

Responding to Wi-Fi Safety Concerns in Our Schools

January 2014

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Executive Summary

In 2013, a concerned Washington resident contacted the state Office of Superintendent of Public Instruction (OSPI) and the Department of Health (Health) about the safety of Wireless Fidelity (Wi-Fi) in schools. The state agreed to evaluate comprehensive reviews of the literature on the health effects of radiofrequency (RF) radiation. This report summarizes the findings of those reviews, but does not present state policy or recommendations on the use of Wi-Fi in schools.

A draft report was posted to the Department of Health website on January 31, 2014, and public comments were collected until March 3, 2014. The state received public comments from 58 individuals. Many of them included documents or references that were not evaluated in this report. The draft report was modified based on public comments, and responses to comments submitted by Washington residents are included in an appendix at the end of this report.

The Health-OSPI work group found 15 documents that satisfied the evaluation criteria. Each document was a comprehensive literature review of the health impact of human exposure to RF fields, and was published in English between January, 2000 and March, 2014 by a national or international health agency.

Among the 15 documents that were evaluated, 11 concluded there is no clear and consistent evidence that low levels of RF have any adverse health effects. The other four concluded there is limited and uncertain evidence that cell phone use can cause brain tumors; however, these four documents also concluded there is no evidence that RF field exposure at levels much lower than cell phones (which would include Wi-Fi) has any adverse health effect.

Introduction

Washington has 295 school districts with more than 2,200 buildings and more than one million students. School staff, parents, and students all expect schools to provide a healthy and comfortable environment conducive to learning and teaching.

In today's classroom, devices using Wi-Fi are commonly used for both administrative and instructional purposes. In 2012-13, more than 90 percent of Washington schools reported providing wireless access in one or more classrooms, and more than two-thirds of buildings provided wireless access throughout the building. Devices—such as tablets, smart phones, and wireless laptops—are used in many Washington schools by educators and students for tasks ranging from taking attendance to accessing online instructional materials.

A concerned Washington resident questioned the safety of Wi-Fi in schools. In response to this concern, the Washington State Office of Superintendent of Public Instruction and Department of Health have evaluated studies conducted by national or international health agencies that had already carried out comprehensive reviews of the literature on the health effects of radiofrequency (RF) radiation. This report presents the findings of these reviews.

Background

The fields generated by Wi-Fi devices are in the RF part of the electromagnetic spectrum. Cell phones, cell towers, radar, microwaves, and radio and TV broadcasts also generate RF fields. Most studies regarding the health effects of RF fields have evaluated cell phones because the level of exposure from cell phones is far greater than that from other devices, including Wi-Fi. Therefore, cell phones can be used as an indicator for health risks from other RF devices, at least if no evidence of risk is found; if there is no evidence of risk associated with cell phone use, then there is also no evidence of risk from other RF devices.

The International Commission on Non-Ionizing Radiation Protection (international commission, ICNIRP), which is associated with the World Health Organization (WHO), sets guidelines for exposure to RF fields. At high levels, RF can cause dangerous thermal (heat) effects, such as those caused inside microwave ovens. The international commission sets RF exposure levels so that thermal effects will not occur. The commission's review of the science found that thermal effects do not occur below a power density limit of 4 watts per kilogram (W/kg), and after incorporating a 50-fold safety factor, they have established a safety limit of 0.08 W/kg for public RF exposure for the whole body, and 2 W/kg for localized exposure (Appendix A, document 5). Among RF devices to which the public is commonly exposed, cell phones provide by far the highest exposure, with some models providing an exposure of 1 W/kg or more to the head. Wi-Fi, cell towers, and Bluetooth devices all provide roughly similar levels of exposure, about 100 to 1,000 times lower than exposure from cell phones (Appendix A, documents 5 and 6).

Documents Review Process

An enormous amount of research has been conducted into the possible health effects of RF fields. The WHO maintains a catalog of this research that includes more than [3,000 scientific articles](#). The Health-OSPI work group determined that conducting a comprehensive review of this research was not feasible within current staffing resources. Because it wasn't possible to review all individual reports, and selecting a subset of reports might lead to inaccurate or biased conclusions, the work group decided to evaluate existing comprehensive reviews that have already been conducted, and to summarize the findings of those reviews.

To be certain of not selecting only particular viewpoints, the work group established objective criteria and conducted a search to find all reviews meeting those criteria. The criteria the reviews had to satisfy included that they were:

- Conducted by a national or international health agency.
- Published in English or had an official summary published in English.
- Published between 2000 and March, 2014.

- A comprehensive review of the scientific literature on some aspect of the health impact of human exposure to RF fields.

Some agencies published updated versions of previous reviews during this time period. When this was the case, the work group included only the most recent version of the review. Some agencies published separate reviews of different health impacts of RF field exposure. In these cases, the work group included each of the reviews. The work group found 15 documents satisfying the criteria and reviewed them for this report. The documents came from eight national health agencies and six international health agencies (one agency had two reports included in the review) Appendix A lists the 15 documents.

For each document, the Health-OSPI work group determined:

- The exposure and health outcome categories to be evaluated. The work group looked for exposure categories of RF fields, RF fields in children, Wi-Fi, Wi-Fi in schools, Wi-Fi in other settings, mobile phones, cell towers, and other. Health outcome categories included cancer (meningioma, glioma, acoustic neuroma, other or unspecified brain tumors, or other cancers), non-cancer health effects (cognitive, behavioral, immune system, hearing, brain development, nerve conduction, endocrine system or other), and electrosensitivity.
- The findings for each health outcome category.
- Whether each document provided an overall conclusion regarding health risks from RF field exposure in general and Wi-Fi exposure specifically.
- If the document discussed how or whether the precautionary principle applies.

For each document, the work group summarized the overall scientific findings, including uncertainties. These are summarized in Table 1, and the [accompanying Excel spreadsheet](#) provides the entire set of data for each document.

TABLE 1: Overall scientific findings regarding RF field exposure and conclusion of 15 documents reviewed

Country/Entity	Year Published	Overall scientific findings/conclusions (Text in quotes represents a direct quote from the document; otherwise, text is a summary of the document's conclusion):
Canada ¹	2014	(p. 10) "Therefore, the Panel has concluded that the balance of evidence at this time does not indicate negative health effects from exposure to RF energy below the limits recommended in the Safety Code. However, research on many of these health effects is ongoing and it is possible that the findings of future studies may alter this balance of evidence."
France ²	2013	(p. 23) Biological effects below the exposure limits can be observed, but a causal relationship with adverse health effects has not been established. There is no rationale for proposing new exposure limits for the general population. There is limited evidence that there may be an increase in risk of glioma among intensive mobile phone users, but the evidence indicates that if there is an increased risk, it is low.
The Netherlands ³	2013	(p. 121) "Based on the available epidemiological evidence described in this report and taking into account the quality of the different studies and their strengths and weaknesses, the final conclusion from this systematic analysis is then, that there is no clear and consistent evidence for an increased risk of tumours in the brain and other regions in the head in association with up to approximately 13 years use of a mobile telephone. For longer term use, for which no data are available, such risk cannot be excluded at present."
Sweden ⁴	2013	(p. 9-10) There is no good evidence of adverse health effects of RF field exposure, but there is still uncertainty regarding the effects of long-term (more than 15 years) exposure to cell phones.
WHO ⁵	2013	(p. 419) "There is limited evidence in humans for the carcinogenicity of radiofrequency radiation. Positive associations have been observed between exposure to radiofrequency radiation from wireless phones and glioma, and acoustic neuroma." (p. 419) "Radiofrequency electromagnetic fields are possibly carcinogenic to humans (Group 2B)." There was no evidence that environmental exposure [i.e. RF from cell towers and radio/TV transmitters] causes cancer.
England ⁶	2012	(p. 4) "...in summary, although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children."
European Union ⁷	2012	(p. 41-44) There is limited evidence that long-term cell phone exposure causes brain tumors in adults, evidence that RF does not cause symptoms in electrosensitive people, and inadequate evidence for all other associations that were considered.

Norway ⁸	2012	(p. 38) "The large total number of studies provides no evidence that exposure to weak RF fields causes adverse health effects. Some measurable biological / physiological effects cannot be ruled out." (p. 38) "This uncertainty [regarding mobile phone use] is considered to be low. There is negligible uncertainty in the risk assessment associated with other sources, such as base stations, wireless networks, ..."
The Netherlands ⁹	2011	(p. 33-34) Based on currently available knowledge, there is not an increased risk of harmful health effects in children from RF exposure from cell phones, cell towers, or Wi-Fi, but more research is needed.
European Union ¹⁰	2010	(p. 29) "...the environmental levels of RF due to anthropogenic sources are not sufficient to produce observable health effects." But there is still scientific uncertainty, especially regarding long-term exposure.
European Union ¹¹	2009	(p. 60-61) Exposure to RF fields is unlikely to cause cancer in humans, according to epidemiological, animal, and in vitro studies, but there is still some uncertainty regarding the effects of long-term exposure. There is some evidence RF exposure can influence EEG patterns but the health relevance of this is uncertain. Studies on functions of the nervous system, including cognitive and sensory functions, and studies on human reproduction and development show no or no consistent effects. Information on the possible effects of RF fields in children is limited.
ICNIRP ¹²	2009	(p. 260-261) The plausibility of the mechanisms that have been proposed for non-thermal effects is very low. Recent studies suggest that genotoxicity effects are unlikely. There may be effects on other endpoints, such as cell signaling and EEG, but there is no evidence of adverse health effects associated with them. There is no consistent evidence of increased cancer risk, but there is still uncertainty regarding long-term effects. The data do not suggest that children are more susceptible than adults to the effects of RF radiation, but there have been few studies.
Ireland ¹³	2007	(p. 3) "So far no adverse short or long-term health effects have been found from exposure to the RF signals produced by mobile phones and base station transmitters. RF signals have not been found to cause cancer. However research is underway to investigate whether there are likely to be any subtle, noncancer effects on children and adolescents."
Australia ¹⁴	2002	(p. 76) No adverse health effects have been consistently observed when exposures are within the current standards. There is no need to revise the standards to lower exposure levels.
New Zealand ¹⁵	2000	(p. 2) "The Ministry of Health considers there are no established adverse effects from exposures to radiofrequency fields which comply with the ICNIRP guidelines and the New Zealand Standard."

Summary/Results

Among the 15 documents the work group included in the review, 14 reported on the health effects of RF fields in general, and one reported solely on the health effects of cell phones (See Table 2.) Twelve of the documents commented on health effects of RF field exposure in children. Only four of the documents commented specifically on the health effects of Wi-Fi. Fourteen documents reviewed evidence about the relationship between RF field exposure and cancer. Two of these documents were concerned only with cancer; the others also included a review of at least some other health conditions, but the specific conditions varied among the documents. Nine of the documents were published in 2011 or more recently, and as a whole, the documents include a review of the most recent research in the field.

The documents generally described their conclusions in terms of there being ‘no evidence’ or ‘no clear and consistent evidence’ that RF field exposure causes a particular health effect (except for the few times they concluded there was limited evidence of an effect). It is usually very difficult for health studies to show that a harmful effect does not exist, so a conclusion of ‘no evidence’ of a harmful effect may cover a wide range of possibilities—it may mean that numerous high-quality studies found no harmful effect, or it may mean that few studies evaluated the effect. For this reason, the work group also tabulated the uncertainty in the estimates of effect, when that was reported.

Among the 15 comprehensive review documents that were evaluated, 11 concluded there is no clear and consistent evidence that low levels of RF field exposures have any adverse health effects. Four of the 15 documents concluded there is limited and uncertain evidence that cell phone use can cause brain tumors; however, these four documents also concluded there is no evidence that RF exposure at levels much lower than cell phones, such as those obtained from Wi-Fi, has any adverse health effect.

Many of the documents noted that cell phones have been used for a shorter period of time than the latency period for slow-growing brain tumors, such as meningioma and acoustic neuroma. Therefore, epidemiological studies have not properly evaluated the health effects of long-term use. Most of these documents also noted that since cell phone prevalence was very high (approaching 100 percent) in many countries by 2000, some effects on national trends should have been seen by now unless the increased risk due to cell phone use is small.

Nine of the documents specifically stated that the long-term effects of cell phone use are still uncertain, or that long-term studies are needed. Two of the documents concluded that there was little uncertainty in their assessment that RF field exposure has no adverse health effects. Among the nine documents that concluded there is uncertainty regarding cell phone use, none of the documents concluded that there is uncertainty regarding low-level RF exposure.

Eight of the documents addressed the possible cognitive effects of RF exposure. All eight of these documents concluded that there is no clear and consistent evidence that RF exposure has adverse cognitive effects. Three of the documents addressed behavioral effects. All three

concluded there is no clear and consistent evidence that RF exposure has adverse behavioral effects.

Several other health effects were addressed by one or more of the documents, including effects on the immune system, hearing, brain development and function, nerve conduction, the endocrine system, the cardiovascular system, and the reproductive system. No clear and consistent evidence for adverse health effects was found for any of these. Although RF field exposure was found to possibly affect nerve conduction, this was not associated with adverse health effects.

Eight of the documents commented on the phenomenon of electrosensitivity—the phenomenon in which people exhibit symptoms that they attribute to RF or other electromagnetic field (EMF) exposure. Several documents stated that it is well-established that the symptoms exhibited by electrosensitive people are real, and can be severe, to the point that some people are disabled or have their lives disrupted by their symptoms. The documents were unanimous though in concluding that there is good evidence from numerous, well-controlled studies that these symptoms are not actually caused by RF or EMF exposure. Further, there is no evidence that anyone can detect the presence of EMF at the levels to which people are commonly exposed.

Six of the documents mentioned the precautionary principle in some way, although there was a wide range of how that principle was interpreted. This ranged from limiting unnecessary exposure to recommending that children should minimize cell phone use. None of the documents that mentioned the precautionary principle advocated eliminating the use of Wi-Fi.

One report (Appendix A, document 6) measured the magnitude of exposure to RF fields in school settings, and concluded that levels were far below the international commission threshold.

Conclusion

The work group evaluated studies conducted by national or international health agencies that have carried out comprehensive reviews of the literature on the health effects of exposure to RF radiation, and that have been published in English between 2000 and March, 2014. The consensus conclusion of these 15 documents was that there is no clear and consistent evidence that low levels of RF fields, such as produced by Wi-Fi equipment, have any adverse health effects in people. Although there is some uncertainty regarding the possible effects of cell phones, which expose users to RF fields with much higher power density than Wi-Fi, the documents assert there is little uncertainty regarding health effects of the low levels of RF field exposures produced by Wi-Fi equipment.

TABLE 2: Characteristics and conclusions of the 15 reviewed documents

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Reported on RF fields in general	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Reported on cell phones only			X												
Reported on RF in children	X	X		X		X	X	X	X	X	X	X	X	X	
Reported on health effects of Wi-Fi					X		X	X					X		
Concluded there is no evidence RF has adverse health effects	X	X	X		X	X		X		X	X	X	X		X
Concluded there is limited evidence cell phones cause brain tumors				X			X		X					X	
Concluded long-term effects of cell phone use are still uncertain	X	X	X	X	X		X			X	X	X			
Concluded there is little uncertainty in conclusion of no adverse effects					X		X								
Reported on cognitive effects	X	X		X		X			X	X	X	X			
Reported on behavioral effects						X		X	X						
Reported on electrosensitivity	X			X		X	X	X			X	X	X		

Appendix A: Documents Reviewed

Text in parentheses at the end of each citation refers to the corresponding tab in the accompanying spreadsheet.

1. The Royal Society of Canada. A Review of Safety Code 6 (2013): Health Canada's Safety Limits for Exposure to Radiofrequency Fields. The Royal Society of Canada, 2014. http://rsc-src.ca/sites/default/files/pdf/SC6_Report_Formatted_1.pdf, accessed on April 1, 2014. (Canada14)
2. ANSES. Opinion of the French Agency for Food, Environmental and Occupational Health & Safety concerning the update of the "Radiofrequency electromagnetic fields and health" expert appraisal. ANSES, 2013. <http://www.anses.fr/en/documents/AP2011sa0150RaEN.pdf>, accessed on March 18, 2014. (Fr13)
3. Health Council of the Netherlands. Mobile phones and cancer. Part 1: Epidemiology of tumours in the head. Health Council of the Netherlands, 2013. <http://www.gezondheidsraad.nl/en/publications/environmental-health/mobile-phones-and-cancer-part-1-epidemiology-tumours-head>, accessed on September 12, 2013. (Neth13)
4. SSM:s Scientific Council on Electromagnetic Fields. Eighth report from SSM:s scientific council on electromagnetic fields. 2013:19, Swedish Radiation Safety Authority, SSM, 2013. <http://www.stralsakerhetsmyndigheten.se/om-myndigheten/Organisation/Radnamnder/Vetenskapligt-rad-for-elektromagnetiska-falt/>, accessed on September 11, 2013. (Swed13)
5. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Non-ionizing radiation, Part II: Radiofrequency electromagnetic fields, vol. 102. Geneva: International Agency for Research on Cancer (IARC), 2013. <http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf>, accessed on September 5, 2013. (WHO13)
6. Independent Advisory Group in Non-ionising Radiation. Health effects from radiofrequency electromagnetic fields. ISBN 978-0-85951-714-0, Health Protection Agency, 2012. <http://www.hpa.org.uk/Publications/Radiation/DocumentsOfTheHPA/RCE20HealthEffectsfromRFElectromagneticFields/>, accessed on September 17, 2013. (Eng12)
7. European Health Risk Assessment Network on Electromagnetic Fields Exposure. Risk analysis of human exposure to electromagnetic fields (revised). EFHRAN, 2012. http://efhran.polimi.it/docs/D2_Finalversion_oct2012.pdf, accessed on September 20, 2013. (EU12)
8. The Expert Committee. Low-level radiofrequency electromagnetic fields an assessment of health risks and evaluation of regulatory practice. ISBN: 978-82-8082-509-4, Norwegian Institute of Public Health, 2012. <http://www.fhi.no/dokumenter/c5ab86c32b.pdf>, accessed on September 17, 2013. (Nor12)

9. Health Council of the Netherlands. Influence of radiofrequency telecommunication signals on children's brains. Health Council of the Netherlands, 2011. <http://www.gezondheidsraad.nl/en/publications/environmental-health/influence-radiofrequency-telecommunication-signals-children-s-brai>, accessed on September 12, 2013. (Neth11)
10. Promoting healthy environments with a focus on the impact of actions on electromagnetic fields (lot 3). Contract Reference: 2009 62 03, Executive Agency for Health and Consumers, 2010. http://ec.europa.eu/health/electromagnetic_fields/docs/bio_frep_en.pdf, accessed on September 13, 2013. (EU10)
11. SCENIHR (Scientific Committee on Emerging and Newly Identified Health Risks). Health effects of exposure to EMF. European Commission Health & Consumer Protection Directorate-General, 2009. http://ec.europa.eu/health/ph_risk/committees/04_scenihp/docs/scenihp_o_022.pdf, accessed September 5, 2013. (EU-09)
12. Vecchia P, Matthes R, Ziegelberger G, et al. Exposure to high frequency electromagnetic fields, biological effects and health consequences (100 kHz–300 GHz). International Commission on Nonionizing Radiation Protection (ICNIRP), 2009. <http://www.icnirp.de/documents/RFReview.pdf>, accessed on September 5, 2013. (ICNIRP-09)
13. Health effects of electromagnetic fields. Ireland Department of Communications, Marine and Natural Resources, 2007. <http://www.dcenr.gov.ie/NR/rdonlyres/9E29937F-1A27-4A16-A8C3-F403A623300C/0/ElectromagneticReport.pdf>, accessed on September 13, 2013. (Ire-07)
14. Maximum exposure levels to radiofrequency fields 3 kHz to 300 GHz. Radiation Protection Series Number 3, Australian Radiation Protection and Nuclear Safety Agency, 2002. <http://www.arpansa.gov.au/Publications/codes/rps3.cfm>, accessed on September 13, 2013. (Aust-02)
15. Ministry for the Environment, in partnership with the Ministry of Health. National guidelines for managing the effects of radiofrequency transmitters. The Ministry for the Environment, 2000. <http://www.mfe.govt.nz/publications/rma/radio-freq-guidelines-dec00.html>, accessed on September 24, 2013. (NZ-00)

APPENDIX B: Glossary

Terminology	Definition
acoustic neuroma	An acoustic neuroma is a rare, usually slow-growing tumor of the inner ear, specifically of the nerve that connects the ear to the brain (the hearing nerve). This type of brain tumor develops in the eighth cranial nerve, which controls hearing and balance and is located in the inner ear near the back of the skull.
behavioral effects	In RF studies, this may refer to many aspects of animal and human behavior; in this review, it refers to general behavior in people, especially children, such as the ability to concentrate on tasks or follow directions.
cognitive effects	These include effects on conscious mental activities such as thinking, understanding, learning, and remembering.
electrosensitivity	A common name for the phenomenon in which some people are sensitive to the presence of electromagnetic fields, either to RF fields, or to other parts of the EMF spectrum. Electrosensitivity is associated with a very wide range of symptoms, including some which are clinically observable, such as skin rashes and heart rate variability. Some medical organizations have termed this phenomenon "idiopathic environmental intolerance attributed to electromagnetic fields" (IEI-EMF) to reflect the fact that the actual cause of the symptoms is unknown.
EMF	EMF is an acronym for electromagnetic fields.
glioma	A glioma is a type of tumor that starts in the brain or spine.
meningioma	Meningiomas are a diverse set of tumors arising from the meninges, the membranous layers surrounding the central nervous system.
nerve conduction	The electrical conduction of nerve cells in either the peripheral or central nervous systems. Usually measured with an electroencephalogram (EEG) or a test of event-related potential (ERP).
power density	The rate at which energy from an electromagnetic field is absorbed by human tissue.
precautionary principle	There are many definitions of this concept; all of them express the idea that when there is evidence that a particular exposure is harmful, people or governments need not wait for proof of harm before taking steps to limit exposure.
RF	RF stands for <i>radiofrequency</i> , part of the electromagnetic spectrum.
SAR	SAR stands for <i>specific absorption rate</i> , a measure of the intensity of the radiofrequency field produced by a device.
Wi-Fi	Wi-Fi stands for <i>wireless fidelity</i> ; Wi-Fi is a popular technology that allows an electronic device to exchange data or connect to the Internet wirelessly using radio waves.

APPENDIX C: Public Comments

<ul style="list-style-type: none"> • Comments included in this document are from Washington residents only. • To protect privacy, commenter's street addresses, email addresses and telephone numbers have been redacted. • Multiple comments from the same person are combined in one PDF file. • Click on each name below to read comments. 	Advocated no Wi-Fi in schools.	Advocated use of precautionary principle.	Expressed concern about possible bias of documents reviewed or omission of other documents, studies, or expert testimony.	Asserted that other countries have banned Wi-Fi in schools.	Mentioned electrosensitivity or stated personal effect of RF on themselves.	Expressed concern that DOH/OSPI only summarized the documents reviewed, or details from documents reviewed were not included in the report.	Expressed concern that current safety standards are out of date and are not based on all possible health outcomes.	Expressed concern that research is biased by industry funding.
Ace Swerling	X				X			
Ann Marie Fischer	X		X		X			
Audrey Adams	X	X						
Avantika Nirupama	X	X	X	X				
Brigitta Erhard	X	X			X			
Cynthia Franklin		X	X					
David Morrison	X		X	X				X
Erica Swedberg	X		X					
Erin Honeycutt	X	X	X					X
Evelyn Savarin	X		X					X
Faith de Coeur	X		X					
Gert Gustedt	X							
Jeffri D Smith			X					
Jordan Van Voast	X	X	X				X	
Judi Hangartner	X							
Julienne Battalia			X					X
Kaitlin Losansky	X	X	X					X
Karen Nold	X	X	X			X		X
Kulany Hanson (Roeksbutr)	X				X			
Laura Legere	X	X	X			X		X
Martin Pall	X		X				X	
Michael Meek	X	X	X					
Miranda Taylor	X		X					
Nancy Morris	X	X	X		X	X		X
Olemara Peters	X		X				X	
Rose Miller	X							

Sandra Storwick	X	X	X		X	X		
Shirleann Nold	X		X					
Sonia M. Hoglander	X	X	X			X		X
Stephanie Lecovin	X	X						
Stephen F. Ludwig	X	X	X			X		X
Terry Losansky	X	X	X			X		X

APPENDIX D: Response to Comments

Report changes based upon comments

The typographical error identifying the Health Council of the Netherlands report (formerly Document 1) as the sole document that measured the exposure to RF field exposures in school has been corrected to Health England (now Document 6).

The final report has been modified to include discussion of the precautionary principle. Other minor changes were made to clarify the report.

The French 2013 report “Opinion of the French Agency for Food, Environmental and Occupational Health & Safety concerning the update of the ‘Radiofrequency electromagnetic fields and health’ expert appraisal” met our criteria and was added to the report with its accompanying spreadsheet (new Document 2). As a result, we have removed the 2005 French report from the final document (formerly Document 13).

Two documents in the draft report were determined not to meet the criteria for inclusion, and were removed from the final report. They were the 2011 document from Spain (formerly Document 8), which was sponsored by a university (Fundación General of the Complutense University of Madrid), not by a health agency; and the 2003 report from the USA National Council on Radiation Protection and Measurements (formerly Document 14), because that body accepts corporate sponsorship.

Another document that meets the criteria for inclusion was published after the comment period ended, and has also been added. This document is “A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields,” published in March, 2014 (new Document 1).

Responses to specific comments submitted by Washington residents

See Appendix C: Public Comments – page 12

Comment: Advocated no Wi-Fi in schools.

The decision to use Wi-Fi in schools is a policy decision that this report does not address. This report only reviews the evidence concerning the safety and potential health effects of Wi-Fi in schools.

Comment: Advocated use of precautionary principle.

The final report has been modified to include discussion of the precautionary principle. The decision to use the precautionary principle is a policy decision that this report does not address.

Comment: Expressed concern about possible bias of documents reviewed or omission of other documents, studies, or expert testimony.

As noted above, two documents were removed from the final report.

Several comments recommended additional studies, expert opinion, or other documents to include in this report. We did not include these suggested studies, as they did not meet our stated criteria (e.g., they were not conducted by a national or international health agency, or they did not include a comprehensive review of the scientific literature).

Comment: Asserted that other countries have banned Wi-Fi in schools.

The Health-OSPI work group have not found any evidence to support the assertion that other countries have banned Wi-Fi in schools.

Comment: Mentioned electrosensitivity or stated personal effect of RF fields on themselves.

As noted in the report, several documents stated that it is well-established that the symptoms exhibited by electrosensitive people are real, and can be severe, to the point that some people are disabled or have their lives disrupted by their symptoms. However, the eight documents that addressed electrosensitivity were unanimous in concluding that there is good evidence from numerous, well-controlled studies that these symptoms are not actually caused by RF or EMF exposure. Further, there is no evidence that anyone can detect the presence of EMF at the levels to which people are commonly exposed.

Comment: Expressed concern that Health-OSPI work group only summarized the documents reviewed, or details from documents reviewed were not included in the report.

As described in the Documents Review Process section, the goal was to “summarize the overall scientific findings, including uncertainties,” which was generally provided in the executive summary of each document reviewed. The report includes links to the complete documents, so those who are interested can read the complete details provided in those documents.

Comment: Expressed concern that current safety standards are out of date and are not based on all possible health outcomes.

The International Commission on Nonionizing Radiation Protection (ICNIRP) sets recommended standards for RF exposure limits, and the limits are based upon a review of the scientific literature. The most recent review of the standards are included in Document 12, one of the reviews evaluated in this report. The ICNIRP standards are based on thermal effects; however, the ICNIRP evaluates all other known outcomes when setting or reviewing standards.

Comment: Expressed concern that research is biased by industry funding.

None of the reviews that were evaluated were funded by industry; however, the Health-OSPI work group acknowledge that some of the authors of these reviews may be associated with industry in other contexts.

Specific concerns were expressed that a document prepared by the ICNIRP was included, and that individuals associated with the ICNIRP served as authors on other included documents. The ICNIRP is publicly funded, and does not accept industry funding.