

Strengthening Federal Research, Regulation and Public Health Guidance on Radiofrequency Exposure

Public comment — Docket HHS-OASH-2026-0397

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Public comment on the U.S. Department of Health and Human Services (HHS) Request for Information (RFI) on Electromagnetic Fields, Radiofrequency Radiation, and Wireless Radiation Exposure, 91 Fed. Reg. 59792 (Sept. 21, 2026), Docket HHS-OASH-2026-0397 [16].

A. Executive summary and principal federal requests

HHS already holds enough evidence to act. Its own National Toxicology Program (NTP) found clear evidence of carcinogenic activity in male rats exposed to cell-phone radiofrequency (RF) radiation based on malignant heart schwannomas, and some evidence based on malignant brain gliomas; a companion study reported deoxyribonucleic acid (DNA) damage in several tissues [1,41]. An independent lifetime study by the Ramazzini Institute found the same rare heart tumor at far lower, base-station-like exposures [35]. A systematic review commissioned by the World Health Organization (WHO) then rated the animal evidence for these tumors as high certainty. The authors retained that rating in a 2026 corrigendum, although scientists at Germany's Federal Office for Radiation Protection have challenged the certainty assessments [56]. In January 2024, the National Institute of Environmental Health Sciences (NIEHS) reported that it has no plans for further RF exposure studies [17,42].

Human epidemiology provides additional grounds for concern, particularly among heavy and long-term wireless-phone users. Case-control studies in several countries have reported elevated glioma estimates in these exposure categories, and some have also reported higher acoustic-neuroma estimates [2,45–48,67]. These patterns are consistent with a possible long-latency carcinogenic effect and warrant particular attention given the experimental findings of Schwann-cell tumors. Prospective and pediatric studies have not established comparable increases, but their exposure characterization, statistical precision and available follow-up do not resolve the questions concerning the heaviest and longest exposures [4,12,13]. The appropriate federal response is to strengthen proportionate precautionary protections now while commissioning independent investigations capable of determining whether these associations are causal.

The current federal RF exposure limits, set by the Federal Communications Commission (FCC), were derived to prevent excessive tissue heating. They were not set on the basis of chronic endpoints such as cancer, reproduction or neurodevelopment [5–7]. Applying dose-response methods of the kind the U.S. Environmental Protection Agency (EPA) uses to the NTP and Ramazzini data, the authors of a 2026 peer-reviewed risk assessment estimated that general-public limits are 15- to 900-fold above exposure levels associated with a one-in-100,000 cancer risk, and 8- to 24-fold above levels protective of male reproductive health [36]. These are model-

based estimates; HHS should reproduce and test them independently. In mice already treated with a chemical carcinogen, RF exposure at whole-body levels below the human limit has been reported to promote tumors [38]. In 2021 a federal appeals court held that the FCC had not adequately explained why its limits protect against non-cancer harms, long-term exposure, children and the environment [8].

Congress has already assigned HHS the duty this RFI describes. The electronic product radiation provisions of the Federal Food, Drug, and Cosmetic Act require the Secretary to carry out a program to protect the public from electronic product radiation. That program must include performance standards, research to minimize unnecessary exposure, and techniques for minimizing exposure [63]. RFI Question 5(o) repeats the statute's own language. HHS should use that authority, not only study the problem.

Seven actions HHS should take

1. **Correct the federal record.** Publish a formal reassessment of the Food and Drug Administration's (FDA's) 2020 RF-cancer literature review and its public statements that current limits are protective, stating which conclusions are retained, revised or withdrawn in light of NTP, Ramazzini, the Japan-Korea studies, the WHO-commissioned reviews and the 2026 risk assessment [30,33-36,43].
2. **Restart federal RF toxicology.** Reverse NIEHS's January 2024 position that no further RF exposure studies are planned, fund a joint audit of the existing animal data and an adequately powered multi-dose replication, and nominate RF radiation for review in the NTP Report on Carcinogens [1,33,34,42].
3. **Exercise FDA's statutory authority.** Direct FDA to evaluate under section 360kk of title 21 of the United States Code (21 U.S.C. § 360kk) whether a performance standard for wireless consumer devices is necessary to protect public health and safety, and publish its determination and supporting analysis, addressing body-contact testing and point-of-sale exposure disclosure [57,63].
4. **Give the FCC a health-based recommendation.** Within 12 months, transmit a formal HHS assessment of whether revised limits should incorporate chronic and other health endpoints beyond acute thermal effects, with attention to children and long-term exposure, based on an independent risk assessment that reproduces and tests the published calculations [8,9,36,37].
5. **Protect children now.** Issue Centers for Disease Control and Prevention (CDC) and Department of Education guidance that favors wired classroom connections, keeps transmitting devices off children's bodies and limits unnecessary exposure in schools and childcare. Recommend, as a precautionary measure, no new cell towers or base-station antennas, including small cells, on school, childcare or public-playground property; federally determined protective exposure criteria for installations nearby; and a survey of existing installations under a published measurement protocol (Section H.3) [50-52].
6. **Fund targeted research and anticipate sixth-generation (6G) wireless.** Support cancer-latency, adolescent cognition, sleep, fertility and pregnancy studies with measured exposure, and require exposure assessment and targeted biological research at 6G candidate frequencies before commercial deployment (Sections G.3 and J.3).
7. **Guarantee independence and accountability.** Apply defined conflict-of-interest thresholds, disclosure and recusal rules, publish all positive and null results, and report annually to the public [62].

Within 90 days of the RFI's close, HHS should name a responsible lead and issue interim precautionary guidance. Within six months, HHS should publish its reassessment of FDA's 2020 review and issue school guidance. Within nine months, HHS should publish a draft hazard and risk assessment. Within 12 months, HHS should transmit its recommendation to the FCC and publish FDA's determination under § 360kk with its supporting technical and legal assessment. Section J.8 of this comment sets out the full proposed schedule.

B. Cancer and carcinogenicity

Addresses RFI Questions 6, 12 and 16.

The animal evidence points to a specific tumor pattern, and that pattern matches the tumor types under study in humans. HHS's own NTP produced the central finding, and a WHO-commissioned review has since rated it at high certainty, a rating now disputed in the literature. One partial replication was negative. NIEHS has reported no plans for further RF exposure studies that could resolve that conflict.

B.1 What HHS's own scientists found

The NTP exposed rats for two years to 900-megahertz (MHz) RF signals modulated as in Global System for Mobile Communications (GSM) and code-division multiple access (CDMA) networks. It reported **clear evidence** of carcinogenic activity in male rats, based on malignant heart schwannomas, and **some evidence** based on malignant brain gliomas and adrenal tumors [1]. Companion NTP genotoxicity work reported DNA damage in the hippocampus of male rats and the frontal cortex of male mice [41]. NIEHS itself states that the brain tumor observed is similar to a type associated with heavy cell-phone use in some human studies [17]. FDA originally nominated RF radiation to NTP for this study.

Two features of the NTP results have been used to discount them. Exposed male rats lived longer than controls, and exposures were whole-body. NTP analyzed tumor rates with survival-adjusted statistics designed for exactly this situation and still reached its clear-evidence conclusion [1]. The whole-body exposures, measured as specific absorption rate (SAR), ran from 1.5 to 6 watts per kilogram (W/kg). NIEHS has itself described the lowest exposure level as roughly equal to the highest local exposure permitted for cell phones [17,42]. Whole-body and local SAR are different quantities, so this is an order-of-magnitude comparison, not an equivalence.

B.2 Independent confirmation of the same tumor

The Ramazzini Institute exposed 2,448 Sprague-Dawley rats from prenatal life until natural death to a 1.8-gigahertz (GHz) GSM far field for 19 hours a day. This mimicked base-station rather than handset exposure [35]. At the highest level, 50 volts per meter (V/m), it found a statistically significant increase in heart schwannomas in males. It also reported a non-significant increase in malignant glial tumors in females [35].

The Ramazzini exposures were far below NTP's. The highest group's estimated whole-body SAR was about 0.1 W/kg, compared with 1.5 to 6 W/kg in NTP [1,35]. That is close to, and slightly above, the FCC's 0.08 W/kg whole-body limit for the general public, and rat and human whole-body SARs are not directly interchangeable [5]. Measured as incident power density, calculated from the measured field strength of 50 V/m, the highest Ramazzini exposure (about 0.66

milliwatts per square centimeter [mW/cm^2]) was below the FCC general-population limit of $1.0 \text{ mW}/\text{cm}^2$ at 1.8 GHz. The FCC limit is averaged over 30 minutes, while the rats were exposed 19 hours a day [5,35]. Two laboratories, different frequencies and an exposure range spanning roughly 60-fold produced the same rare tumor in the same sex and strain. That independent convergence deserves substantial weight. Because the protocols, frequencies and dosimetry differed, Ramazzini is corroboration rather than an exact replication.

Tumor promotion is a separate question. Lerchl and colleagues replicated an earlier finding that RF exposure increased lung and liver tumors and lymphomas in mice pretreated with a chemical carcinogen, at whole-body SARs from 0.04 to 2 W/kg [38]. The increases did not follow a clear dose–response pattern. The study tests promotion in an already initiated model, not whether RF alone initiates cancer.

B.3 The WHO-commissioned systematic review

WHO commissioned systematic reviews of RF health effects to inform its own assessment. The animal cancer review, Mevissen et al. (2025), screened 4,350 publications and, as corrected in 2026, included 51 studies. It concluded that RF exposure increases cancer incidence in experimental animals, with the certainty of evidence strongest for malignant heart schwannomas and gliomas [30]. It also reported moderate-certainty evidence for several other tumor types [30]. These ratings are the review authors' judgment. In 2026, scientists at Germany's Federal Office for Radiation Protection published a re-analysis that pooled sufficiently similar studies. It found wide 95% confidence intervals (CIs): malignant glioma odds ratio 3.3 (95% CI 0.46–23.84) and malignant heart schwannoma 9.11 (95% CI 1.51–54.84). It concluded moderate certainty of evidence for heart schwannomas, citing a positive exposure–response association, and low certainty for gliomas. A group led by the vice-chair of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) also published a critique. The review authors have replied to both [56,68]. A 2026 corrigendum to the review restated its findings, retaining high certainty for gliomas and heart schwannomas, and noted that extrapolating animal results to humans is particularly complex for radiofrequency electromagnetic fields [30]. HHS should weigh the review together with these exchanges rather than adopt or dismiss its ratings alone.

The WHO review of human observational studies, Karipidis et al. (2024), reached a different conclusion. It concluded, with moderate certainty, that mobile-phone use likely does not increase glioma risk [32]. However, HHS should also consider published critiques, which argue that the review gives substantial weight to cohorts with crude exposure measures, has limited ability to test long-latency heavy use, and pools categories in ways that may dilute the highest-use strata [49]. Both reviews belong in the federal record. Citing only the human review would misrepresent what WHO's reviewers found cumulatively.

The 2025 companion review of less-researched cancers examined 26 articles describing 143 exposure–outcome pairs, not 143 independent studies. It reported no pooled increase in leukemia, non-Hodgkin lymphoma or thyroid cancer associated with regular mobile-phone use; the authors rated that evidence low certainty. Occupational evidence for lymphohematopoietic cancers and oral/pharyngeal cancer was very low certainty, in part because exposure characterization was poor. For less-studied malignancies associated with fixed-site transmitters, the review found insufficient evidence for assessment [78]. This Part II review and the 2024 Part I review are related components of one WHO-commissioned review program, not independent confirmations.

These findings should be considered together with the positive case–control and animal evidence rather than treated as definitive proof either of harm or of safety.

B.4 The 2026 Japanese–Korean replication

In January 2026, Japanese and Korean teams reported parallel two-year studies in male Sprague-Dawley rats exposed to 900-MHz CDMA signals. They found no statistically significant increase in neoplastic lesions in the heart, brain or adrenal glands, and no genotoxicity [33,34]. These were substantial, coordinated two-year studies conducted under Organisation for Economic Co-operation and Development (OECD) guidelines and Good Laboratory Practice, with exposure delivered in alternating 10-minute on and off periods over about 18 hours 20 minutes a day, roughly 9 hours of active exposure, a schedule comparable to NTP's [1,33,34]. Their null results materially constrain conclusions for 900-MHz CDMA exposure at 4 W/kg in male rats, and HHS must address them.

They do not, however, settle the question.

1. **One dose.** The studies tested a single whole-body SAR of 4 W/kg [34]. NTP's statistically significant pairwise increase in heart schwannomas occurred at 6 W/kg, with a positive trend across 1.5, 3 and 6 W/kg [1]. A single intermediate dose cannot test a dose–response trend.
2. **Rare-tumor power.** Malignant heart schwannomas occur at low single-digit percentages even in exposed NTP groups. Smaller groups at one exposure level have limited power to detect a difference of that size.
3. **Direction of effect.** Germany's Federal Office for Radiation Protection noted that the replication is not necessarily inconsistent with NTP, because the effect estimates in both studies point in the same direction [33].
4. **Design.** FDA and OECD carcinogenicity guidance calls for at least three exposure levels plus a control. Each follow-up study used a single exposure group, fewer animals per group than NTP, and an exposure below NTP's highest. A published critique argues that these choices left the studies unable to test NTP's findings; its lead author designed the NTP study and discloses that interest [69].

The correct federal response is a joint individual-animal data audit and common pathology review of NTP, Ramazzini and the Japan–Korea studies, with a prespecified assessment of whether quantitative pooling is scientifically justified given their different exposure systems, followed by an adequately powered multi-dose study. Section J.2 specifies that work.

B.5 Human studies: where elevated risks appear

The human studies that report elevated risk share a pattern: the heaviest cumulative use and the longest time since first use.

- **INTERPHONE glioma.** Regular users overall showed an odds ratio of 0.81, while the highest cumulative call-time category showed 1.40 [2,3]. The investigators acknowledged that recall and selection bias could affect both estimates.
- **INTERPHONE acoustic neuroma.** In the highest decile of cumulative call time (1,640 hours or more), the odds ratio for acoustic neuroma was 1.32 (95% CI 0.88–1.97). The investigators said the elevation could reflect chance, reporting bias or a causal effect [45].

Acoustic neuroma is a Schwann-cell tumor of the hearing nerve, the same cell type as the rat heart tumors.

- **Dose at the tumor site.** Cardis et al. estimated the RF energy absorbed at each tumor's location in INTERPHONE participants. In the highest-dose group with seven or more years since first use, the glioma odds ratio was 1.91 (95% CI 1.05–3.47). The authors cautioned that the result needed replication before a causal interpretation [46].
- **France.** The CERENAT case–control study found no statistically significant association for regular users overall, but elevated glioma risk among the heaviest users: an odds ratio of 2.89 (95% CI 1.41–5.93) for those with at least 896 lifetime hours of calls [47].
- **Sweden.** Hardell and colleagues reported associations between wireless phone use and malignant brain tumors diagnosed in 2007–2009. For analogue mobile phones the odds ratio was 1.8 (95% CI 1.04–3.3), rising to 3.3 (95% CI 1.6–6.9) with more than 25 years' latency [67]. Their pooled analyses, which reuse these cases, reported glioma risk increasing with latency and cumulative use [48]. The Swedish studies are contested on recall and selection grounds and are not independent of one another, but their latency findings address the gap that the cohort studies cannot yet fill.

The large prospective Cohort Study of Mobile Phone Use and Health (COSMOS) provides an important independent test of these associations. Its results did not demonstrate an increased glioma risk across the exposure comparisons examined, although relatively few cases and limited follow-up leave some long-latency, heavy-use hypotheses unresolved. The cohort followed more than 264,000 participants and recorded lifetime phone use at enrollment. It found a hazard ratio of 1.07 (95% CI 0.62–1.86) for glioma in the highest cumulative call-time group, and 0.97 (95% CI 0.62–1.52) for more than 15 years of use [4]. With 149 glioma cases over a median follow-up of about seven years, its estimates for the heaviest and longest use remain imprecise: the highest call-time interval is consistent with no effect or a near-doubling of risk. Its exposure histories also rely on recalled use calibrated against operator records collected at enrollment.

Population-level brain-tumor incidence trends have also been cited as evidence against a substantial increase in risk. Incidence trends are a blunt test. They can be masked by long latency, changes in diagnosis and registration, and a risk confined to heavy users. They cannot exclude the risk pattern the case–control studies report.

B.6 The international classification

In 2011 the International Agency for Research on Cancer (IARC) classified RF electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on limited evidence in humans for glioma and acoustic neuroma [39]. Every major animal finding described above came after that classification. In 2024 an IARC advisory group listed RF as a high priority for re-evaluation during 2025–2029, but recommended scheduling it no earlier than the second half of that period [40]. HHS should not wait for that review before acting.

B.7 What the cancer evidence requires of HHS

The federal record now contains a clear-evidence NTP finding, an independent same-tumor finding at base-station-type far-field exposure, a WHO-commissioned high-certainty rating that its authors retained after challenge, and a human tumor pattern among the heaviest users that is concordant in cell type. The Japanese–Korean single-dose experiments provide important contrary evidence but do not negate the independently reported NTP and Ramazzini findings or

resolve their differences. Taken together, these results warrant a transparent, independent reassessment of the animal evidence and a multi-dose replication capable of testing the competing interpretations. For a chemical agent, a record of this kind would prompt a formal hazard evaluation and a quantitative risk assessment. HHS should apply the same approach here. This comment's specific requests are in Sections J.1 through J.4.

C. Neurological health, symptoms and sleep

Addresses RFI Questions 6, 10, 11, 12 and 16.

RF exposure from a phone held to the head produces a measurable change in human brain metabolism. Research funded by the National Institutes of Health (NIH) has shown it directly. What remains unresolved is whether repeated changes of this kind affect memory, sleep or long-term neurological health. HHS should fund the studies that can answer that, keeping RF exposure separate from the behavioral effects of device use.

C.1 Measured effects on the human brain

In a randomized crossover study at Brookhaven National Laboratory, funded by NIH, 47 healthy adults had brain glucose metabolism measured by positron emission tomography (PET) with a phone turned on and off at the ear. Fifty minutes of active exposure increased glucose metabolism in the brain region closest to the antenna, with no change in whole-brain metabolism, and the increase correlated with estimated field strength [44]. The study was published in the *Journal of the American Medical Association*. Field strength was estimated rather than measured in tissue, tissue temperature was not reported, and the authors described the clinical significance as unknown. The study establishes a localized response to handset exposure. It does not establish harm or a mechanism, which is precisely the question HHS should be funding.

C.2 Adolescent memory

Foerster and colleagues followed Swiss adolescents for about one year [18]. In the 274 participants with mobile-network records, an interquartile increase in modeled daily brain dose of 341 millijoules per kilogram (mJ/kg) was associated with a 0.26-point reduction in figural memory score (95% CI 0.10 to 0.42). In the full sample of 669, the estimate was smaller and its interval included no change.

A systematic review of observational cognition studies reported little or no association, at very low to low certainty [19]. A review of short-term controlled experiments found no pooled effect on the cognitive tasks it could combine [20]. The observational review included longitudinal evidence from children and adolescents, while the experimental review examined mainly short-term cognitive responses. Neither resolves the consequences of well-characterized cumulative RF exposure throughout adolescence. NIH should fund an independent cohort with validated individual exposure estimates and prespecified memory outcomes (Section J.3).

C.3 Sleep

A randomized, double-blind crossover pilot exposed adults to an active or sham 2.4-GHz baby monitor for seven nights each. Insomnia-symptom scores were worse during active exposure (14.64 versus 9.63; $p = 0.03$; bootstrap 95% CI for the difference 1.18 to 8.73) [23]. The study had

11 analyzable participants and no continuous exposure measurement. It is a signal requiring an adequately powered replication, not a finding about the population. It is relevant because children's bedrooms routinely contain the same kinds of devices.

A separate randomized, double-blind, sham-controlled crossover study enrolled 34 adults, each undergoing three experimental nights with 30-minute pre-sleep exposure to 700-MHz 5G, 3.6-GHz 5G, or sham conditions in randomized order [75]. Sousouri and colleagues reported a genotype-dependent change in non-rapid-eye-movement sleep-spindle center frequency after 3.6-GHz exposure involving variation in the CACNA1C gene [75]. This is controlled evidence of a specific sleep electroencephalography (EEG) response, not evidence of impaired sleep quality, neurological injury or disease. Its modest sample size and subgroup-specific result require independent replication with prespecified genotype analyses and exposure dosimetry.

For context, Prins and colleagues systematically reviewed 51 human mobile-phone RF studies of waking EEG or event-related potentials. They found evidence of an EEG effect in an eyes-open resting-state comparison involving a second-generation (2G) exposure protocol, but not during task performance; no included study was free from risk of bias, and heterogeneity prevented informative meta-analysis for most comparisons [76]. Taken together, these studies justify standardized, preregistered, double-blind replication rather than a conclusion that an observed EEG change necessarily constitutes harm.

C.4 Symptoms attributed to electromagnetic fields

Blinded provocation studies have generally not shown that self-identified sensitive people can detect, or react symptomatically to, short exposures [21,22]. These studies included repeated short blinded sessions; in the most recent, 16 participants completed 12 sessions of real or sham exposure [22]. They did not evaluate prolonged everyday or overnight exposure, and they lose substantial numbers of participants. Their findings constrain the specific acute exposure–symptom hypotheses tested and leave other exposure durations and conditions for separate investigation. People reporting these symptoms deserve clinical attention and patient-informed research. CDC should track their reports in a standardized way that keeps reported symptoms, diagnoses, perceived exposure and measured exposure as separate variables (Section J.5).

A WHO-commissioned systematic review of 41 human experimental studies (2,874 participants) similarly found little evidence that acute RF exposure under the conditions tested caused headache, reported sleep disturbance or composite symptoms, including among participants reporting sensitivity to electromagnetic fields [79]. Its conclusion applies mainly to short-term, often blinded laboratory exposures and self-reported acute endpoints; it does not establish the effects of chronic or developmentally timed exposure. This counterevidence should inform any patient-centered replication protocol, which should prespecify symptom outcomes, sham fidelity, relevant exposure duration and objective exposure measurement.

D. Reproductive and developmental health

Addresses RFI Questions 6, 10, 11, 12 and 16.

A WHO-commissioned review found high-certainty animal evidence that RF exposure reduces pregnancy rates, largely at heating-level exposures, and the authors of a 2026 risk assessment estimated that current limits exceed levels protective of male reproductive health [31,36]. Human

evidence is weaker and depends on crude exposure proxies. Prenatal and early-life exposure has also been associated with behavioral problems in children. These findings justify both precaution for pregnant women and men planning conception, and a federal research program designed to resolve them.

D.1 Male fertility: experimental evidence

The WHO-commissioned review of experimental male-fertility studies, Cordelli et al. (2024), pooled animal studies across species. After a 2025 corrigendum, the review rated evidence for reduced pregnancy rate as high certainty and evidence for reduced sperm count as low certainty [31]. The corrected pregnancy-rate analysis involved nine lower-risk-of-bias studies averaging 6.98 W/kg (range 0.31–43.4 W/kg). The authors noted that the pooled effect was largely driven by a single study at 43.4 W/kg; excluding it reduced the estimate and its confidence interval crossed the null. Heating cannot be excluded, and whether the finding extends to human-relevant exposure levels remains uncertain.

Melnick and Moskowitz applied standard regulatory uncertainty factors (100 to 300) to the pregnancy-rate potency reported in that review. They estimated that general-public limits are 8- to 24-fold higher than levels protective of male reproductive health [36]. HHS should reproduce that calculation and test it against alternative assumptions.

In a controlled mouse study, repeated whole-body 905-MHz exposure at about 2 W/kg increased oxidative DNA damage and reduced motility in sperm [24]. Laboratory fertilization was not impaired in that experiment, and only three mice per group were assayed. It supports a mechanistic hypothesis that warrants independent replication with temperature monitoring.

D.2 Male fertility: human evidence

The WHO-commissioned review of human observational studies judged the evidence very uncertain, mainly because exposure was poorly measured [65]. Within that evidence:

- A study of young Swiss men found that frequent phone use was associated with lower sperm concentration [26].
- Two prospective preconception cohorts found little overall association between front-pocket carrying and conception. Among men with a body mass index (BMI) below 25, the fecundability ratio was 0.72 (95% CI 0.59–0.88) [25].

Carrying time is an imprecise proxy for testicular RF dose. Random (nondifferential) exposure misclassification often attenuates associations toward no effect, although recall and selection errors can bias estimates in either direction. A null finding from these designs is therefore weaker evidence of safety than its sample size suggests.

D.3 Pregnancy and child development

An analysis of 55,507 mother–child pairs from four birth cohorts found a dose–response trend in preterm birth with increasing maternal phone use (trend $p = 0.003$). The high-use versus low-use odds ratio was 1.28 (95% CI 0.87–1.88) [27]. Exposure was largely recalled years after pregnancy.

In the Danish National Birth Cohort, children exposed both prenatally and postnatally to mobile phones had higher odds of behavioral problems by age seven [53]. A pooled analysis of five birth cohorts reported a higher risk of hyperactivity and inattention problems among children whose

mothers used phones more during pregnancy, while cautioning that unmeasured confounding could explain it [54]. In mice, prenatal exposure to an active phone produced hyperactivity and impaired memory in offspring [55]. The human findings are associations with maternal phone use, not measured fetal RF dose, and parenting or household factors could explain them. The mouse study is an RF-specific experiment but has not been independently replicated. Together they justify low-cost precaution during pregnancy and early childhood, and prospective study with measured exposure (Section J.3).

E. Cardiovascular, systemic and mechanistic questions

Addresses RFI Questions 6, 11, 12 and 16.

The mechanistic evidence most relevant to HHS is DNA damage and oxidative stress, because these are plausible pathways to the cancer and fertility findings above. Cardiovascular evidence in humans is limited and does not yet show an RF-specific effect.

DNA damage and oxidative stress. NTP's companion study, after 19 weeks (rats, up to 6 W/kg) or 14 weeks (mice, up to 10 W/kg) of exposure, reported significant increases in DNA damage in the hippocampus of male rats (CDMA only), the frontal cortex of male mice (both modulations) and blood leukocytes of female mice (CDMA only). Findings in several other tissues were judged equivocal, and micronucleus tests were negative [41]. NIEHS's 2025 follow-up report found no DNA damage in the brain, liver, heart or blood cells of rats and mice after five days of exposure; that short study does not address the subchronic or two-year findings [70]. The mouse sperm study above attributed DNA damage to an oxidative mechanism [24]. Other reviewers have judged the broader oxidative-stress literature inconsistent and of low quality. The 2026 Japan–Korea replication found no genotoxicity at its single exposure level [33,34]. Federal mechanistic studies should test specific predictions with blinded assays, temperature control and positive controls, so that a positive result is credible and a null result is informative.

Human genotoxicity evidence remains a targeted assessment gap. Weller and colleagues mapped more than 500 genotoxicity studies of radiofrequency electromagnetic fields across in-vitro, in-vivo and epidemiological designs, reporting heterogeneous findings, including positive DNA-damage results in some studies involving humans [77]. The authors also reported that funding source was more strongly associated with study outcomes than study quality, and that 58% of studies reporting DNA damage involved exposures below ICNIRP guideline limits [77]. Their descriptive counts of statistically significant and nonsignificant findings do not establish causality, study independence or an exposure threshold, and the authors found that higher-quality subsets more often reported null results. HHS should separately appraise studies involving exposure of living humans, distinguishing them from isolated human-cell experiments and from observational exposure proxies, with particular attention to measured exposure, temperature, blinding, assay validity, confounding and independent replication.

Cardiovascular outcomes. A large analysis of the UK Biobank, a United Kingdom (UK) cohort, reported an association between regular mobile-phone use and incident cardiovascular disease, partly mediated by sleep and psychological distress [29]. That design cannot separate RF exposure from phone-use behavior. Experiments in healthy volunteers at rest show largely nonsignificant heart-rate effects and inconsistent heart-rate-variability results [28]. The NIH National Heart, Lung, and Blood Institute should fund blinded experiments that include people with existing heart disease, since resting healthy volunteers are not the population of greatest concern (Section J.3).

Biological effects that are not yet harms. A localized change in brain glucose metabolism is evidence of a biological response, not proof of injury [44]. It does, however, warrant testing whether exposure within current limits can produce responses of clinical importance. Whether such responses involve heating, and whether any are harmful, are questions the federal program should resolve (Section F).

F. Exposure standards and regulatory science

Addresses RFI Questions 5(n-p), 6, 8 and 12.

Current U.S. limits are designed to prevent excessive tissue heating. Compliance establishes that a device or site was tested below specified absorption or field values under defined test conditions. It does not establish protection against chronic outcomes such as cancer or reproductive and developmental effects, because the limits were not derived from those endpoints and have not been revised to account for them.

F.1 What the limits are designed to prevent

For the general public, FCC rules in title 47 of the Code of Federal Regulations (47 CFR § 1.1310) set a whole-body SAR of 0.08 W/kg and a localized SAR of 1.6 W/kg averaged over one gram of tissue, with averaging periods of up to 30 minutes [5]. ICNIRP's 2020 guidelines use 2 W/kg over ten grams for the head and torso [6]. The FCC limits, adopted in 1996, derive from a whole-body threshold of about 4 W/kg for heat-related behavioral disruption in animals, divided by safety factors [81]. ICNIRP's 2020 limits derive from thresholds for tissue temperature rise [6,7]. Neither is based on cancer, reproductive or developmental endpoints.

In 2021, the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit held that the FCC had failed to provide a reasoned explanation for retaining its limits. The court found the FCC had not addressed evidence on non-cancer effects, long-term exposure, children, the ubiquity of wireless devices and environmental harm [8]. The FCC's remand proceeding remains open [9].

F.2 Answer to Questions 6 and 12: evidence of harm at or below current limits

Three lines of evidence bear on harm at or below current limits.

1. **Quantitative risk assessment.** Melnick and Moskowitz fitted EPA benchmark-dose models to survival-adjusted heart-schwannoma incidence (alone and combined with gliomas) in the NTP and Ramazzini studies, then extrapolated linearly to a one-in-100,000 cancer risk. They estimated that the general-public whole-body limit is 15- to 114-fold above the corresponding exposure for one hour of daily exposure, and 121- to 909-fold for eight hours; the highest ratios derive from the Ramazzini data. For male fertility, applying uncertainty factors of 100 to 300 to a pregnancy-rate potency from the WHO-commissioned review, they estimated limits 8 to 24 times lower than current limits [31,36]. An earlier benchmark-dose analysis, using heart-muscle damage in male rats as the most sensitive endpoint, derived a whole-body limit 20 to 40 times lower than the U.S. limit [37]. These are the authors' model-based estimates. They rest on linear low-dose extrapolation, on applying rat whole-body SAR values directly to human limits, and on scaling risk with hours of daily exposure. They are not measurements of risk in people. HHS should commission an independent assessment that reproduces these calculations, tests

reasonable alternative models, incorporates contrary animal evidence such as the Japan–Korea studies, and states whether its regulatory recommendations change.

2. **Animal findings near or below limits.** Ramazzini found heart schwannomas at an incident power density below the FCC general-public power-density limit at 1.8 GHz, although the estimated whole-body SAR (about 0.1 W/kg) was slightly above the human whole-body SAR limit [5,35]. In carcinogen-treated mice, tumor promotion was reported at 0.04 W/kg whole-body, half the human whole-body limit, though without a clear dose–response pattern [38]. Rat, mouse and human SARs are not directly interchangeable, so these comparisons indicate where testing is needed rather than establishing human risk below the limits.
3. **Human epidemiology.** Studies of users of commercially marketed phones, including INTERPHONE, CERENAT and the Swedish studies, raise questions about the adequacy of prevailing exposure frameworks [2,45–48,67]. Their exposure measures, however, do not establish that individual participants received a measured dose below a particular regulatory limit. HHS should investigate these questions using validated exposure reconstruction and explicit comparisons with the applicable standards.

Together these studies show that the protectiveness of current limits for chronic outcomes has not been demonstrated and should be tested directly. A health-protective framework should not treat that gap as evidence of safety.

F.3 How compliance testing can differ from real-use conditions

FCC rules allow phones to be tested for body-worn SAR with a separation distance from the body. People routinely carry phones in pockets and against the skin. In September 2023, France’s national frequency agency, the Agence nationale des fréquences (ANFR), ordered iPhone 12 units withdrawn from the French market after its tests at body contact (0 millimeters, with the phone in the hand or a trouser pocket) measured a limb SAR of 5.74 W/kg against a limit of 4 W/kg [57]. After Apple provided a software update, ANFR retested the phone at 3.94 W/kg and concluded that the update restored compliance [57]. This is not a direct comparison with the FCC’s SAR limit, which is averaged over 1 gram of tissue; it illustrates that measured compliance can depend materially on test position and device operating behavior. The separation distance assumed in body-worn testing generally appears only in user manuals or regulatory filings, and consumers are not given SAR results at body contact. The policy need is for prominent, understandable disclosure and body-contact testing, which FDA can address directly (Section J.4).

F.4 Answer to Question 5: international frameworks HHS should consider

Jurisdiction or body	Approach	Relevance to HHS
Switzerland	Installation limit values for base stations and other fixed sources in places of sensitive use such as homes, schools and offices, set about ten times lower in field strength than the general immission limits, which follow ICNIRP reference levels [60]	Shows a precautionary limit for fixed infrastructure is administrable

Jurisdiction or body	Approach	Relevance to HHS
Italy	Attention value and quality objective for places of prolonged stay: 6 V/m from 2003 until April 2024, then raised to 15 V/m by Law No. 214 of December 30, 2023, art. 10, effective April 29, 2024 [64]	Even after the 2024 increase, Italy's value remains well below ICNIRP-based reference levels; the change illustrates that national values reflect policy choices as well as science
France	2015 law restricting Wi-Fi in childcare facilities for children under three, and requiring Wi-Fi in primary classrooms to be switched off when not in instructional use [66]	Child-specific precaution in schools
Study requested by the European Parliament's Panel for the Future of Science and Technology (STOA) and managed by the European Parliamentary Research Service (EPRS)	2021 study concluded RF is probably carcinogenic for glioma and acoustic neuroma and clearly affects male fertility in animals [58]	Independent legislative-science assessment
International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF)	2022 peer-reviewed critique of the assumptions behind FCC and ICNIRP limits [59]	Scientific case for health-based limits

HHS should publish a provision-by-provision comparison of FCC, ICNIRP, Institute of Electrical and Electronics Engineers (IEEE) C95.1-2019 and the national precautionary frameworks above. For each, it should state the population, metric, frequency range, averaging rules and health outcomes considered [5–7]. Numbers from different metrics must not be compared as if they were interchangeable.

G. Modern exposure conditions and public disclosure

Addresses RFI Questions 5(p), 7–10, 13(a–k) and 15(a–d).

Poor exposure measurement is the single largest weakness in the human evidence. When exposure is misclassified at random, true associations are often diluted toward no effect; recall, selection and other differential errors can instead bias estimates in either direction. Better exposure science is therefore a prerequisite for a credible federal conclusion of safety, not only of harm.

G.1 Measurement (Questions 7 and 8)

Recalled call time, subscription records, distance to a tower and body-worn meters are different kinds of information. None directly measures energy absorbed in a particular organ. Personal RF meters need frequency-dependent corrections and disagree with one another across settings

[10,11]. NIH and FDA should fund an interlaboratory validation program comparing calibrated personal meters, near-body models and consent-based device transmission records. It should publish calibration data so independent laboratories can reproduce the results (Section J.3).

Studies should record carrier frequency, modulation and pulse structure, duty cycle, distance and body position, and both peak and time-averaged values with stated averaging intervals. They should never add unlike quantities into a single “cumulative” score.

G.2 Newer technologies, including fifth-generation (5G) networks (Question 13)

The evidence reviewed for this comment does not provide a comprehensive, validated cumulative-exposure estimate spanning 5G, Wi-Fi, smart meters, wearables and connected homes. HHS should assess and publicly identify that evidence gap. “5G” covers very different exposures. Low-band and mid-band 5G, below about 6 GHz, is deployed largely from existing macro towers and penetrates the body much as earlier signals do. Millimeter-wave 5G, at 24 GHz and above, is absorbed mainly in the skin and eyes; above 6 GHz both the FCC and ICNIRP limit power density rather than SAR [5,6]. Dense small-cell networks, with antennas close to street level and often near homes and schools, are one deployment configuration, used with millimeter-wave and lower bands.

Frequency alone does not determine deployment density, antenna placement or exposure in a nearby building, so assessments should rest on measurements that reflect actual antenna characteristics, traffic patterns, beamforming and occupancy. Beamforming directs energy toward individual users and changes exposure from moment to moment. NTP’s long-term studies did not address millimeter-wave or 5G beamformed exposures [42]. Pending that research, HHS should recommend that new small-cell installations be sited to minimize exposure in homes, schools and childcare facilities, and that their measured exposure be disclosed (Sections G.4 and H.3).

Wearables and wireless medical devices sit against the body for many hours, which calls for near-body dosimetry. Generation labels such as “5G” are not exposure descriptions. Protocols should specify actual frequencies, waveforms and operating states.

G.3 6G: safeguards before deployment (Question 13(b))

6G standards are still being developed through the International Telecommunication Union’s (ITU’s) International Mobile Telecommunications-2030 (IMT-2030) process [72]. The 2027 World Radiocommunication Conference will consider the bands 4.4–4.8 GHz, 7.125–8.4 GHz and 14.8–15.35 GHz for mobile systems [73], and the ITU has examined the technical feasibility of mobile systems above 100 GHz [74]. The evidence assembled in this comment does not establish the long-term health consequences of the exposure conditions future 6G systems may create, and energy at the highest of these frequencies is absorbed almost entirely in the skin and the surface of the eye. That question can be answered before deployment rather than after. HHS should commission a frequency-, waveform- and exposure-specific assessment that identifies consequential gaps in the evidence, and should ask that:

1. FDA and NIEHS obtain, through the FCC and standards bodies, the frequencies, power levels, beamforming methods and deployment densities proposed for 6G.
2. NIH fund dosimetry and targeted biological studies at 6G candidate frequencies to close the gaps that assessment identifies, with priority on skin, eye and chronic low-level exposure.
3. Exposure assessments for 6G infrastructure near homes and child-serving locations be published before commercial deployment.

4. HHS report to the FCC whether existing limits and averaging rules are adequate for those frequencies before the FCC authorizes commercial 6G service (Section J.7).

G.4 Infrastructure near homes and schools (Question 15)

The Ramazzini findings make exposure from base stations a cancer-research question, not only an engineering one [35]. Measurements near homes, schools, childcare facilities and health-care facilities should document indoor and outdoor levels, traffic variation across days and seasons, and nearby personal sources. Antenna count and distance are context, not exposure.

Human base-station studies merit separate evaluation. Balmori's 2022 narrative review collected 38 studies of people living near mobile-phone base stations and reported associations involving symptoms, cancer and biochemical markers [80]. The review's proportion of studies reporting effects is not an estimate of causal probability: study populations, outcomes, field measurements, comparators, adjustment for confounding and independence differed. Separately, blinded human experiments synthesized in the WHO symptom review did not generally support acute RF-induced symptoms under the exposure conditions tested [79]. Conversely, the WHO-commissioned human cancer review concluded, with moderate certainty, that environmental exposure from fixed transmitters likely does not increase childhood leukemia risk, while the evidence regarding some other pediatric cancers and long-latency conditions is less informative [32]. The 2025 Part II review found little evidence on other cancers specifically from fixed sites [78]. These disagreements warrant an HHS appraisal separating actual RF measurements from simple distance-to-tower surrogates, and prospective and blinded designs from ecological or symptom surveys. None of these reviews establishes that a particular tower causes disease; neither does reliance on distance alone adequately characterize local exposure.

G.5 What should be disclosed (Question 9)

- **Consumers:** SAR at body contact (zero separation) as well as at the tested separation distance, the separation distance assumed, and plain-language advice on keeping devices off the body [57].
- **Schools and local governments:** measured RF levels at and near facilities, measurement methods, uncertainty and time coverage, before and after new installations.
- **Workers:** source-specific exposure information and practical controls.
- **Health professionals:** an explanation distinguishing regulatory compliance from evidence about health outcomes.

Device and network records used in research should be collected with consent, minimized and protected against reidentification.

H. Children, schools and sensitive populations

Addresses RFI Questions 10 and 11(a–g).

Yes, exposure assessment and risk evaluation should differ for children (Question 11). Modeling indicates that young children can absorb more RF energy than adults in parts of the brain. Children will also be exposed for more years, beginning earlier. Existing U.S. limits were derived principally from thermal-effect thresholds, while handset compliance testing has historically relied on adult-sized anthropomorphic models. In response to the FCC's 2013 inquiry, the

American Academy of Pediatrics asked the FCC to adopt radiation standards that protect children's health and reflect how people use phones today [52]. The FCC retained its existing limits in 2019.

H.1 Why children are different

A modeling study by France Telecom researchers found that the maximum SAR in 1 gram of peripheral brain tissue was about twice as high in models of children aged five to eight as in adult models, although differences in maximum head SAR averaged over 10 grams were small [51]. Other investigators have argued that the adult head model used in certification underestimates children's exposure [50]. The standard adult head model was not designed to represent a child.

The pediatric brain-tumor studies do not resolve this. CEFALO reported an odds ratio of 1.36 (95% CI 0.92–2.02) for regular use [12], an interval consistent with no effect or a doubling of risk. MOBI-Kids found no clear association and noted possible bias [13]. Both studied short exposure histories. Neither addresses tumors with decades of latency, or outcomes other than brain tumors.

The developmental evidence in Section D (behavioral problems after prenatal and early exposure) and the adolescent memory signal in Section C are directly relevant to children [18,53–55].

H.2 Schools and childcare (Questions 11(a) and 15(a))

Children in school cannot choose their exposure. Classrooms can contain many wireless devices and access points operating for hours a day. HHS, through CDC and in coordination with the Department of Education, should issue guidance that:

- prefers wired network connections in classrooms and childcare settings where feasible;
- turns off wireless access points when not in instructional use, as France requires in primary schools;
- keeps laptops and tablets on desks rather than laps, and phones away from children's bodies;
- discloses measured RF levels to parents and staff, with methods; and
- does not recommend unvalidated shielding products.

Several of these measures are low-cost or low-burden where feasible and can preserve access to education and emergency communication. They follow the precautionary practice already adopted in several European countries (Section F.4).

H.3 Wireless infrastructure at and near child-serving locations (Questions 11(a) and 15(a))

Children cannot avoid exposure from fixed transmitters on or beside their schools, childcare facilities and playgrounds. The Ramazzini findings make base-station exposure a cancer-research question [35], and children may face decades of such exposure. That evidence justifies investigating exposure at child-serving locations; it does not show that every such installation presents a demonstrated health risk. The measures below rest on a separate precautionary policy judgment: on property dedicated to children, unresolved uncertainty about chronic exposure should be resolved in children's favor while the research in Section J proceeds. HHS should recommend three distinct measures:

1. **On child-serving property.** No new cell towers or base-station antennas, including small cells, on the grounds or buildings of schools, childcare facilities and public playgrounds, and no new leases of such property for those installations.
2. **Near child-serving property.** Protective siting criteria for new installations near those locations, expressed as maximum measured exposure at the property line and in occupied spaces. A fixed setback distance is not proposed, because the available studies do not establish a universally safe distance and exposure depends on antenna power, height and direction as well as distance. The numeric criteria are a federal determination still to be made: FDA, with NIEHS and CDC, should derive them through the assessment in Section J.1 and transmit them to the FCC. This comment does not propose a specific value.
3. **Existing installations.** A survey of existing installations on or adjacent to child-serving property, conducted under the published CDC–NIEHS measurement protocol (Section J.7), with public reporting. Where measurements exceed the federal criteria once adopted, HHS should recommend exposure reduction by antenna adjustment, relocation or non-renewal of leases. The decision would rest with the property owner, through its lease, for installations on its property, and with the licensee and the FCC for others.

A prohibition limited to school property would not address a tower across the property line, which is why the three measures are distinct. They also require action beyond HHS. Under 47 U.S.C. § 332(c)(7)(B)(iv), state and local governments may not regulate the placement of personal wireless service facilities on the basis of the environmental effects of RF emissions when the facilities comply with FCC rules [71]. HHS therefore cannot impose a nationwide siting rule, and many communities cannot act on health grounds alone. HHS can recommend child-protective siting criteria to the FCC in the remand proceeding, publish guidance that school districts and childcare operators can use in their own leasing and property decisions, and fund the measurement survey (Section J.7). The legal effect of § 332(c)(7)(B)(iv) on particular local or property-owner decisions is a question this comment does not resolve.

H.4 Other sensitive populations

- **Pregnant women:** prospective research with measured exposure by gestational stage, and interim advice to keep devices away from the abdomen (Section D.3).
- **Older adults and people with heart disease:** do not extrapolate from healthy young volunteers; include these groups in autonomic experiments (Section E).
- **People with implanted medical devices:** electromagnetic interference is a device-performance question for FDA, separate from biological effects. Advice should follow device-specific testing.
- **Workers with elevated exposure:** The National Institute for Occupational Safety and Health (NIOSH) should characterize task-specific exposures, record peaks and averages, and protect workers from retaliation or unnecessary disclosure of medical information.
- **People reporting symptoms they attribute to RF:** clinical attention and patient-informed research (Section C.4).

Research should include people across occupations, housing conditions and device access, and should report whose exposure was and was not represented.

I. Environmental and ecological evidence

Addresses RFI Questions 14, 15(e) and 16.

The ecological evidence consists mostly of laboratory studies with reported effects but uneven quality, plus a small number of controlled field experiments. The D.C. Circuit specifically faulted the FCC for failing to address environmental evidence [8]. To the commenter's knowledge, no federal agency has since announced a research program on RF effects on pollinators, wildlife or livestock.

- A 2023 systematic map located 334 publications on RF and animals or plants, mostly laboratory studies, and identified frequent methodological weaknesses [14]. These are publications, not 334 independent confirmations.
- A controlled experiment exposing honeybee colonies to 2.4- and 5.8-GHz fields found impaired homing ability, with no effect on brood development or worker longevity [15]. Homing failure is directly relevant to colony survival.
- A three-part peer-reviewed review by Levitt, Lai and Manville, the latter a retired U.S. Fish and Wildlife Service biologist, compiled reported effects on birds, insects, amphibians and plants. It argued that exposure standards should account for wildlife [61].

HHS should seek a joint program with EPA, the Department of Agriculture and Interior science agencies. The program should select a few organism–outcome pairs, starting with pollinator homing and livestock reproduction, then replicate them with calibrated exposure, blinded scoring and colony- or site-level analysis. Power-line (extremely low frequency) studies should be analyzed separately from wireless RF. Both positive and null results should be published (Section J.6).

J. Federal actions, legal authority and milestones

Addresses RFI Questions 5(n–p), 7–11 and 13–18, including 17(a–c).

Congress gave HHS a mandatory electronic-product-radiation control program; the specific measures below are recommendations for carrying out that mandate. Under 21 U.S.C. § 360ii(a), the Secretary “shall establish and carry out” an electronic product radiation control program to protect the public. That program must develop performance standards, support research to minimize unnecessary exposure, study conditions of exposure, and develop techniques for minimizing exposure [63]. Each request below is tied to that duty. Milestones run from the date this RFI closes.

J.1 Correct the federal record and assess the evidence independently

1. **Reassess FDA's 2020 review.** FDA's *Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer* remains HHS's operative statement on cancer [43]. It predates the WHO-commissioned reviews, the Japan–Korea studies and the 2026 risk assessment [30–36]. Within six months, FDA should publish a formal reassessment stating whether each of the review's conclusions is retained, revised or withdrawn, and why. If the review is no longer an adequate basis for FDA's public statements, FDA should withdraw or revise it and those statements. Until the reassessment

is published, FDA and NIEHS webpages should state that the question is under re-evaluation.

2. **Commission an independent hazard and risk assessment.** The Office of the Assistant Secretary for Health (OASH) should commission an outcome-by-outcome assessment of cancer, reproduction, neurodevelopment and sleep. It should use the systematic-review and risk-assessment methods HHS and EPA apply to chemical agents. It should include a quantitative dose–response analysis of the NTP, Ramazzini and Japan–Korea data that reproduces the published risk calculations, tests reasonable alternative models and assumptions, and states whether regulatory recommendations change [1,33–37].
3. **Manage financial and institutional conflicts.** A 2007 systematic review of experimental RF studies found industry-funded studies less likely to report statistically significant effects [62]. HHS should publish defined conflict thresholds covering industry funding, advocacy roles and prior institutional positions. Members above those thresholds should be recused from the relevant judgments. All members’ funding and affiliations should be published, the panel’s expertise should be balanced, and disputed judgments should be adjudicated by reviewers without conflicts.

Deliverables: lead official, panel membership, conflict disclosures and assessment protocol within 90 days; draft assessment for public comment within nine months.

J.2 Restart federal RF toxicology

1. **Reverse NIEHS’s January 2024 position** that no further RF exposure studies are planned [42]. NIEHS’s own 2025 report on its follow-up exposure system concluded that high-quality studies of biological responses to RF remain needed given widespread human exposure [70]. The statute directs HHS to “plan, conduct, coordinate, and support research” on this exact subject [63].
2. **Joint data audit.** NIEHS should obtain individual-animal data from NTP, Ramazzini and the Japan–Korea studies. Within twelve months it should publish a data audit, a blinded common pathology review and a prespecified analysis plan stating whether quantitative pooling is scientifically justified, given the studies’ different exposure systems and dose metrics [1,33–35].
3. **Multi-dose replication.** NIEHS should design and fund a chronic bioassay with several exposure levels, including environmental-level exposures like Ramazzini’s. It should include both sexes, continuous temperature monitoring and modulations used by current fourth-generation (4G) and 5G networks. It should publish the protocol within twelve months, with a funded timetable for the two-year study.
4. **Report on Carcinogens.** HHS should nominate RF radiation for evaluation in the NTP Report on Carcinogens.
5. **Reproductive replication.** NIEHS and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) should replicate the sperm DNA and pregnancy-rate findings at exposures designed to avoid heating, with measured temperature, blinded assays and natural-mating endpoints [24,31].

Funding: HHS should request a dedicated appropriation for RF toxicology and exposure science and publish a program budget. As an illustrative order of magnitude, not a costed estimate, this commenter suggests about \$50 million over five years; for scale, the NTP rodent studies cost about \$30 million.

J.3 Fund targeted human research and exposure science

Each study below should register its protocol before data collection, use measured or validated modeled exposure rather than self-report alone, and publish all results, including nulls.

Child-centered infrastructure study. CDC, NIEHS and NCI should jointly develop a multicenter prospective school-exposure study alongside the Section H.3 site survey. Schools should be selected across prespecified gradients of measured—not merely distance-inferred—environmental RF exposure. The protocol should distinguish macrocell antennas, small cells, Wi-Fi, students’ own devices and other transmitters; capture frequency, beamforming/traffic variation, duty cycle, occupied-space field levels, time averaging, calibration and uncertainty; and reconstruct individual exposure where feasible with consent and privacy protections. Prespecified outcomes should include objectively assessed sleep and age-appropriate cognition or development, with adjustment for screen time, socioeconomic and educational differences, noise, air pollution and other relevant confounders. Cancer incidence would require a distinct long-latency registry-based design, not inference from short-term endpoints. Before recruitment, investigators should publish clinically meaningful effect sizes, power calculations, and results that would materially strengthen or weaken the rationale for further protective measures. Independent replication and public release of null as well as positive findings are essential.

Question	Lead	First deliverable (12 months)
Glioma and acoustic neuroma with 20+ years latency, by laterality and dose at tumor site [2,4,45–48]	National Cancer Institute (NCI)	Cohort-linkage feasibility study and harmonized exposure model
Adolescent memory and cumulative brain dose [18]	NIH, with NICHD	Registered cohort protocol separating RF dose from screen time
Sleep under nighttime device exposure [23]	NIH	Powered, blinded multi-night crossover trial with continuous exposure measurement
Male fertility and testicular dose [25,26,31]	NICHD	Couple-based cohort protocol with device-transmission records
Pregnancy outcomes and child behavior [27,53–55]	NICHD, with NIEHS	Prospective exposure collection embedded in existing birth cohorts
Cardiovascular effects in people with heart disease [28,29]	National Heart, Lung, and Blood Institute (NHLBI)	Blinded experimental protocol including clinical populations
Exposure measurement validity [10,11]	NIH and FDA	Interlaboratory comparison of meters, models and device records
Biological effects at 6G candidate frequencies, especially skin and eye	NIEHS, with FDA	Dosimetry and study protocol for the bands under international study

J.4 Use FDA’s authority over radiation-emitting products

Section 360kk directs the Secretary to prescribe performance standards to control electronic product radiation if the Secretary determines that such standards are necessary to protect public

health and safety. Standards may include testing requirements, warning labels and instructions. In making that determination, the Secretary must consider the latest scientific and medical data, standards recommended by other agencies and expert groups, and the reasonableness and technical feasibility of a standard for the product. Before prescribing a standard, the Secretary must consult federal and state agencies with related responsibilities and the Technical Electronic Product Radiation Safety Standards Committee. Any standard is adopted through notice-and-comment rulemaking and is subject to judicial review [63]. FDA has adopted standards under this authority for microwave ovens, lasers and other products in 21 CFR Subchapter J. It has never done so for wireless consumer devices. FDA should:

1. **Conduct and publish a determination under § 360kk for wireless consumer devices within twelve months, with a supporting technical and legal assessment. If the Secretary determines that a standard is necessary, consult the Technical Committee before prescribing it.**
2. **Address body-contact testing.** The assessment should evaluate requiring manufacturers to test and report SAR at zero separation from the body, and at positions people actually use, including pocket carry and use by children [57].
3. **Address point-of-sale disclosure.** It should evaluate disclosure of maximum SAR at the head and at body contact, the separation distance assumed in testing, and practical advice for reducing exposure.
4. **Explain the chosen path.** If FDA concludes that a standard is needed, it should begin rulemaking. If it concludes otherwise, it should explain why, and state whether interagency coordination, reporting requirements under 21 U.S.C. § 360nn, or other measures would address the same concerns [63].

The FCC regulates RF emissions from licensed devices and is an agency with related responsibilities that the statute requires FDA to consult. HHS should coordinate with the FCC so that any requirements are consistent, and should explain publicly how responsibilities are divided.

J.5 Symptoms, surveillance and sensitive populations

1. **CDC symptom surveillance.** CDC should pilot standardized surveillance for symptoms attributed to RF exposure with clinical partners. It should record reported symptoms, diagnoses, perceived exposure and measured exposure as separate fields, with a published case definition within twelve months.
2. **Registry linkage.** CDC and NCI should assess linking cancer registries (including brain and acoustic-neuroma cases) with consented device or carrier records, and publish a feasibility report within six months.
3. **Workers.** NIOSH should publish occupational RF exposure-assessment methods within twelve months.
4. **Implants.** FDA should publish device-specific interference guidance for implanted medical devices.
5. **Patient-informed studies.** NIH should fund blinded provocation studies of prolonged and overnight exposure, designed with affected people [21,22].

J.6 Environmental program

HHS should propose a joint program with EPA, the Department of Agriculture and Interior science agencies. It should publish its scope within six months and registered protocols for pollinator and livestock studies within twelve months [14,15,61].

J.7 Recommend health-based limits to the FCC, and act on precaution now

1. **Formal transmittal to the FCC.** Within twelve months, HHS should transmit to the FCC a formal health assessment for the remand proceeding [8,9]. It should state whether exposure limits derived from health endpoints rather than heating alone are warranted, with explicit attention to children, pregnancy and chronic exposure. It should rest on the independent risk assessment described in Sections F.2 and J.1, and request a public FCC response.
2. **Interim public guidance within 90 days.** It should cover using speakerphone or wired headsets, keeping phones off the body and out of pockets, keeping devices out of beds and away from sleeping children, preferring wired connections at home, and following medical-device instructions. It should state plainly why HHS is issuing it: because the research shows unresolved risk, not because harm is proven.
3. **School and childcare guidance within six months,** issued by CDC with the Department of Education, as specified in Section H.2.
4. **No unvalidated products.** The guidance should not endorse shielding products or suggest that purchases are needed.
5. **Child-centered siting.** Within twelve months, include child-protective siting criteria in the formal transmittal to the FCC and publish guidance for school districts and childcare operators, as described in Section H.3. Within six months, CDC and NIEHS should publish a protocol for measuring existing installations on and next to child-serving property.
6. **6G before deployment.** Within twelve months, publish the frequency-, waveform- and exposure-specific 6G assessment plan and a pre-deployment plan covering the steps in Section G.3, and ask the FCC to seek HHS's health assessment before authorizing commercial 6G service.

J.8 Accountability and milestones

When
(from RFI
close)

	Deliverable	Responsible
90 days	Lead official named; assessment panel and conflicts published; interim public guidance issued	OASH
6 months	FDA reassessment of its 2020 review published; school and childcare guidance; survey protocol for installations at child-serving sites; registry feasibility report; environmental program scope	FDA, CDC, NIEHS, NCI
9 months	Draft hazard and risk assessment for public comment	OASH, NIEHS
12 months	Joint animal data audit and common pathology review; replication protocol; FDA determination under § 360kk with technical and legal assessment; formal transmittal to FCC, including child-protective siting criteria; 6G pre-deployment assessment plan; registered human-study protocols	NIEHS, FDA, OASH, NIH

When (from RFI close)	Deliverable	Responsible
Annually	Public report on every deliverable, funding, positive and null results, and any change in guidance with reasons	OASH

A replicated hazard, a result crossing a prespecified health threshold, or a finding that exposure was materially misclassified should trigger an explicit reassessment of guidance and of the recommendation to the FCC. A precise null result should narrow the concern for the conditions tested, not be generalized beyond them.

Conclusion

The federal government’s own toxicology program reported clear evidence of carcinogenic activity in male rats exposed to cell-phone RF radiation. An independent laboratory found the same rare tumor under a far-field GSM exposure system designed to model base-station emissions. WHO’s reviewers rated that animal evidence at high certainty, an assessment that remains contested [56,68], and found high-certainty evidence of reduced pregnancy rates in animals. The authors of a 2026 risk assessment using EPA-style methods estimated that current limits are not protective against either outcome, an estimate HHS should test itself. In people, case-control studies report elevated tumor estimates among the heaviest and longest-term users, a signal consistent with the animal findings that prospective and pediatric studies have not resolved. Requiring conclusive proof of long-latency human cancer before taking precautionary action would leave potentially avoidable or unnecessary exposures unaddressed for decades. HHS should act now while commissioning the research needed to determine the magnitude and conditions of any risk, including the work NIEHS set aside in 2024, rather than treating compliance with limits derived primarily from thermal-effect thresholds as resolving questions about chronic outcomes.

Congress gave HHS the duty to protect the public from electronic product radiation, including through performance standards and research to minimize unnecessary exposure. HHS should correct its outdated public statements, reinvigorate its research, use FDA’s authority over wireless devices, give the FCC a health-based recommendation, and tell families and schools now how to reduce exposure. HHS should report publicly on every step and change course when the evidence warrants.

Submitter and perspective (Question 2). Submitted by Ethan Augreen in an individual capacity, as a member of the public with professional experience in environmental policy. This comment is based on peer-reviewed studies, government scientific reports, regulatory texts, international guidelines and a federal judicial decision, each cited by number.

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Appendix. Where each RFI question is answered

RFI question	Where answered
2 Perspective	Submitter statement
3(a–g) Personal experiences	Not addressed; this comment contains no personal medical information
4(h–m) Clinical and research observations	B–E, H; research design in J.3 and J.5
5(n–p) Standards, changes, classification	F.1, F.4, G.1; FDA authority in J.4; FCC recommendation in J.7
6 Harm caused by current limits	F.2, B.2, D.1
7–9 Exposure methods and disclosure	G.1, G.5; J.3, J.4
10(a–h) Surveillance	J.5
11(a–g) Sensitive populations	H, including H.3 (infrastructure near children); J.7
12 Harm below federal limits	F.2, B.2, B.5
13(a–k) Technologies and cumulative exposure	G.2 covers 5G and selected contemporary sources; G.3 covers 6G; several other listed technologies are not separately evaluated
14 Environmental effects	I; J.6
15(a–e) Infrastructure	G.4, H.3, B.2, I
16 Research priorities	J.2, J.3
17(a–c) FDA, NIH, CDC roles	J.1–J.5, J.8
18 Additional evidence	A, B.6, F.4