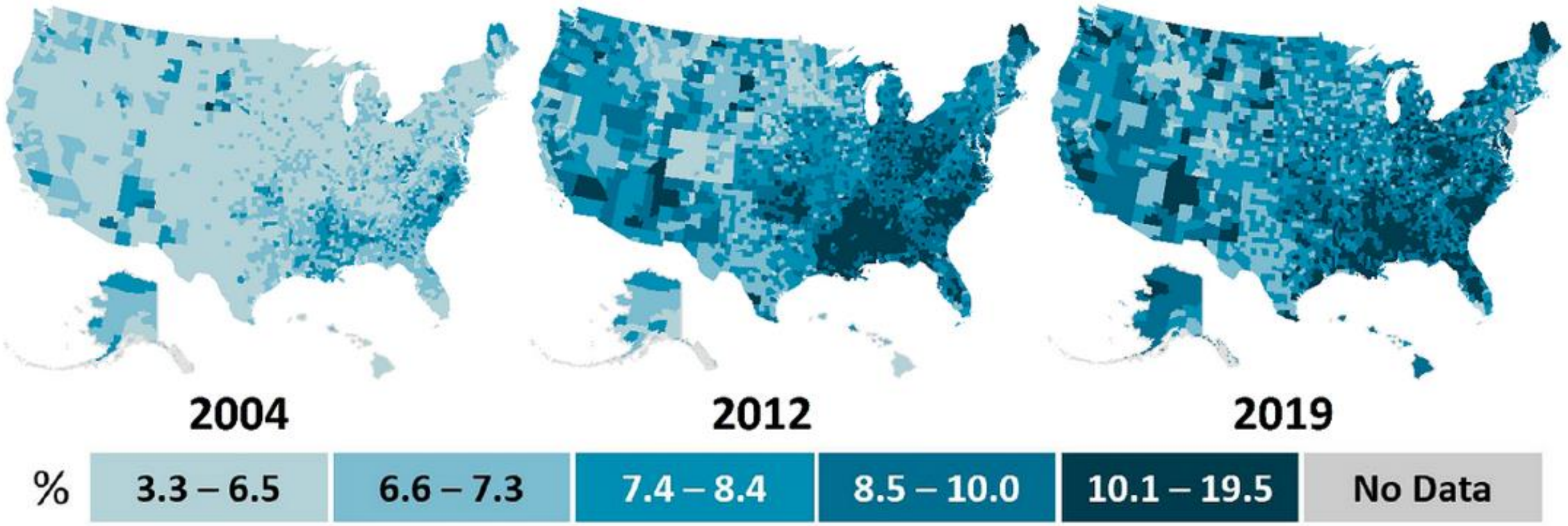
- **Reproduction (sperm damage and infertility)**
- **Neurodegenerative disease (Alzheimer's)**
- **Cancer**
- **Cardiovascular disease**
- **Diabetes**
- **Chromosome damage**
- **Neuronal DNA damage**
- **Neuropsychiatric effects**

U.S. Alzheimer's Death Rate (per 100,000 people)



https://www.alz.org/media/Documents/alzheimers-facts-and-figures.pdf

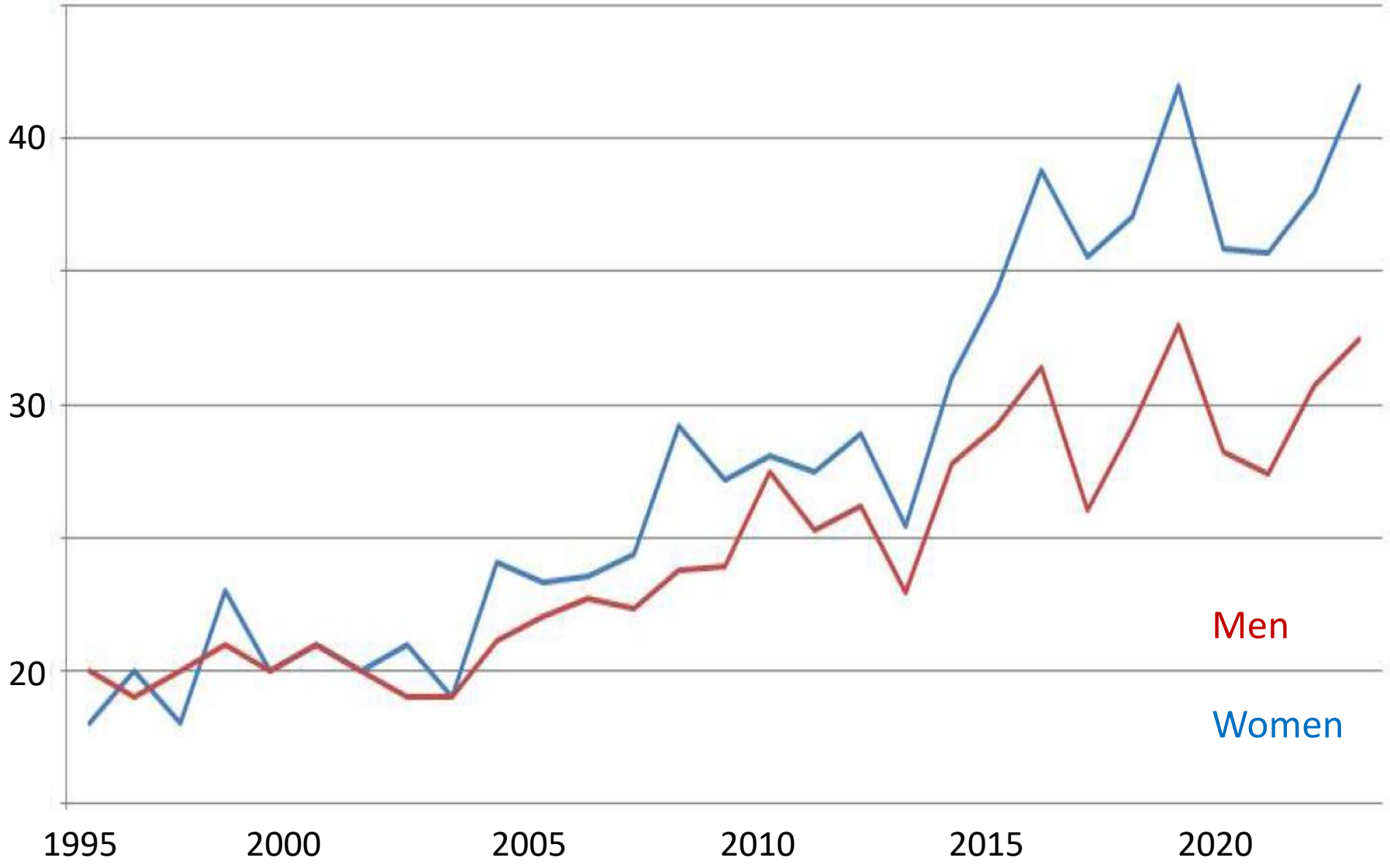
Age-adjusted prevalence of diagnosed diabetes among adults aged 20 years or older, United States, 2004, 2012, and 2019



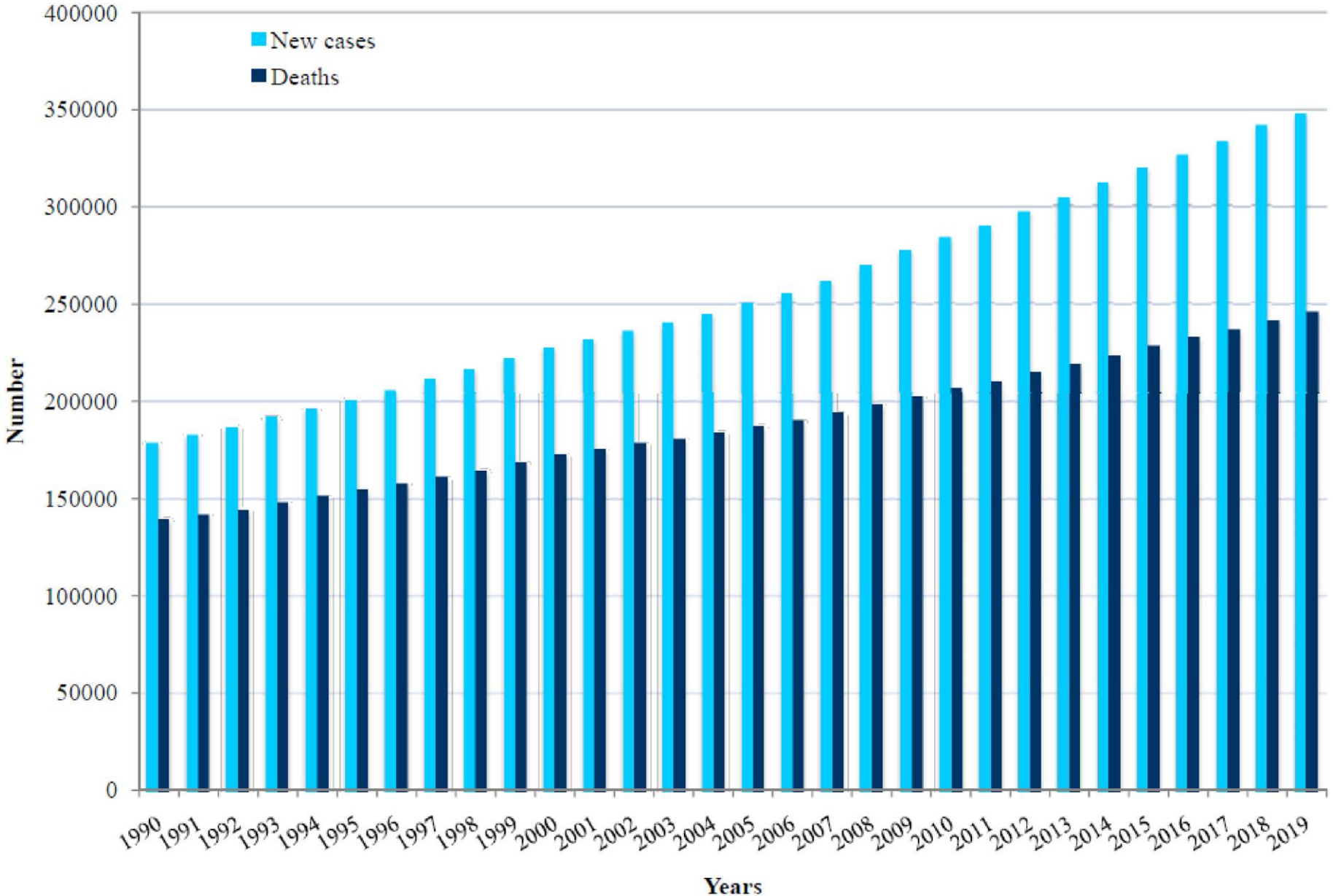
Data sources: US Diabetes Surveillance System; Behavioral Risk Factor Surveillance System.

https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html

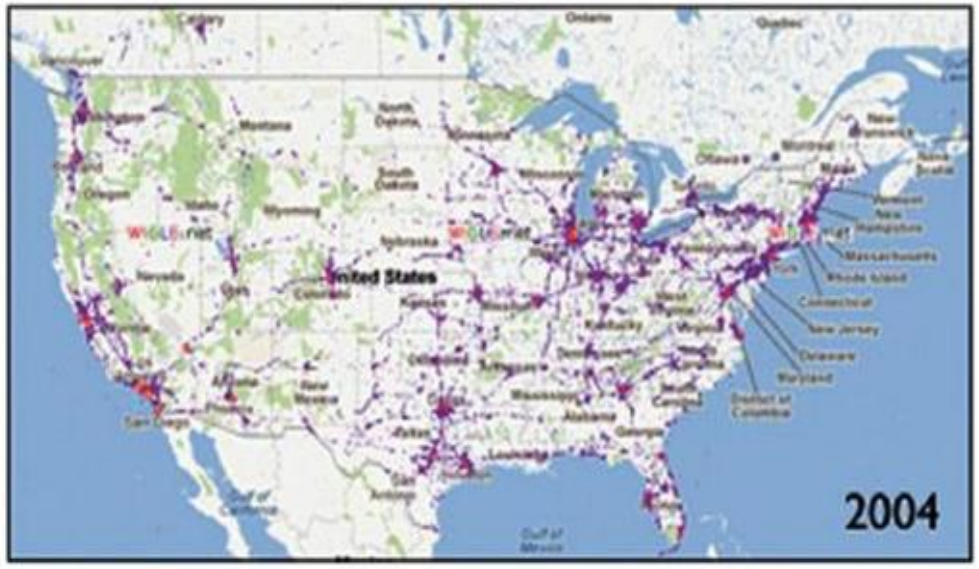
Danish Cancer Registry Report on New Central Nervous System and Brain Tumors per 100,000 People (reference)

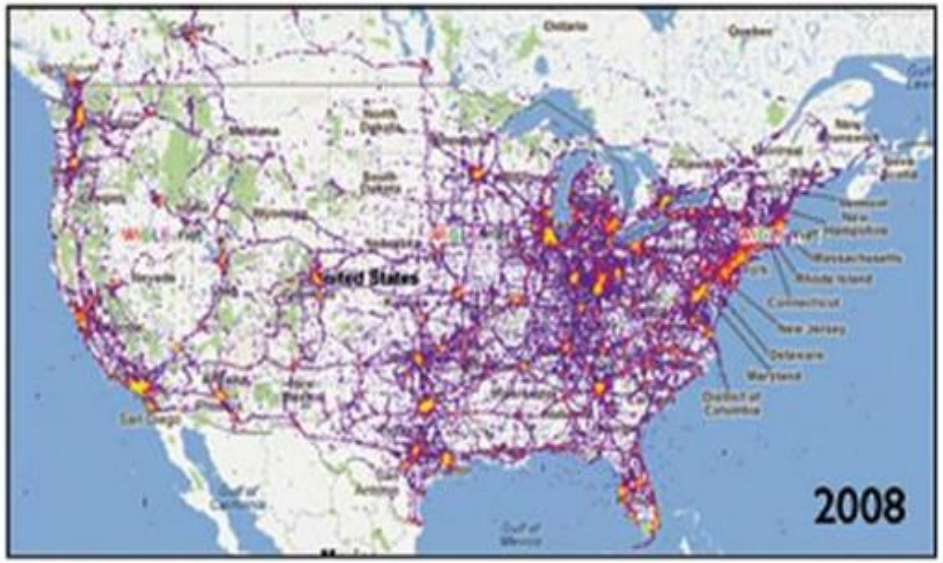


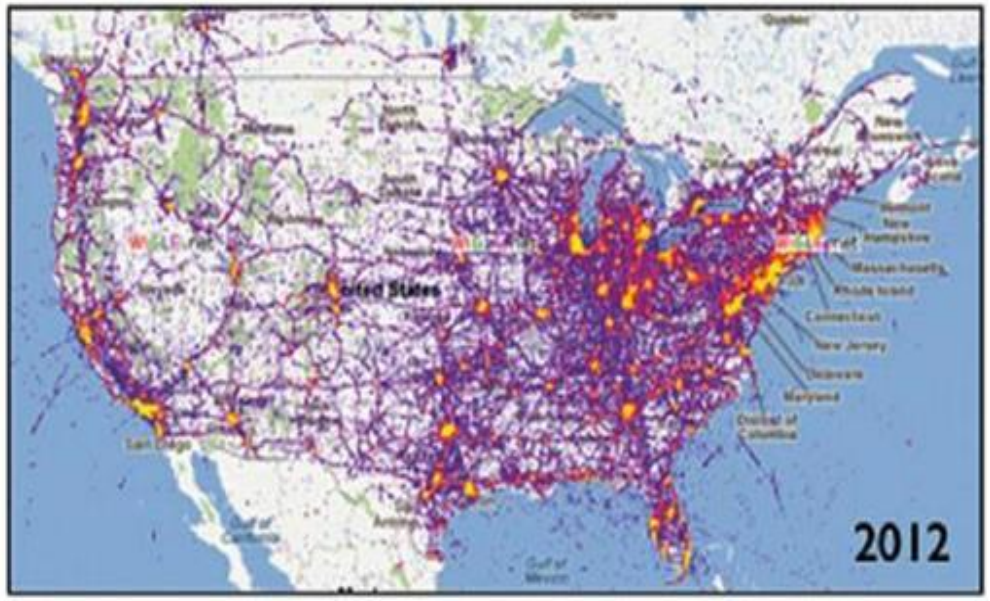
International patterns and trends in the brain cancer incidence and mortality (reference)

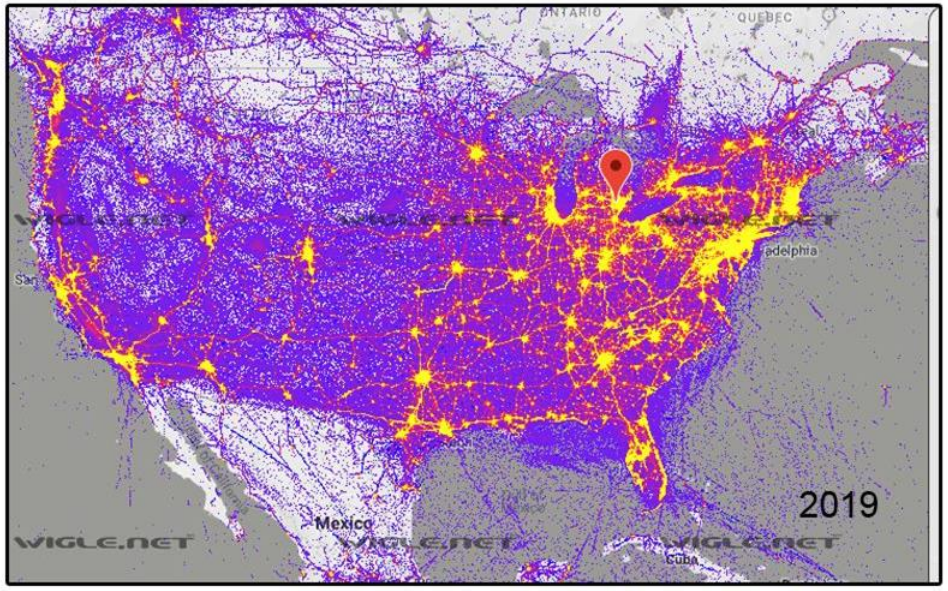


Network Density History in the United States (WiGLE.net)









What Is Known About the Placement of Cell Towers on Buildings?

What happened when cell towers were turned on?

Within a week of installation many firefighters developed unusual symptoms of headaches, fatigue, insomnia, memory loss, confusion, nausea and weakness. After a time, firefighters in stations with adjacent cell towers were found to have forgotten CPR or became lost responding to a fire in a city they grew up in.

Physicians for Safe Technology

Firefighters' Symptoms Consistent With Laboratory Findings

Article Title: Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system

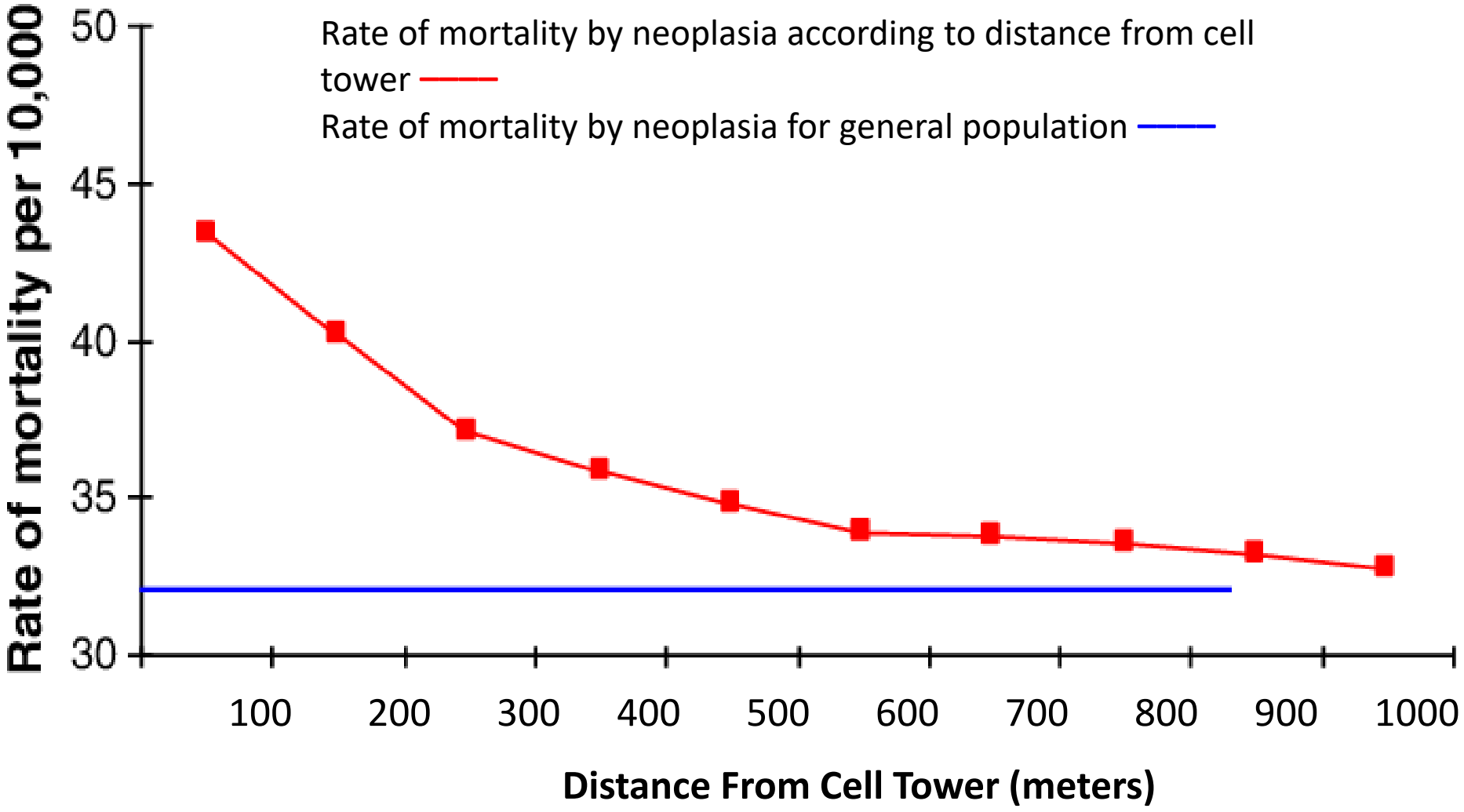
Quote from article: "Provocation studies presented in this article demonstrate that the response to electrosmog is physiologic and not psychosomatic. Those who experience prolonged and severe EHS may develop psychologic problems as a consequence of their inability to work, their limited ability to travel in our highly technologic environment, and the social stigma that their symptoms are imagined rather than real."

Havas, Magda, *Reviews on Environmental Health*, vol. 28, no. 2-3, 2013, pp. 75-84. https://doi.org/10.1515/reveh-2013-0004

Death Rates from Cancer versus Distance People Live from Cell Tower Transmitter

- Peer-reviewed article: Mortality by neoplasia [cancer] and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais State, Brazil
  - Explored the relationship between cancer mortality rates and the distance people lived from a cell tower
  - Study investigated a large number of cancer deaths (7,191) and a large number of cell towers (856)
  - Performed during a time when few people had personal electronic devices (1996-2006)
    - Results of study revealed the effects of living near a cell tower
    - The maximum exposure level measured during the study was 407.8 mW/m^2 which is less than 5% of the ICNIRP/FCC guidelines

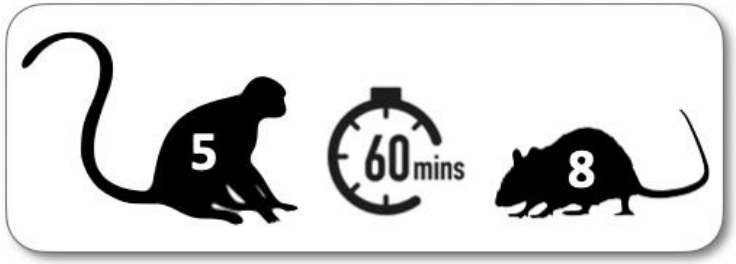
Key Finding from the Article Referenced on Previous Slide

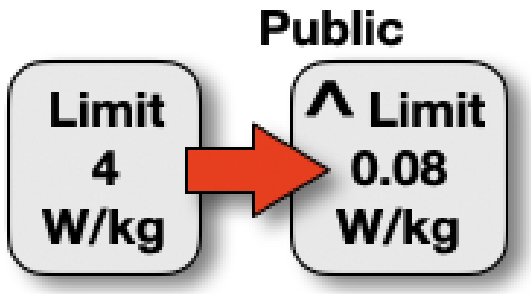


Epidemiology for People Living Near Cell Towers

- Meta study of **38** previous studies: Evidence for a health risk by RF on humans living around mobile phone base stations: from radiofrequency sickness to cancer
  - 73.6% of studies showed effects of radiofrequency sickness
  - 76.9% of studies showed increased cancer rates
  - 75% of studies showed changes in biochemical parameters
  - Studies also showed negative impacts on animals and trees.
  - A distance of 500 meters from a cell tower appears to be a “reasonable” cutoff distance for adverse health effects.

How the Current FCC Wireless Radiation Exposure Guidelines Were Set





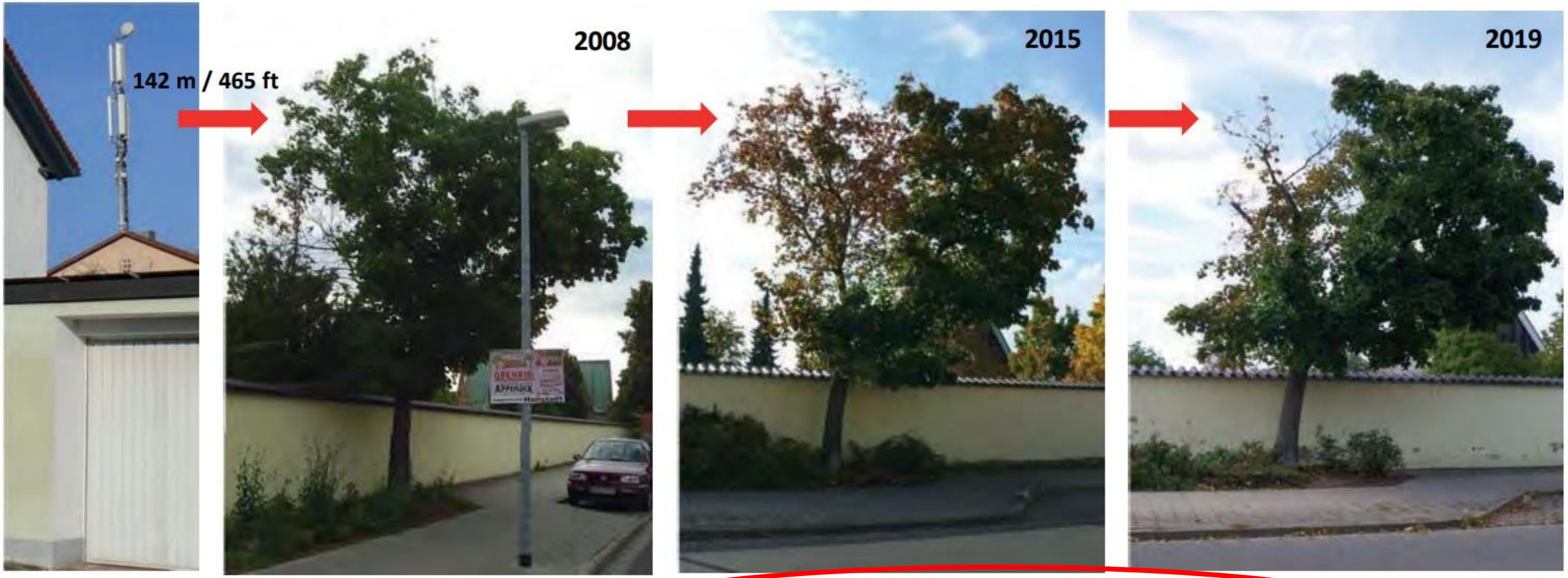
- Current limits were set in the 1980s and were based on short-term (around an hour) behavioral studies on 8 rats and 5 monkeys
- The assumption made in setting these limits is that, if wireless radiation is not strong enough to warm tissues, it will not cause harm
- The animals were exposed to increasing levels of radiation until they could no longer perform their task. That level was then designated as the threshold dose
- An arbitrary "safety factor" of 50 was then applied to that number to come up with a radiation threshold for the general public (that "safety factor" is 10 for workers)

Recap of How FCC Guidelines Were Set

The FCC radiation guidelines currently being used today for **lifetime** exposures are based on:

- Studies lasting an hour or less
- A single endpoint attributed to heating effect
- A small sampling of animals (8 rats and 5 monkeys)
- An arbitrary “safety factor”

Example of Long-Term, Very-Low Exposure



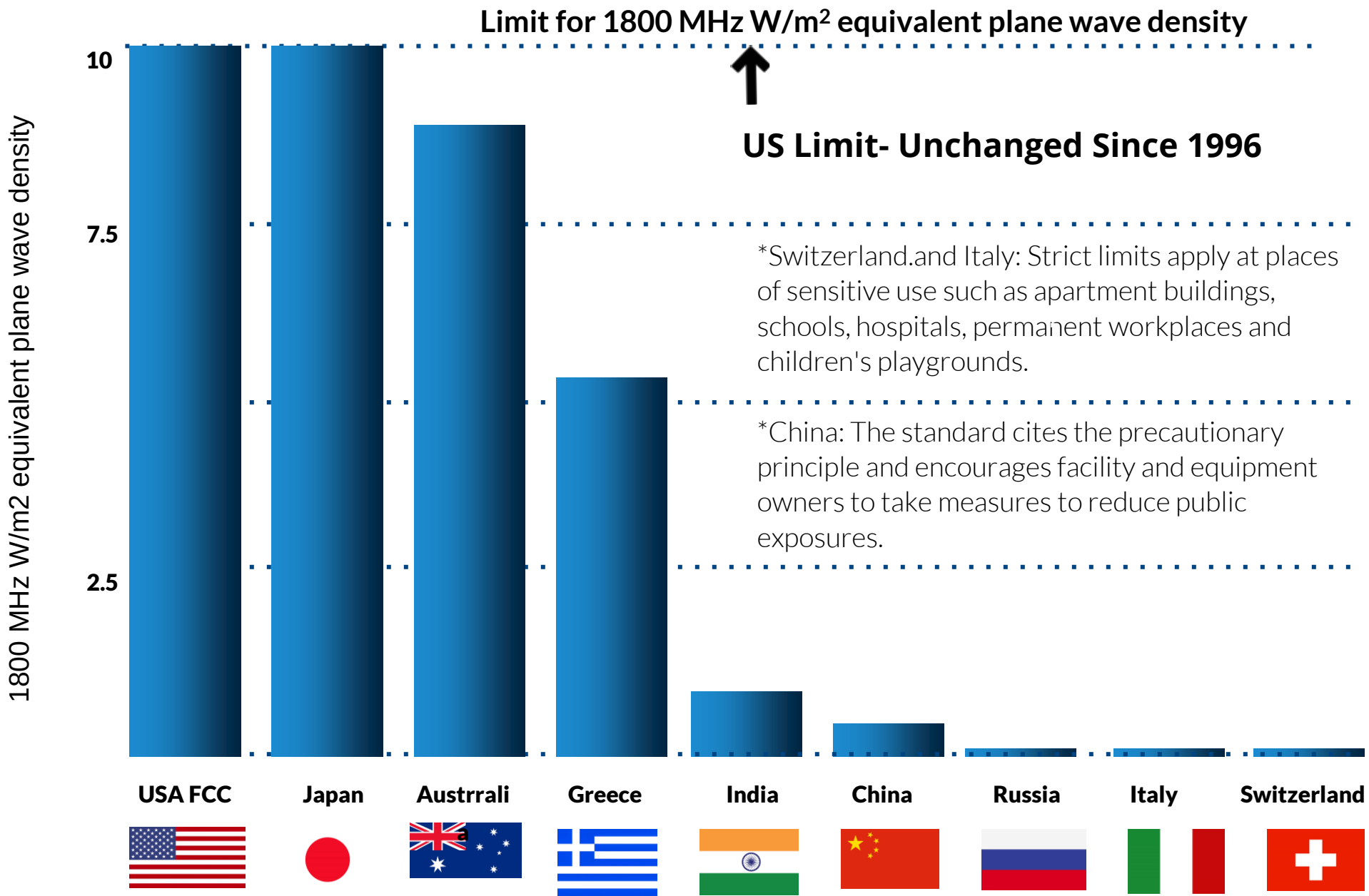
Left side of tree: 3380 µW/m² (0.03% of FCC limit)
Right side of tree: 500 µW/m² (0.005% of FCC limit)

No. 14 from Group 1 (Table 4), Norway Maple Tree (Acer platanoides), Hallstadt, Königshofstraße/Friedhof (2008–2019)

Human Exposure Exposure Limits For RF From Cell Towers and Wireless Networks

Environmental Limit as Applied to Homes and Schools

ehtrust.org



Signal Level Needed for Robust Cellphone Communication (voice & video)

St. Catherine of Siena Elementary School Parking Lot

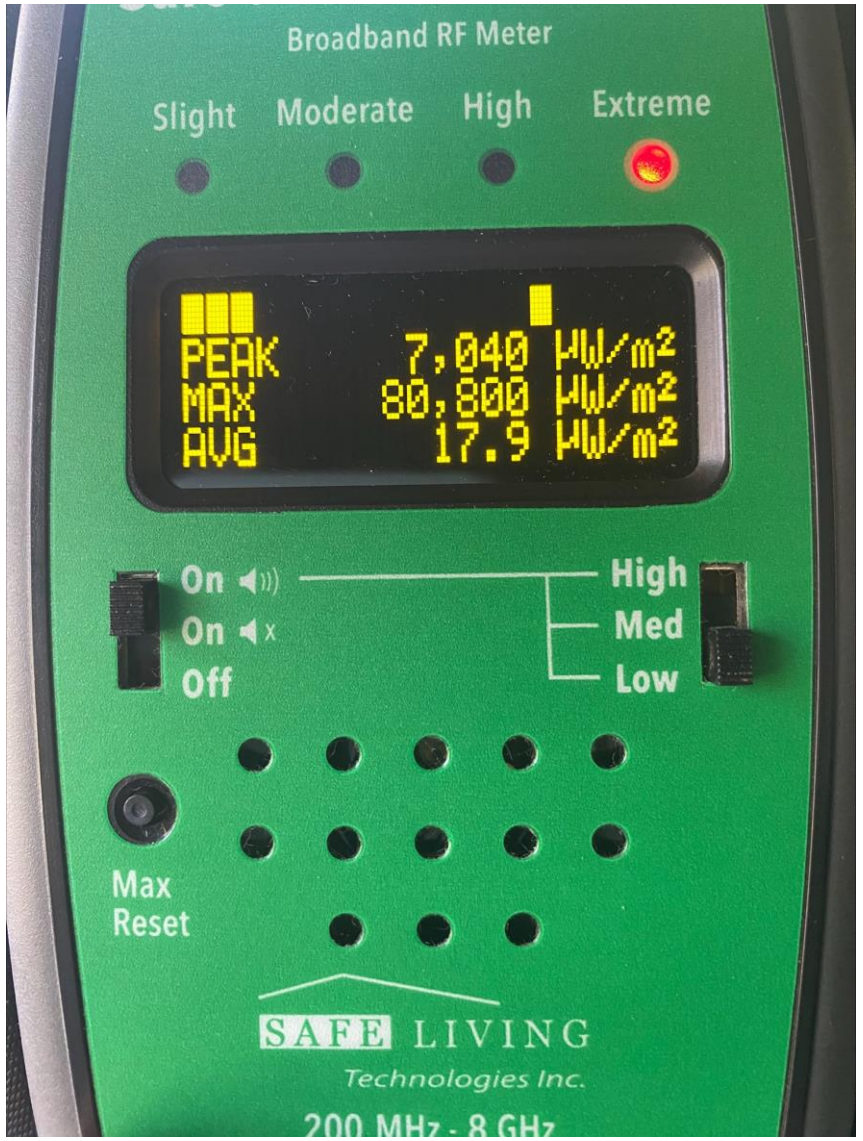
- **Great Signal (4 to 5 bars)**

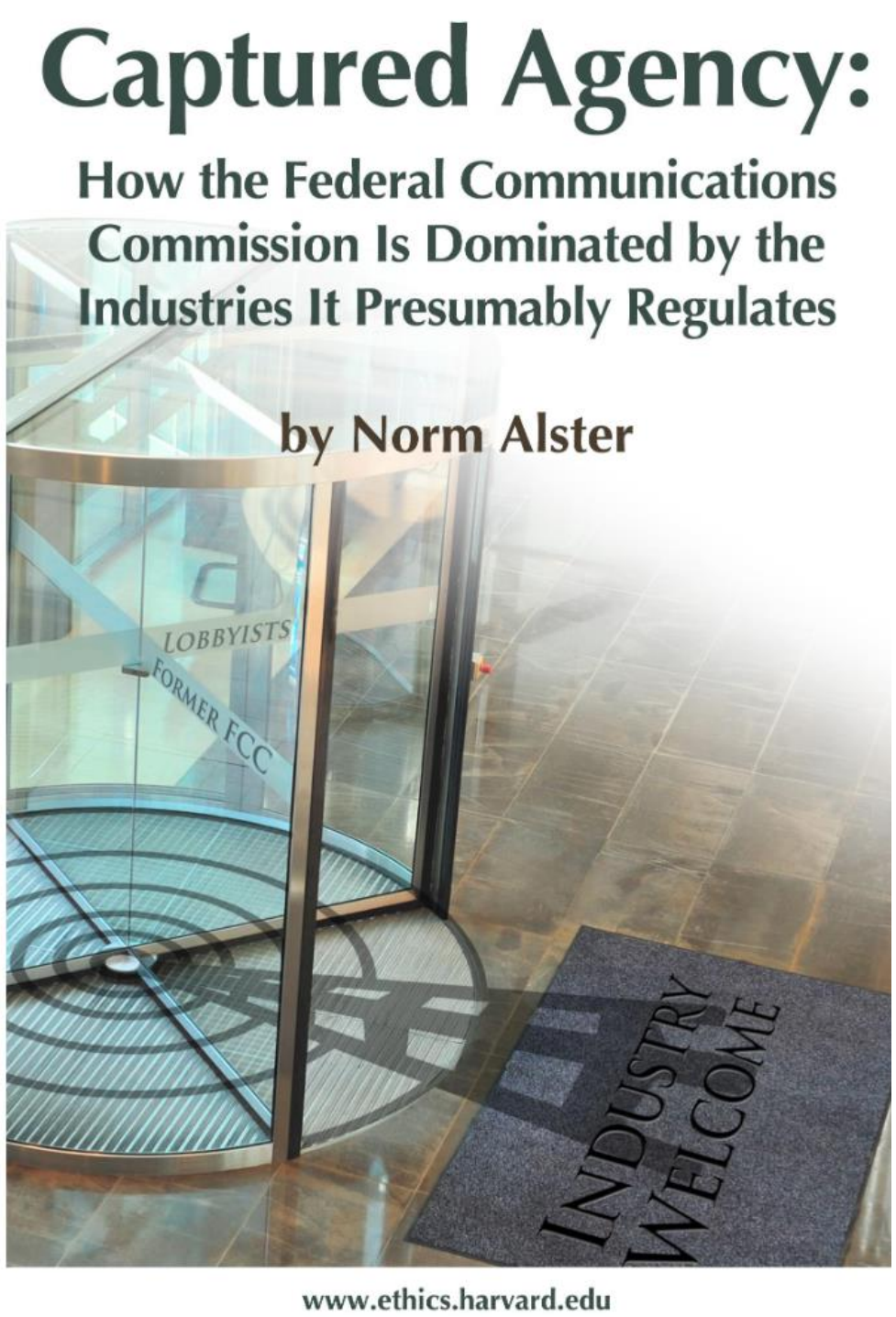
-50 to -79 dBm or 6.16 to 0.0078 µW/m^2 or one-millionth of FCC limit

- **Good Signal (3 to 4 bars)**

-80 to -89 dBm or 6.16 to 0.775 nW/m^2 or one-billionth of FCC limit

Note: my iPhone SE downloads videos with 2 bars





What Role Do Regulatory Agencies Play?

"Industry controls the FCC through a soup-to-nuts stranglehold that extends from its well-placed campaign spending in Congress through its control of the FCC's Congressional oversight committees to its persistent agency lobbying."

https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency_alster.pdf

Harvard Report Shows Wireless Industry Using a Playbook Similar to the One Used by Big Tobacco

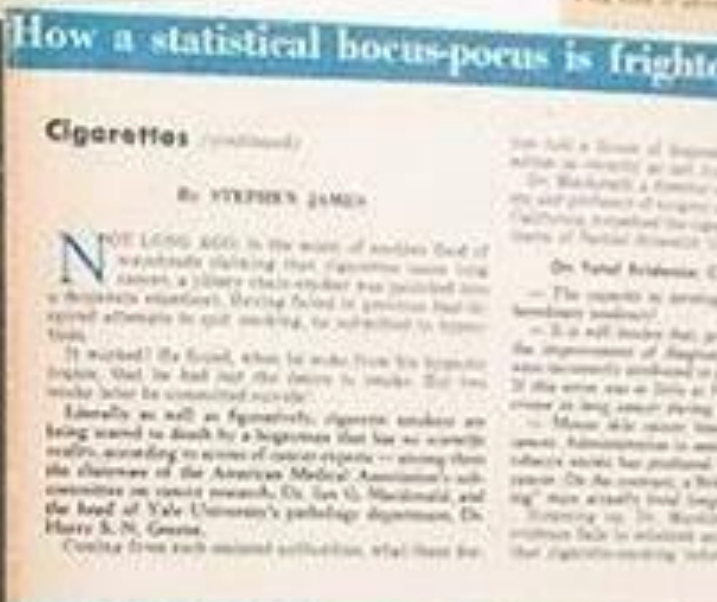
- To ensure its access on Capitol Hill, the wireless industry spends tens of millions of dollars in campaign contributions according to the Center for Responsive Politics, and over $100 million on lobbying in recent years.
- The playbook's key insight is that an industry doesn't have to win the scientific argument about safety; it only has to keep the argument going.
  - As recently as 1998, even as evidence of tobacco toxicity grew overwhelming, cigarette maker Phillip Morris was writing newspaper advertorials insisting there was no proof smoking caused cancer: page 20 of Harvard Report


Light and Mild
MUCH MORE FLAVOR
MUCH LESS
NICOTINE
L&M
FILTERS


dunhill
DE-NICOTEA
Crystal Filter Cigarette Holder


COMPARISON: PRODUCTION OF ELECTRIC ENERGY
AND CANCER OF LUNG


LATEST REPORT
Leading doctors in the field
of cancer research insist . . .
CIGARETTES
DO NOT CAUSE
CANCER!
TURN THE PAGE


How a statistical hocus-pocus is frighte
Cigarettes

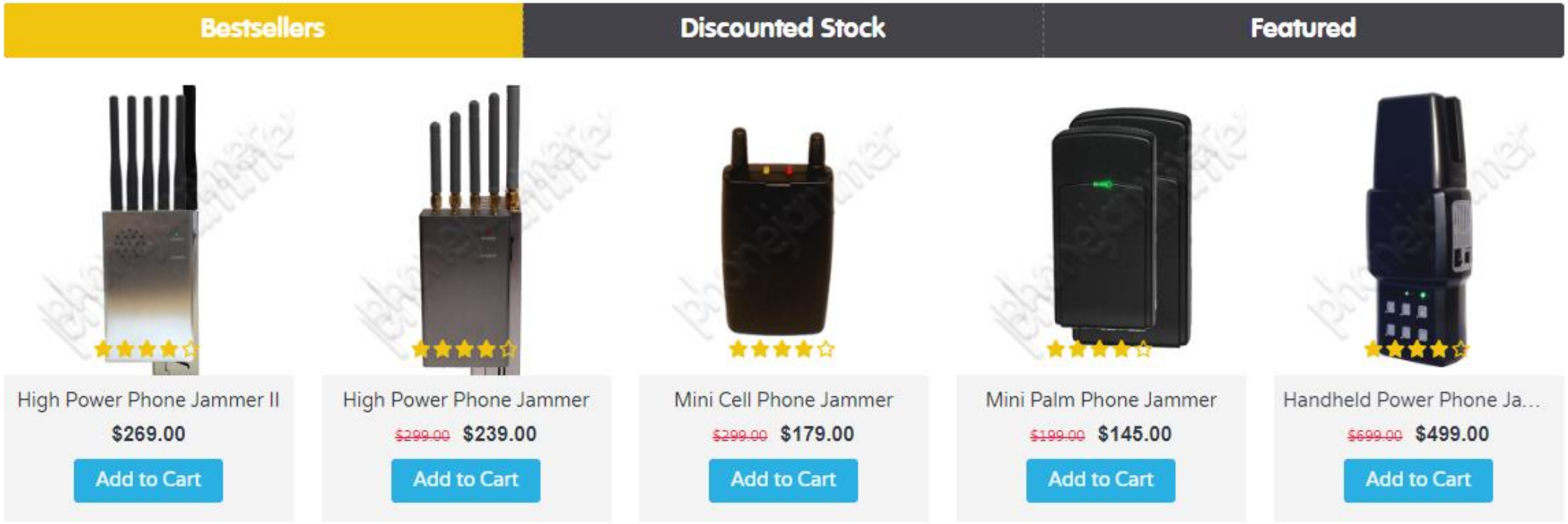

FACTS THAT DON'T FIT THE CLAIM THA
CIGARETTES CAUSE LUNG CANCER.
Americans smoke far more cigarettes than the English.
The English have 50% more lung cancer per capita!
Country people smoke at least as much as city people.
Yet country people have far less lung cancer.
The percentage of female cigarette smokers is increasing.
The percentage of female lung cancers is decreasing.
Many non-smokers develop lung cancer.
99.9% of heavy smokers don't get it.
Heaviest smokers are the young adults 20 to 40.
In this group, there has been no increase in lung cancer.
There is a recorded increase in lung cancer among dogs.
There is no recorded increase in cigarette smoking among dog
Cigarette smoking began in the twentieth century.
Hundreds of lung cancer cases were reported in the 19th cen
Tobacco tars produced skin cancer in mice.
The same tars failed to produce skin cancer in monkeys.
Despite yellow-stained fingers, there has never been a case
tobacco-caused skin cancer in man.

Security Issues Relating to Wireless Communication

- With the move toward the elimination of landlines and the promotion of wireless for connecting to the internet (such as “5G Home Internet”) we are putting more and more of our communication “eggs” in one basket for voice and data. My work for the Department of Justice showed the vulnerability of cell communications in emergency situations:
  - Cell communication can saturate in emergency situations
    - For example, the East Coast earthquake
  - Wireless networks can be jammed
    - Burglars can jam wireless, in-home security and communication devices
  - Wireless networks are far more vulnerable to hacking than wired networks
- Reliable communication can only be achieved through a distributed network using multiple technologies such as fiber optics and landlines

Wireless Communication Is Vulnerable to Jamming

- "The military uses jamming attacks as a tool to attack and disrupt terrorist's communications, because the open nature of wireless networks makes them vulnerable to various attacks."
- Jammers are not legal, but they are readily available



Conclusions Reached by the Commission

Final Report submitted in November 2020.

- Wireless radiation, which includes 5G and Wi-Fi, poses a significant threat to human health and the environment
- Electro Hypersensitivity (EHS) is an illness caused by wireless radiation
- Wireless communication is not nearly as secure as wired communication
- This is not solely a scientific issue, it is a political/economic issue

Concluding Remarks

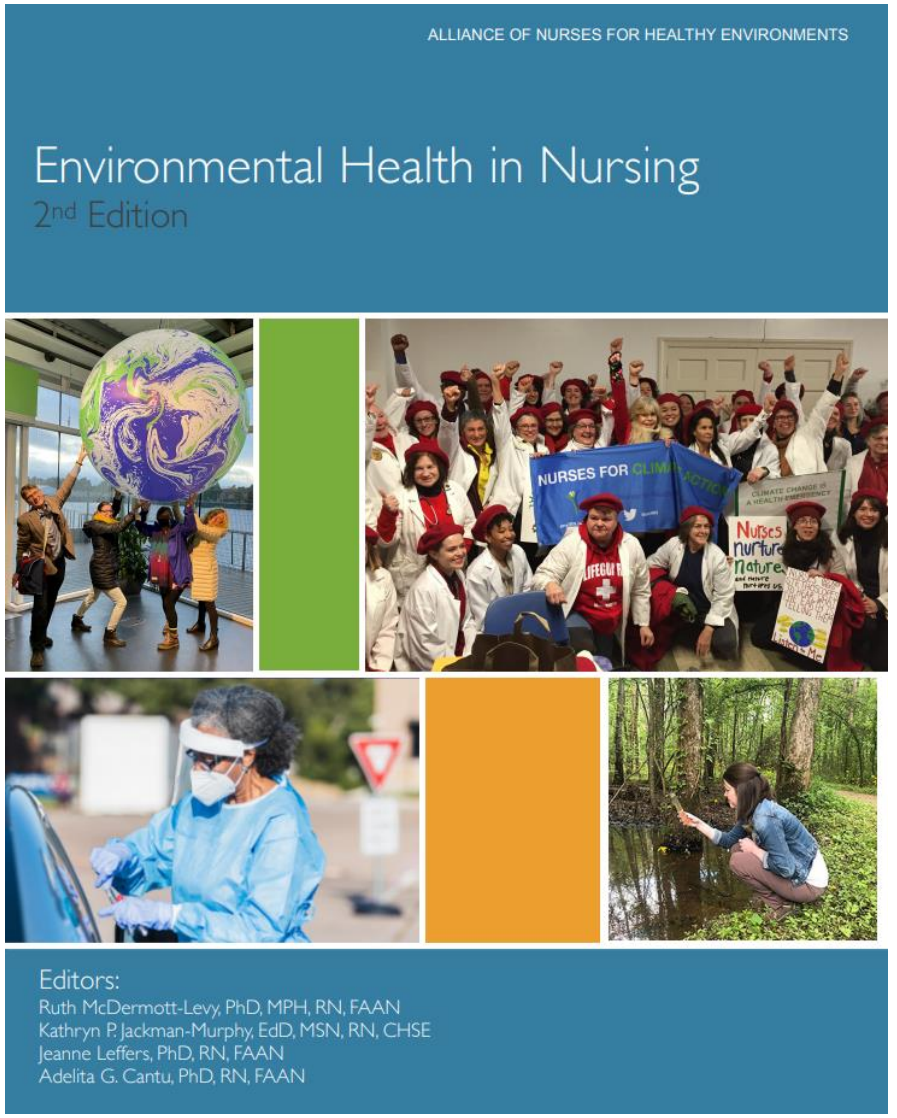
- A formal state commission of unbiased experts, formed through bipartisan legislation, concluded that low-level wireless radiation exposure is harmful to human health and the environment
- There is a lot that can be done to reduce exposures, and efforts to do so should be aggressively pursued
- Those in a position to do so are strongly encouraged to enact protections against all forms of wireless radiation

Appendix

The slides that follow are slides that have been used in earlier presentations, and they are made available in this appendix because they contain information that is relevant but could not be shown in this presentation because of time constraints.

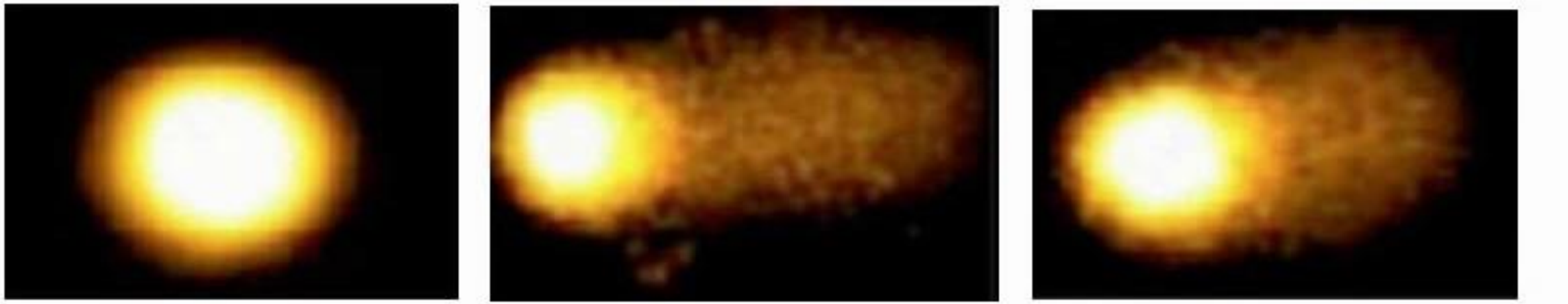
Resources for Medical Professionals

- Access the document on the right by clicking here
- Video presentations from the 2021 EMF Medical Conference
- Physicians for Safe Technology
- Physicians' Health Initiative for Radiation and Environment (PHIRE)



Wireless Radiation Effect on DNA

An important European review of the science, called The Reflex Report, prepared by 12 scientific institutes in 7 countries, confirmed long-term genetic damage in the blood and brains of users of mobile phones and other sources of electromagnetic fields.



Comet Assays of DNA: control and after exposures

Cybersecurity

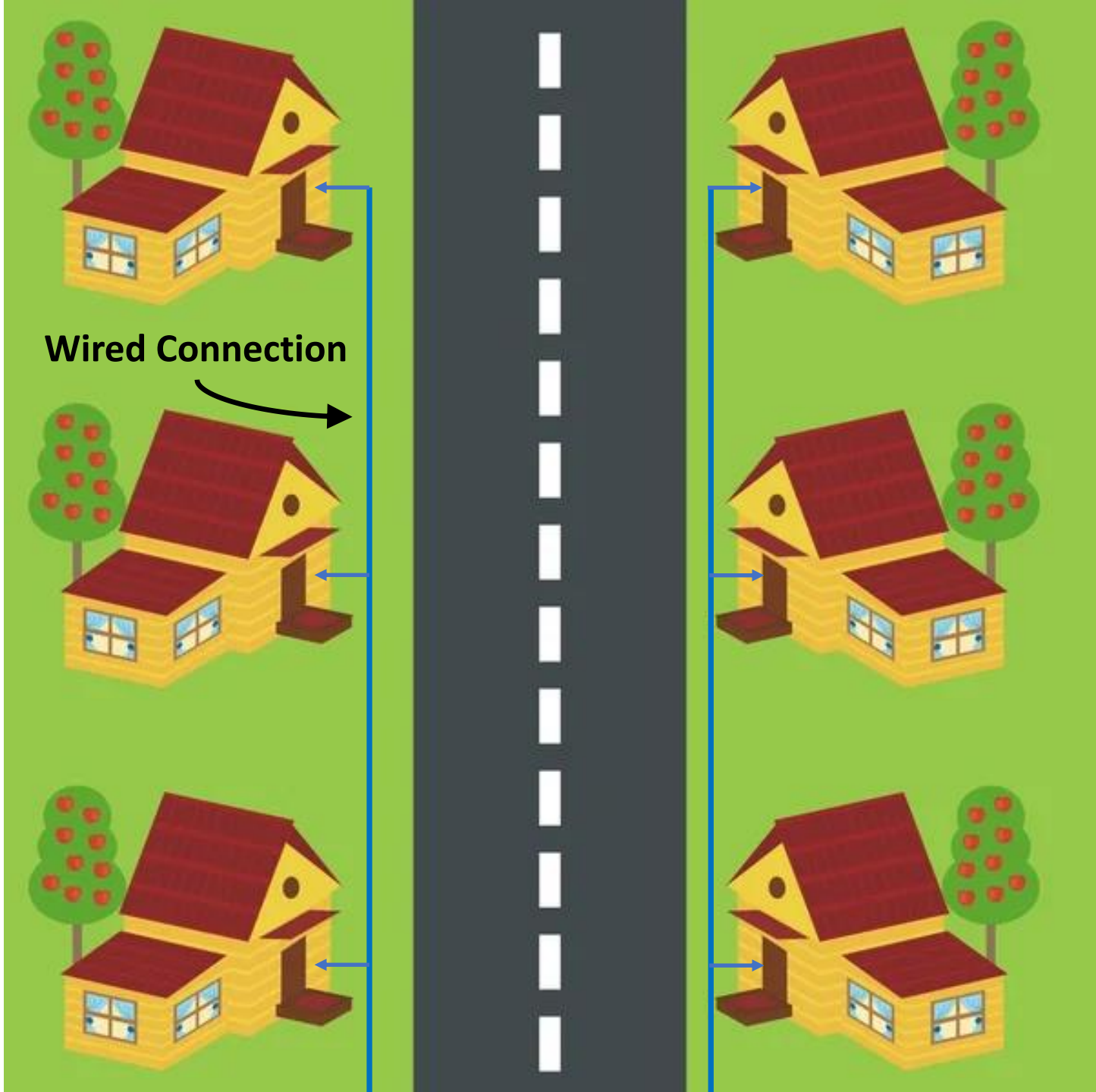
- Security breaches are real, and wireless connections are inherently vulnerable to hacking
  - The NotPetya attack in 2017 [which] caused $10 billion in corporate losses (WITA)
- 5G is more vulnerable than 4G
  - 5G uses short-range, low-cost and small-cell physical antennas within the geographic area of coverage. ***Each antenna can become a single point of control. Botnet and denial of service (DDoS) type attacks can bring down whole portions of the network simply by overloading a single node*** (Forbes)

The world's hackers (good and bad) are already turning to the 5G ecosystem, as the just concluded DEFCON 2019 (the annual ethical 'hacker Olympics') illustrated. The targets of this year's hacker villages included key parts of the 5G ecosystem such as: ***aviation, automobiles, infrastructure control systems, privacy, retail call centers and help desks, hardware in general, drones, IoT, and voting machines*** (Tom Wheeler)

Security Issues

First, consider how most of us connect to the internet now: cable, fiberoptics, DSL, which are all wired connections

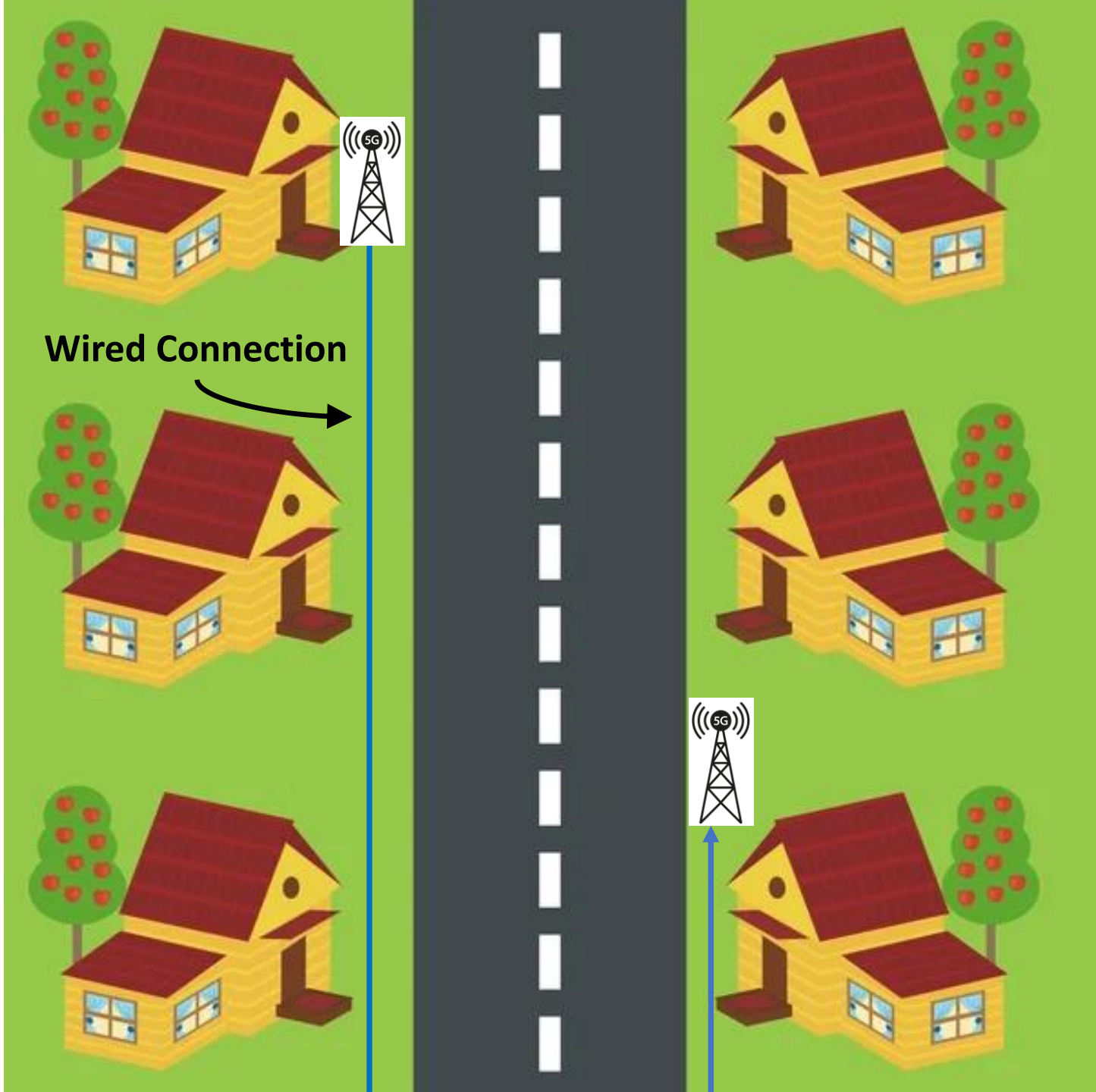
- Far higher symmetric data rates than wireless approaches
- Not easy to hack
- In many cases, the infrastructure for this approach is already in place
- Wired connectivity is “future proof”
  - Addresses the “digital divide”



Security Issues

Next, consider what is being promoted by industry, “5G Home Internet”.

- More convenient and eliminates the need to subscribe to a separate provider (the cable company)
- Requires that “small cells” be sited close to the users (<1,500’)
- Vulnerable to hacking and jamming
- Requires that fiber or cable be available (shown in blue on the right)
- May require costly equipment upgrades with new generations



Concerns About Wireless Devices in Schools Goes Beyond Radiation Exposure

- This year, schools in Ohio, Colorado, Maryland, Connecticut, Pennsylvania, Virginia, California and others banned the devices in class to curb student obsession, learning disruption, disciplinary incidents and mental health worries.
- Schools are banning cellphones as students are more distracted than ever - The Washington Post

- Governments have banned cell phones in schools due to the impact on children's learning range from England, France, Netherlands, Finland and Israel, China, Australia, Ontario and Greece to Ghana, Rwanda: and Uganda. https://healthytechhome.org/screentime-and-childrens-health/

New Hampshire Commission Recommendations
(abbreviated)

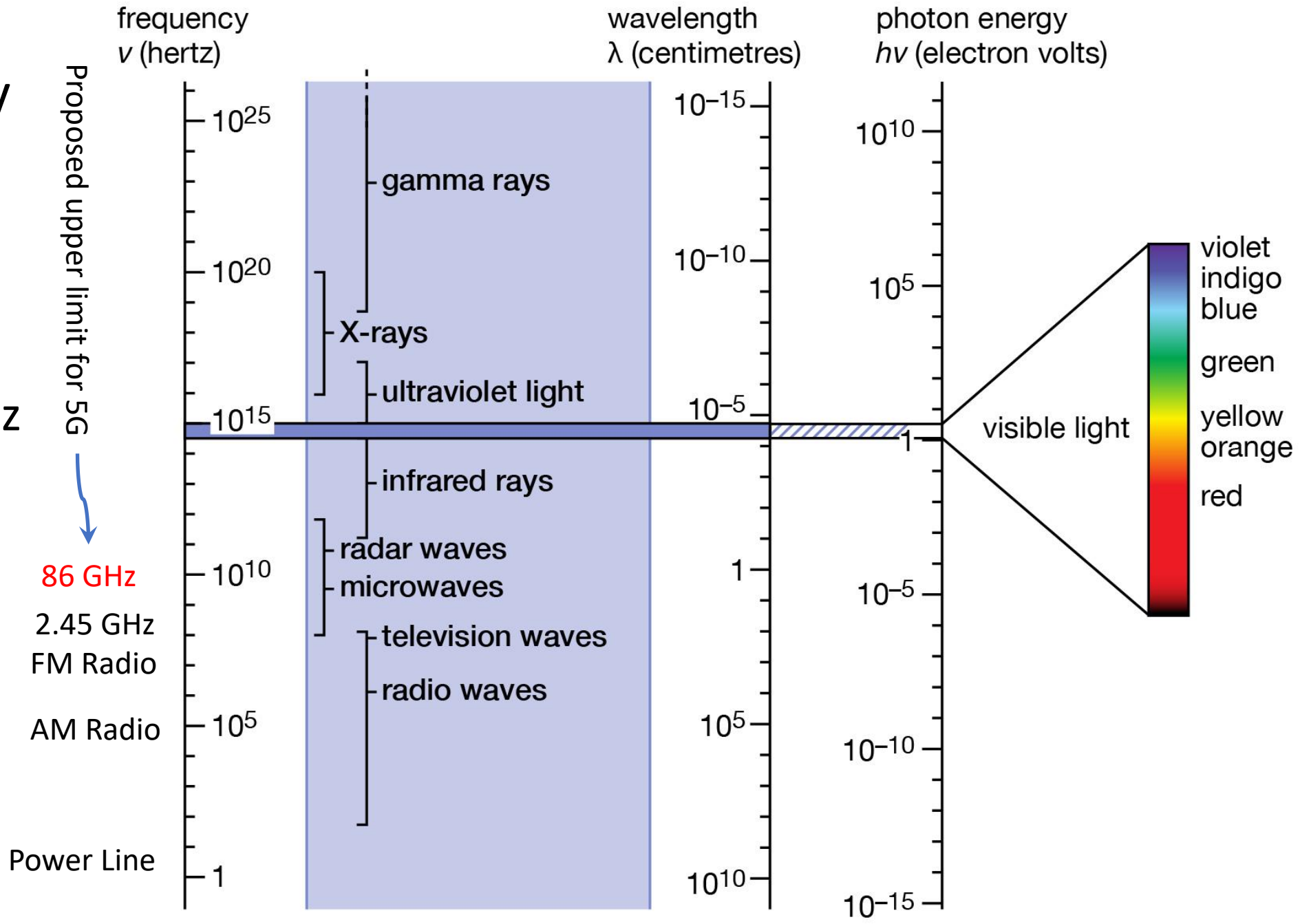
- Issue a resolution to US Congress to require the FCC to commission an independent health study and review of exposure limits.
- Engage agencies such as the EPA to develop wireless-radiation safety limits that will protect the trees, plants, birds, insects, pollinators and people.
- Require setbacks for new wireless antennas from residences, businesses, and schools (500 meters).
- Establish wireless-radiation free zones in commercial/public buildings.
- Require health agencies to educate on minimizing wireless-radiation exposure with multimedia public service announcements – especially for pregnant women and babies.

Insurance Companies Won't Insure Against RFR

- *The Nation* has not been able to find a single insurance company willing to sell a product-liability policy that covered cell-phone radiation. "Why would we want to do that?" one executive chuckled before pointing to more than two dozen lawsuits outstanding against wireless companies, demanding a total of $1.9 billion in damages. Some judges have affirmed such lawsuits, including a judge in Italy who refused to allow industry-funded research as evidence.

The Frequency Spectrum

Most wireless radiation occurs between 300 MHz and 6 GHz, although higher frequencies are being considered

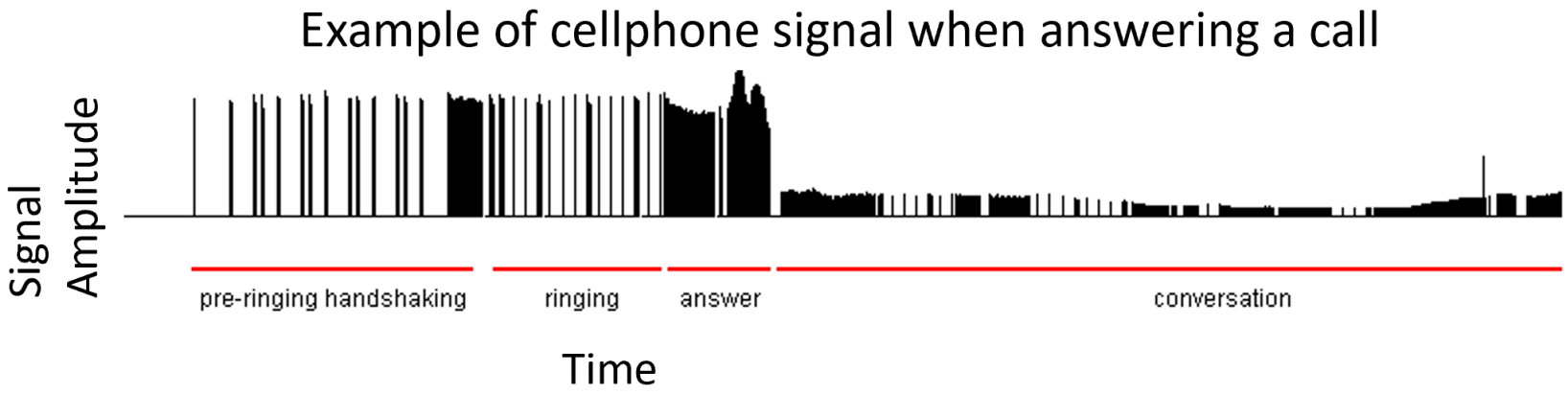


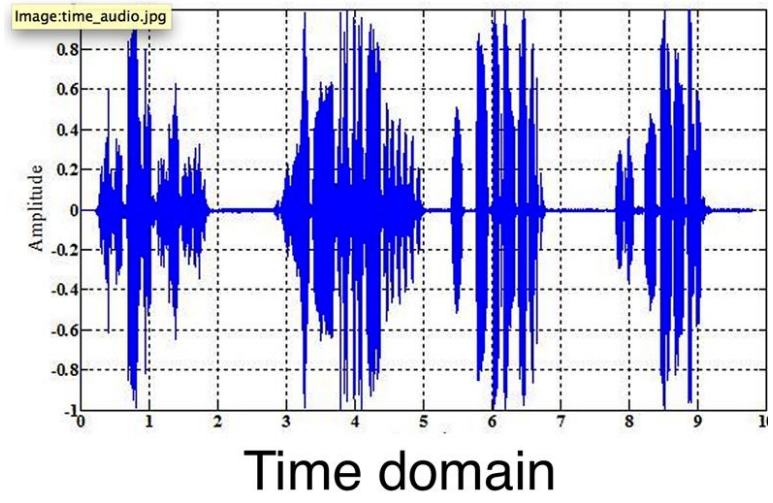
Characteristics of Wireless Signals

- *What is meant by "wireless" radiation?*

  High-frequency devices that transmit digital information fall into this category. These devices include: cellphones, cell towers, Bluetooth, baby monitors, smart meters, cordless phones, Wi-Fi (wireless routers) and IoT devices

Wireless (digital) signals send information in bursts (packets). Each spike (burst) in the plot below represents a time interval when a packet of information is being sent. An expanded view of four packet intervals would look something like the plot on the right:





Notes:

1 Hz = 1 cycle/second
1 MHz = 1,000,000 Hz
1 GHz = 1,000,000,000 Hz

1 mWatt = 0.001 Watt

- *What are the differences between signals from different wireless devices?*

They are all transmitted in high frequency bands (300 MHz to 6 GHz) but frequency varies from device to device

- 5G will extend the upper frequency to around 86 GHz

Different device types use different protocols to transmit digital information

- Generally, devices of the same type (such as cellphone and cell tower) use the same protocol when communicating. Because of this, cellphones and cell towers radiate the same types of signals, although at different powers and different periods of time.

Different device types transmit at different power levels

- Bluetooth & Wi-Fi (up to 100 mWatts)
- Smart Meter ($\leq$ 1 Watt)
- Cellphone (600 mWatts – 3 Watts)
- Cell Tower (typically 10 Watts, but can go as high as 50 Watts)

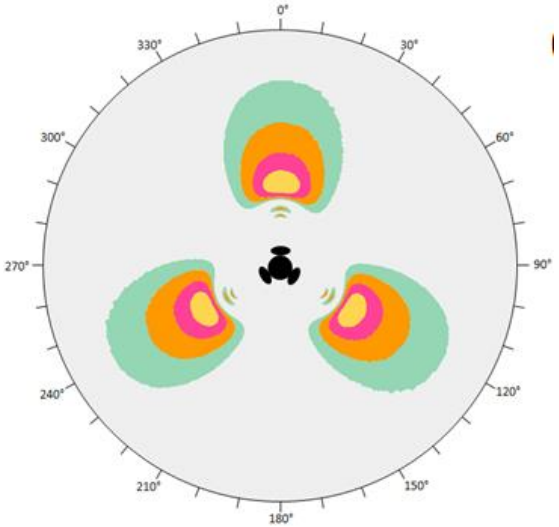
Radiation from all these devices can harm health

What Do Antennas Do to a Cellphone Signal?

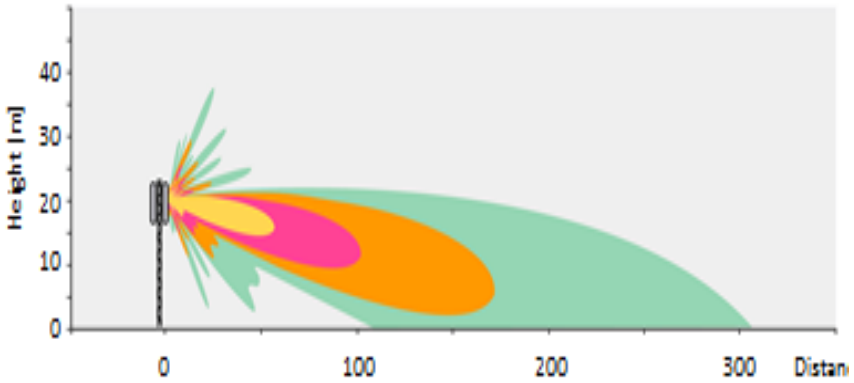
An antenna can focus signal energy in a particular direction, just like a flashlight can focus light in a particular direction; it enables the signal to be concentrated in the direction of the user.

An antenna does not change the frequency or information contained in a signal.

Example: top-view of 3 directional antennas (horizontal, or azimuthal, pattern)



Example: side-view of directional antenna (vertical, or elevation, pattern)



Commonly-Asked Questions

- How does power density from an antenna vary with distance?

  Power density varies as inverse square (Power Density = P_0/R^2)

As reference, assume power density at 1 meter is 1 mW/m^2

If phone is moved to a distance of 0.5 m, P = 4 mW/m^2

In this case, distance is equal to fabric thickness (0.2 mm), so P = > kW/m^2

Definitely <u>not</u> a good idea!

Schools and Cell Tower Setback Examples

Many communities have policies, ordinances or zoning that ensures cellular antennas are restricted to a specific minimum distance from schools.

Copake, New York: No telecommunication facility or tower … shall be located "Closer than 1,500 feet horizontally to any structure existing at the time of application which is used as a primary or secondary residence; to the property of any school (both public and private); to any church; or to any other public building."

Palo Alto, California: Be it resolved: "That the Board supports the City of Palo Alto ("CPA") immediately establishing local municipal zoning setback rules of 1500 feet or more from an operating wireless transmitter and a school site"

Shelburne, Massachusetts: "All new CRS [communications radio service] facilities shall be at least a distance of 3000 feet from the property line of any school." "All new CRS facilities shall be at least a distance of 1500 feet from any residential structure."

Walnut City, California: "Telecommunication towers and antennas shall not be located within one thousand five hundred feet of any school (nursery, elementary, junior high and high school), trail, park or outdoor recreation area, sporting venues and residential zones"

Bar Harbor, Maine: "No [communications] facility shall be located within 1,500 feet of a municipal school, private compulsory school or child-care center as defined in this chapter, at the time of application."

Sallisaw, Oklahoma: No commercial wireless telecommunications towers within 1,500 of homes

Stockbridge, Massachusetts: No personal wireless service facility shall be located "Within 1000 feet horizontally from any school buildings, playgrounds and athletic fields; and within 600 feet horizontally from any residential structure."

Electromagnetic-Sensitivity Is recognized by the ADA

By the Center for Electrosmog Prevention, 2019

- The following ADA Accommodations Request Packet may be used by ES (electrosensitivity) sufferers to apply for reasonable accommodations to help avoid RF radiation from “small cells” and wifi *in public government areas*, related to accessibility or any other Title II application. “Title II of the Americans with Disabilities Act applies to State and Local Governments.

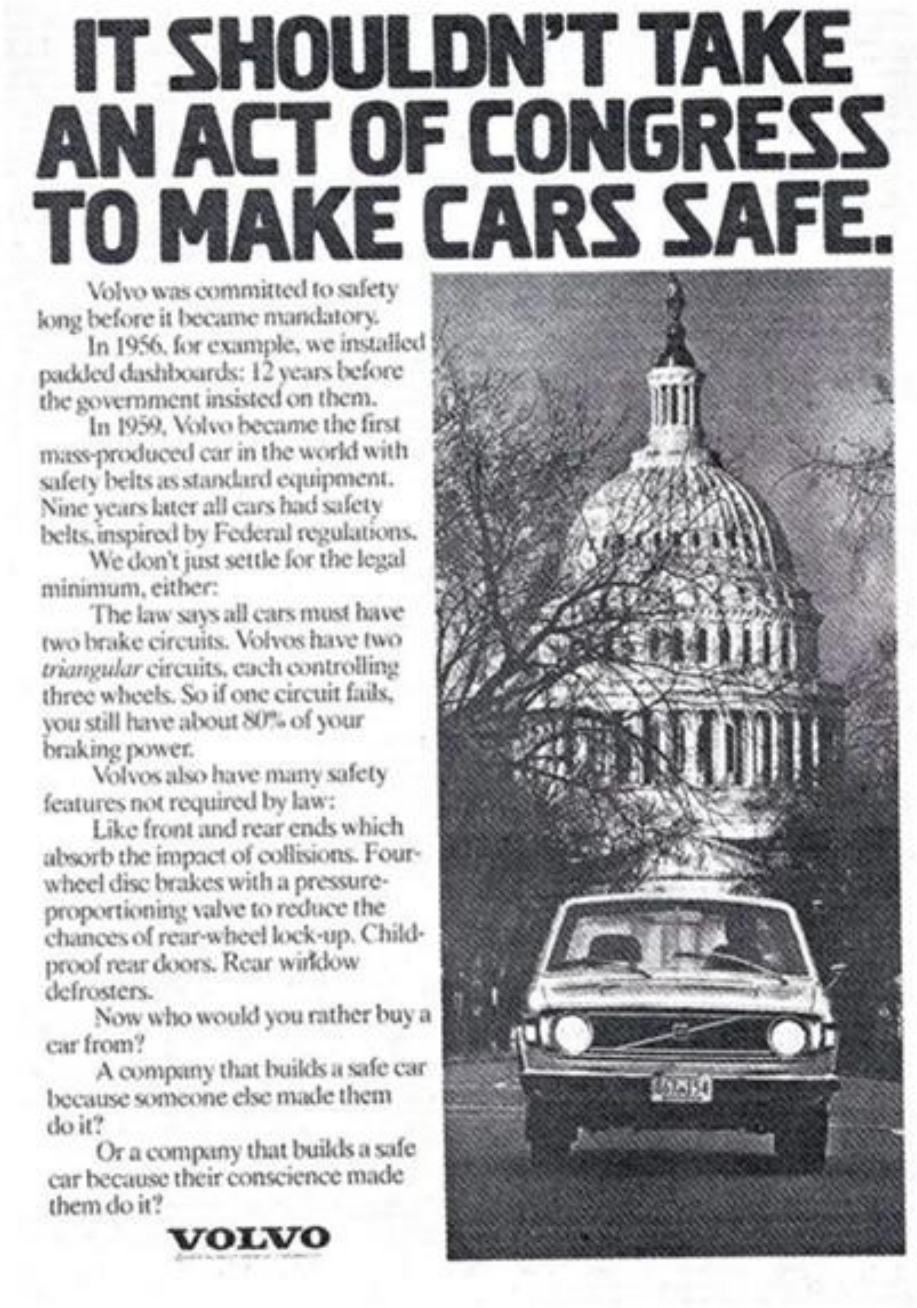
Electromagnetic-Sensitivity Is Recognized by Medicare

Medicare Accepted ICD-10 codes
Billable - W90.0XXA Exposure to radiofrequency, initial encounter
Billable - W90.0XXD Exposure to radiofrequency, subsequent encounter
Billable - W90.0XXS Exposure to radiofrequency, sequela
Billable - W90.1XXA Exposure to infrared radiation, initial encounter
Billable - W90.1XXD Exposure to infrared radiation, subsequent encounter
Billable - W90.1XXS Exposure to infrared radiation, sequela
Billable - W90.2XXA Exposure to laser radiation, initial encounter
Billable - W90.2XXD Exposure to laser radiation, subsequent encounter
Billable - W90.2XXS Exposure to laser radiation, sequela
Billable - W90.8XXA Exposure to other nonionizing radiation, initial encounter
Billable - W90.8XXD Exposure to other nonionizing radiation, subsequent encounter
Billable - W90.8XXS Exposure to other nonionizing radiation, sequela

Competing on Safety

Telecoms deny harm associated with their phones and networks despite crystal clear science otherwise.

Which provider will break the mold and become the Volvo of their industry?



CTIA Sues Berkeley, CA Over Ordinance Requiring Retailers to Warn Cellphone Users

Berkeley Ordinance: "To assure safety, the Federal Government requires that cell phones meet radio frequency (RF) exposure guidelines. If you carry or use your phone in a pants or shirt pocket or tucked into a bra when the phone is ON and connected to a wireless network, you may exceed the federal guidelines for exposure to RF radiation. This potential harm is greater for children. Refer to the instructions in your phone or user manual for information about how to use your phone safely."

Similar information is contained in all cellphones or in their manuals

-For iPhone, go to Settings/General/Legal & Regulatory/RF Exposure

A federal judge ruled in favor of a wireless communication trade group five years after they claimed the city of Berkeley's law that required retailers to warn customers about cellphone radiation violated their First Amendment rights. *July, 26, 2021*

Verizon Acknowledges the Risks of Wireless Radiation to its Shareholders

From page 17 of Verizon's 2022 10-K Report:

- "...our wireless business also faces personal injury and wrongful death lawsuits relating to alleged health effects of wireless phones or radio frequency transmitters. We may incur significant expenses in defending these lawsuits. In addition, we may be required to pay significant awards or settlements."

“Doubt is our product”

- Carlo’s October 7, 1999, letters to wireless-industry CEOs are the smoking-gun equivalent of the November 12, 1982, memo that M.B. Glaser, Exxon’s manager of environmental-affairs programs, sent to company executives explaining that burning oil, gas, and coal could raise global temperatures by a destabilizing 3 degrees Celsius by 2100. For the tobacco industry, Carlo’s letters are akin to the 1969 proposal that a Brown & Williamson executive wrote for countering anti-tobacco advocates. “Doubt is our product,” the memo declared. “It is also the means of establishing a controversy…at the public level.”

Article Title: Association of Exposure to Radio-Frequency Electromagnetic Field Radiation (RF-EMFR) Generated by Mobile Phone Base Stations with Glycated Hemoglobin (HbA1c) and Risk of Type 2 Diabetes Mellitus

Quote from article: “The findings of this study show that the students who were exposed to high RF-EMF had significantly higher HbA1c than the students who were exposed to low RF-EMF.”

Meo SA, Alsubaie Y, Almubarak Z, Almutawa H, AlQasem Y, Hasanato RM., *Int J Environ Res Public Health*. 2015;12(11):14519-14528, Nov 13, 2015 doi:10.3390/ijerph121114519

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4661664/

Article Title: Electromagnetic radiation as an emerging driver factor for the decline of insects

Quote from article: “The extent that anthropogenic electromagnetic radiation represents a significant threat to insect pollinators is unresolved and plausible.”

Alfonso Balmori, Science of The Total Environment, Volume 767, 2021, 144913, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.144913