FAQ, FREQUENTLY ASKED QUESTIONS, FREEWAY AIR TOXINS

1. WHY ARE CITIZENS CONCERNED ABOUT FREEWAY AIR TOXINS?

The city of Pasadena has recently done at least two things that severely threaten residents' health.

First, in the last several years, the city has approved construction of roughly 1230 residences, mostly apartments, in the high-diesel-pollution zones beside, or within 700 feet of, Interstate-210. This is directly **contrary to decades of California Air Board recommendations** against any near-freeway residential development.

Second, on 1-24-19, the city released its **"East Pasadena Draft Vision."** (East Pasadena includes mainly the areas East of Hill Street and North of Colorado Boulevard.) The city's "draft vision" called for massive rezoning of East Pasadena residential neighborhoods, so as to make them a "commercial destination center in the city."

Yet because of I-210 freeway pollution and natural wind patterns, **East Pasadena already has more diesel pollution than 70% of all California communities**. Because diesel particles are responsible for nearly all cancers caused by Los Angeles County air pollution, and because East Pasadena is one of the worst diesel-pollution areas of the state, East Pasadena residents already suffer disproportionate health threats, compared to the rest of the city and the state.

The city's "vision" thus appears to condemn the 22,000 residents of East Pasadena to even worse health harm and more deaths than they already face because of their disproportionate freeway-diesel pollution. **East Pasadena residents already have more freeway-diesel-caused autism, cancer, dementia, heart attacks, and strokes than 70% of other Californians**. Yet the city of Pasadena wants to **increase the health threats, deadly pollution, and traffic burdens of these 22,000 East Pasadena residents.** This is unfair, contradicts state health recommendations, and amounts to environmental injustice**.**[1]

Notes
1. See "The Problem" earlier in this section of the website.

2. HOW RISKY IS IT TO LIVE BESIDE THE FREEWAY?

Living within 1000 feet of a freeway causes much "higher rates of asthma, heart attacks, strokes, lung and other cancers, pre-term births, childhood obesity, autism, and dementia."[1] The major culprit in all this harm is diesel particulates; they are responsible for 70 percent of all Los Angeles County cancers caused by air pollution.[2] The closer that people live to a freeway, the higher their cancer rates. For this reason, for several decades California Air Board officials have repeatedly recommended that no residences be built within 500 feet of freeways.

The severe health effects of even the tiniest amounts diesel particles, for even a short period of time, are especially significant, given that both the Los Angeles and the Pasadena areas remain non-attainment areas for PM2.5 or diesel particles; that is, they violate state and federal health protections for freeway-diesel particles.[3] The magnitude of diesel-particle effects also is massive, given that US vehicle pollution, especially from diesel trucks, kills nearly twice as many people as vehicle accidents---which are one of the top ten causes of death of all Americans through the age of 54.[4]

Those living next to a heavily-trafficked freeway likewise are 6 times more likely to develop all types of cancer, and 8 times more likely to get leukemia.[5] Similar near-freeway statistics hold for heart disease, including strokes and heart attacks; living within 200 feet of a roadway increases sudden cardiac deaths by nearly 40 percent.[6] Because diesel particles easily enter the brain, the closer one lives to a freeway, the greater one's risk for dementia.[7]

However, in 2018 when the city of Pasadena and developers were supposed to assess site-caused cancers caused by a city-approved, beside-the-freeway development,[8] they underestimated near-freeway health risks, especially from diesel particles. They said that in general, year-2000 California diesel-particle levels killed on average about 1 in every 2632 exposed residents.[9] Yet the city's assessment never provided near-freeway, diesel-particle levels for its project, and it never gave diesel-particle risks for residents living near the heavily-diesel, 10-lane, interstate 210---the very risk they were supposed to estimate.

Once one corrects the city's incompleteness by using the most recent scientific data for diesel-truck volume and data specific to Interstate-210, the real I-210-freeway-diesel-particle risk to East Pasadena residents can be seen as quite high. For instance, given the measured truck volume on the I-210 at Lake Avenue, freeway-diesel-particle-caused cancers will prematurely kill 1 in every 526 exposed people who live 100 feet away for several decades. This is a cancer rate hundreds of times higher than allowed by regulations.[10]

Similarly, given the measured truck volume on the I-210 at Rosemead Avenue, freeway-diesel-particle-caused cancers will prematurely kill 1 in every 769 exposed people who live 100 feet away for several decades. Again, this is a cancer rate hundreds of times higher than allowed by regulations.[11]

Likewise, given the measured truck volume on the I-210 at Altadena Avenue, freeway-diesel-particle-caused cancers will prematurely kill 1 in every 625 exposed people who live 100 feet away for several decades. Again, this is a cancer rate hundreds of times higher than allowed.[12]

Moreover, people residing even 1000 feet away from these three locations on the I-210 freeway in Pasadena face roughly a 5-times higher cancer risk from diesel particles than other California residents face. These data show that although the diesel-cancer risk decreases, as one moves farther from the freeway, the severe diesel-cancer risk does not disappear until roughly a mile away.[10-12] Increasing one's premature cancer risk by a factor of 5, when half of us already will die prematurely from cancer, means that near-freeway residence makes diesel-particle-caused cancers very likely---even if we live 1000 or more feet away from the freeway.

Even worse, because children are still developing, because they do not have their detoxification mechanisms in place, and because they take in proportionately more air/water/food/pollution than adults, given their body weight, they face average diesel-cancer cancer risks that are 10 times higher than adults.[13] This means that, although 1 in every 526, 625, and 769 adults living for several decades, respectively, near the I-210 near Lake Avenue, Altadena Drive, and Rosemead Avenue, will die prematurely because of freeway-diesel pollution, children will be hurt even more. Roughly 1 in every 53, 63, and 77 children living for several decades, respectively, near the I-210 near Lake Avenue, Altadena Drive, and Rosemead Avenue, will die prematurely because of freeway-diesel pollution. This is an extraordinarily high risk for children, thousands of times higher than allowed.

Notes

1. https://www.latimes.com/projects/la-me-freeway-pollution/; eg, https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)32 399-6/full text and https://www.ncbi.nlm.nih.gov/pubmed/29587223; https://www.thelancet.com/journals/ lancet/ar ticle/PIIS0140-6736(16)32399-6/fulltext; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6144407/; https://www.sciencemag.org/news/2017/01/brain-pollution-evidence-builds-dirty-air-causes-alzheimer-s-dementia.emag.org
2. SCAMD 2005, MATES iii 2008; https://www.tandfonline.com/doi/abs/10.1080/08989621.2014.956867
3. CARB, 2017 Area Designations for State Ambient Air Quality Standards PM2.5 https://www.arb.ca.gov/desig/adm/2017/state_pm25.pdf
4. Adams, What is a safe distance to live or work near high auto emission roads? https://sandiego.urbdezine.com/2015/05/28/what-is-a-safe-distance-to-live-or-work-near-high-auto-emission-roads/.
5. Pearson et al., 2000, Distance-weighted traffic density in proximity to a home is a risk factor for leukemia and other childhood cancers. Journal of Air and Waste Management Association 50:175-180 and Childhood Leukemia and Road Traffic: A population-based CaseControl study."Crosignani P ;Tittarelli A; Borgini A; Codazzi T; Rovelli A; Porro E; Contiero P; Bianchi N; Tagliabue G; Fissi R; Rossitto F; Berrino F. International Journal of Cancer, 2004 , V108.
6. See https://www.ahajourna ls.org/doi/10.1161/cir.0b013e3181dbece1; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5836577/ and https://ehp.niehs.ni h.gov/doi/10.1289/ehp.1002921. In fact, living within 200 feet of any roadway increases sudden cardiac deaths by 38% (see, for instance, https://www.sciencedaily.com/releases/2014/10/141013190616.htm).
7. See, for example, Chen et al, Living Near Major Roads, The Lancet, https://www.thel ancet.com/journals/lancet/article/PIIS0140-6736(16)32399-6/fulltext and https://www.ncbi.nlm.nih.gov/pubmed/29587223 and https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)32399-6/fulltext and https://www.ncbi.nlm.nih.gov/pm c/articles/PMC6144407/ and https://www.sciencemag.org/news/2017/01/brain-pollution-evidence-builds-dirty-air-causes-alzheimer-s-dementia.

8. City of Pasadena, Sustainable Communities Environmental Assessment, SCEA, 4200 East Foothill, 2018, https://ww5.cityofpasadena.net/planning/wp-sites/56/2018/01 /3200-E-Foothill-SCEA.pdf.
9. City of Pasadena, SCEA Appendix D, 2018, Health Risk Assessment, HRA, p. 6, https://ww5.cityofpasadena.net/planning/wp-content/uploads/sites/56/2018/01/3200-E-Foothill-Appendices.pdf. The city and the developer used only 19-year-old, outdated, statewide underestimates of cancers based on 19-year-old average, statewide diesel risk. Likewise, they used only high-volume and low-volume freeway cancer risks, not the specific, local risks for cancer from the high-volume, diesel-intensive, I-210 freeway. As a consequence of these two scientific errors (using old data and not using data specific to the high-volume I-21 freeway), the city of Pasadena's health risk assessment drew conclusions that did not really tell residents about their near-freeway diesel risk. Instead the assessment said that if current diesel levels remained the same (from 19 years ago, and they have not), diesel particles would kill roughly 1 in 2632 exposed residents, who otherwise would not have died.
10. HRA, p. 6, says "a person exposed to a diesel PM concentration of 1 μg/m3 continuously over the course of a lifetime has a 3 per 10,000 chance (or 300 in one million chance) of contracting cancer due to this exposure." Note that this level of diesel exposure is already 3-300 times what is legally allowed, as the US EPA allowed pollutant level is one that kills 1 per 10,000 to 1 per one million exposed people (US National Research Council, Science and Judgment in Risk Assessment, pp. 3, 331).

    Yet levels of freeway air toxins, mainly diesel particles, for southern California freeways, having 21,600 trucks/day, range from approximately 5.4 μg/m3 at 30 meters (98.4 feet) downwind of the freeway---to approximately 1.3 μg/m3 at 300 meters (984.3 feet) downwind of the freeway, as measured on CA freeway 405, one of the busiest in the nation (Zhu et al, Concentration and size distribution of ultrafine particles near a major highway, Journal of the Air and Waste Management Association. September 2002, table 2, p. 1040, https://www.semanticscholar.org/paper/Concentration-and-size-distribution-of-ultrafine-a-Zhu-Hinds/baa8b1280d6205564c6692d63a2e5 c1501915f01/figure/3

    What do these measured diesel-PM concentrations mean for Pasadena? Because the freeway 210 and Lake Avenue interchange has 25,000 trucks/day (Truck Traffic: Average Annual Truck Traffic, California Department of Transportation, 2016, http://www.dot.ca.gov/trafficops/census and p. 172 of http://www.dot.ca.gov/trafficops/census/docs/2016_aadt_truck.pdf ; hereafter cited as: CA DOT), it likely averages approximately 25,000/21,600 of the Zhu-reported diesel particles for the I-405, that is (25,000/21,600) (5.4 μg/m3 at 30 meters downwind), which amounts to diesel particle levels of 6.25 μg/m3 at 30 meters downwind of the freeway. At 300 meters downwind, the I-210 /Lake Avenue diesel-particle level would be (25,000/21,600) (1.3 μg/m3) = 1.505 μg/m3 at 300 meters downwind of the freeway—or 6.25 and 1.51 μg/m3, respectively, at 30 and 300 meters downwind of the 210 freeway at Lake Avenue. Therefore the 210 freeway/Lake Avenue interchange causes the following cancer risks. Because 1 μg/m3 lifetime exposure causes 300 in one million chances of contracting cancer from this exposure, 6.25-1.51 μg/m3 at 30-300 meters downwind, respectively, of the 210 freeway/Lake Avenue (assuming that a person's 1 μg/m3 exposure continuously over the course of a lifetime causes a 3 per 10,000 chance or 300 in one million chance of cancer due to this exposure) causes (6.25)(300/1,000,000 to (1.51) (300/1,000,000 extra cancers---or at 30 meters. These (300/1,000,000) extra cancers at 30 and 300 meters represent 1,875-453 extra cancers per million people at 30-300 meters from the 210 freeway.

    In other words, at roughly 100 feet or 30 meters from the I-210 freeway at Lake Avenue, 1 in every 526 residents will die prematurely from a freeway-diesel-induced cancer. Here, one million residents would face roughly 1900 cancers that otherwise would not have occurred, and 10,000 residents would face roughly 19 cancers that otherwise would not have occurred. Roughly 1000 feet from the freeway, one million residents would face roughly 450 cancers that otherwise would not have occurred, and 10,000 residents would face roughly 5 cancers that otherwise would not have occurred. The additional diesel-caused cancers that occur near Lake Avenue, at 100 feet from the I-210, are thus 1900-19 times higher than allowed by both US EPA and Cal-EPA---and at 1000 feet from the I-210, are thus 453-5 times higher than allowed by both US EPA and Cal-EPA.
11. Likewise, because the 210 and Rosemead Avenue interchange has 17,000 trucks/day (CA DOT), it averages 17,000/21,600 of the Zhu-reported diesel particles for the I-405, or (17,000/21,600) (5.4 μg/m3 at 30 meters downwind)—that is, (0.79)(5.4)= 4.27 μg/m3 at 30 meters downwind of the freeway. At 300 meters downwind, the I-210/Rosemead Avenue diesel-particle level would be (17,000/21,600) (1.3 μg/m3) = (0.79) (1.3 μg/m3) =1.03. —or 4.27 and 1.03 μg/m3, respectively, at 30 and 300 meters downwind of the 210 freeway at Rosemead Avenue.

    Because 1 μg/m3 lifetime exposure causes 300 in one million chances of contracting cancer from this exposure, 4.27-1.03 μg/m3 at 30-300 meters downwind, respectively (of the 210 freeway at Rosemead Avenue), assuming that a person's 1 μg/m3 exposure continuously over the course of a lifetime causes a 3 per 10,000 chance or 300 in one million chances of cancer due to this exposure) causes (4.27)(300/1,000,000) extra cancers per million people at about 100 feet from the freeway and (1.03) (300/1,000,000) extra cancers per million people at about 1000 feet from the freeway. That is, this Rosemead/I-210 exposure to diesel particles causes 1,281 extra cancers per million people at about 100 feet from the freeway and 309 extra cancers per million people at about 1000 feet from the freeway. The additional diesel-caused cancers that occur near Rosemead Avenue, at 100 feet from the I-210, are thus 1300-13 times higher than allowed by both US EPA and Cal-EPA---and at 1000 feet from the I-210, are thus 310-3 times higher than allowed by both US EPA and Cal-EPA. This Rosemead/I-210 pollution will kill 1 in every 769 people exposed. For 30-40 years.
12. The state collects no data on I-210 freeway-pollution levels between the Lake and Rosemead interchanges. However, the approximate I-210 midpoint between the Lake and Rosemead interchanges is at Altadena. Given the prevailing direction of the wind, toward the Northeast, and CA DOT-measured truck traffic at Lake and at Rosemead, the Altadena/I-210 pollution levels should be at least (6.25 + 4.27)/2 μg/m3 and (1.51+1.03)/2 μg/m3, that is, 5.26 and 1.27 μg/m3, respectively, at 30 and 300 meters downwind of the 210 freeway at Altadena Drive.

    Because 1 μg/m3 lifetime exposure causes 300 in one million chances of contracting cancer from this exposure, 5.26-1.27 μg/m3 at 30-300 meters downwind, respectively (of the 210 freeway at Altadena Drive), assuming that a person's 1 μg/m3 exposure continuously over the course of a lifetime causes a 3 per 10,000 chance or 300 in one million chances of cancer due to this exposure) causes (5.26)(300/1,000,000) extra cancers per million people at about 100 feet from the freeway and (1.27) (300/1,000,000) extra cancers per million people at about 1000 feet from the freeway.

    That is, this Altadena/I-210 exposure to diesel particles causes 1,578 extra cancers per million people at about 100 feet from the freeway and 381 extra cancers per million people at about 1000 feet from the freeway. The additional diesel-caused cancers that occur near Rosemead Avenue, at 100 feet from the I-210, are thus 1600-16 times higher than allowed by both US EPA and Cal-EPA---and at 1000 feet from the I-210, are thus 400-4 times higher than allowed by both US EPA and Cal-EPA. These data indicate that living near the I-210 and Altadena Drive will cause 1 person in every 625 exposed to die prematurely of freeway-diesel-caused cancers.
13. US EPA, https://www.epa.gov/sites/production/files/2015-07/documents/apps-10x-sf-for-cra.pdf; see https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2011.0151; https://www.ncbi.nlm.nih.gov/pmc/articles/PM C4418502/; https://global.oup.com/academic/product/only-one-chance-9780190239732?cc=us&lang =en&

3. WON'T MERV-13 AIR FILTERS PROTECT BESIDE-FREEWAY RESIDENTS?

In its official documents the city of Pasadena says MERV-10 air filters would reduce near-freeway residents' cancer risks to "less than significant levels" because MERV-10 filters "remove 50% of particulates in the 1-3 μg range,[1] and MERV-13 filters remove 75% of all particulates.[2] However, both claims are misleading and partly false.

Diesel particles cause nearly all freeway-cancer risk.[3] However, MERV-10 and MERV-13 filters provide no protection whatsoever against 95% of diesel particles, because virtually all diesel particles are smaller than 0.1 µg.[4] These nano-sized diesel particles easily get through MERV-10 and MERV-13 filters.[5] Of course, Merv-10 and MERV-13 filters do remove many less-harmful particles, those larger than 0.3 µg, but 95% of the deadly diesel particles are 10 times smaller than what MERV-10 and MERV-13 can remove.[6] Merv-10 and MERV-13 filters thus remove only 3% and 4%, respectively, of diesel-particle harm. This means the city grossly overestimates protections from MERV-10 and MERV-13 air filters. Even HEPA filters cut diesel-cancer risk by only 5%.[7]

The preceding data explain why the CA South Coast Air Quality Management District is so skeptical that, for people living near freeways, "health risks would be brought" to safe levels by air filters. Instead, CA air-quality officials warn that "the health science behind recommendations against placing new homes close to freeways is clear." CA air-quality managers warn that even to reduce the diesel-cancer risk by 5%, through a HEPA filter, would involve a cost that is prohibitive for many people---at least $400/year. They also say that most near-freeway residents would not be willing to run their HVAC systems 12 months/year, 24/7, to get continuous and modest air-filtering. Finally, they warn that neither MERV nor HEPA filters can filter out toxic and carcinogenic freeway-exhaust gases such as benzene---something that would require very expensive technology.[8]

The latest CA Air Resources Board recommendations are that "sensitive uses" of land, such as schools and homes, not be put within 500 feet of a freeway---as Pasadena is trying to do. Instead, the board says cities should try to locate "non-sensitive uses," like commercial or warehouse buildings, near freeways.[9] Following this recommendation is especially necessary because people living within 500 feet of freeways already face diesel-particle risks that are 7-25 times higher than what other California residents face.[10]

Notes
1. SCEA Appendix D, HRA, p. 16.
2. http://ww2.cityofpasadena.net/councilagendas/2018%20Agendas/Minutes%202018/2018%2007%2016%20CC%20MIN.pdf
3. SCEA Appendix D, HRA, p. 14 and https://www.ncbi.nlm.nih.gov/pubmed/25635848
4. https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health
5. https://www.coolray.com/img/uploads/What_does_MERV_Rating_mean.pdf
6. McGranahan and Murray, eds, Air Pollution and Health in Rapidly Developing Countries, London, Earthscan, 2003.
7. American Society of Mechanical Engineers, ASME AG-1a–2004, Addenda to ASME AG-1–2003 Code on Nuclear Air and Gas Treatment,, 2004, https://dms.hvacpartners.com/docs/1001/Public/0E/ENG_NEWS_5_1_1.pdf
8. http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-2012-aqmp-(february-2013)/main-document-final-2012.pdf, p. 9-29; http://www.aqmd.gov/docs/default-source/ceqa/commentletters/2014/december/mndmaplewillow.pdf, p. 2.
9. pp. 12, 14, https://www.arb.ca.gov/ch/r d_technical_advisory_final.PDF
10. Kleinman, Effects of Exposure to Fine and Ultrafine Concentrated Ambient Particles, Final Report: Southern California Particle Center and Supersite, https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.highlight/abstr act/1087/report/F; Zhu et al, 2012, Concentration and Size Distribution of Ultrafine Particles Near a Major Highway, Journal of the Air & Waste Management Association, vol. 52, https://www.tandfonline.com/doi/abs/10.1080/10473289.2002.10470842

4. IS IT SAFE TO BE BESIDE THE FREEWAY FOR ONLY A DAY?

Some nonscientists claim that short-term exposure to carcinogens like diesel particulates is not risky. However, this claim is false.

Diesel particles are genotoxic carcinogens.[1] There is neither a safe dose nor a safe time period for exposure to genotoxic carcinogens,[2] because they produce cancer by directly altering a victim's genetic material, that is, by inducing mutations that interact with DNA. However, non-**genotoxic carcinogen**s produce cancer by some secondary mechanism, not related to direct gene, DNA, or mutation damage. Even a short and small exposure to the genotoxic carcinogen of diesel particles thus is risky because it damages genetic material in ways that increase cancer risk.

The fact that diesel particles have no safe dose is also borne out in repeated experimental studies. For instance, even a one-day increase of only 10 µg/m3 [micrograms per cubic meter] of particulate matter---less than one third of the allowed 24-hour average exposure---is associated with increases in COPD mortality.[3] The same short, small, **daily increase in freeway-diesel-particle pollution** likewise is associated both with **increased daily and long-term mortality**,[4] and with increased asthma-related hospital admissions and emergency-room visits for children.[5]

An especially robust study of 61 million people living in 40,000 zip-codes in the continental United States, from the years 2000 through 2012, with 460 million person-years of follow-up, clearly showed that only **one day's exposure** to only 10 µg/m3 [micrograms per cubic meter] of particulate matter---less than one-third of allowed daily diesel-particle exposures---**causes a statistically significant increase of 1.4% in the overall daily death rate.** However, the highest death rates were among men, blacks, and people with Medicaid eligibility. Most importantly, the researchers confirmed that there was no threshold for increased harm from diesel particles. That is, there is no short time period, and no small dose, below which daily exposures to diesel particles did not cause daily fatalities to increase.[6]

California studies have shown that even a 0.2 ug /m3 increase in freeway-particle pollution would kill 1 person/year among every 5,000 exposed people.[7] Yet this amount of pollution is only 1/200 of the allowed daily average level of particles in both CA and the US, namely 35 ug/m3. [8]

Notes

1. Interagency Review Group on Cancer, IARC Monograph 105, pp. 460-465, https://monographs.iarc.fr/wp-content/uploads/2018/06/mono105-DC05-06.pdf
2. Nohm, Thresholds of Genotoxic and Non-Genotoxic Carcinogens, Toxicological Research, 2018, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6195886/
3. Li, Man-Hui, Li-Chao Fan, Bei Mao, Jia-Wei Yang, Augustine M. K. Choi, Wei-Jun Cao, and Jin-Fu Xu. Short-Term Exposure to Ambient Fine Particulate Matter Increases Hospitalizations and Mortality in COPD: A Systematic Review and Meta-Analysis, *Chest* 149, no. 2 (February 2016): 447–58. https://doi.org/10.1378/chest.15-0513.
4. World Health Organization, Ambient (outdoor) Air Quality and Health, World Health Organization. May 2, 2018, http://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.
5. Lim, Hyungryul, Ho-Jang Kwon, Ji-Ae Lim, Jong Hyuk Choi, Mina Ha, Seung-Sik Hwang, and Won-Jun Choi, Short-Term Effect of Fine Particulate Matter on Children's Hospital Admissions and Emergency Department Visits for Asthma: A Systematic Review and Meta-Analysis, *Journal of Preventive Medicine and Public Health = Yebang Uihakhoe Chi* 49, no. 4 (July 2016): 205–19. https://doi.org/10.3961/jpmph.16.037.
6. Di, Qian, Lingzhen Dai, Yun Wang, Anto-nella Zanobetti, Christine Choirat, Joel D. Schwartz, and Francesca Dominici, Association of Short-Term Exposure to Air Pollution With Mortality in Older Adults, *Journal of the American Medical Association* 318, no. 24 (2017): p. 2446 of 2446–56, https://doi.org/10.1001/jama.2017.17923. See also Lavigne, Eric, Richard Burnett, and Scott Weichenthal, Association of Short-Term Exposure to Fine Particulate Air Pollution and Mortality: Effect Modification by Oxidant Gases, *Scientific Reports* 8, no. 1 (October 31, 2018): 16097, https://doi.org/10.1038/s41598-018-34599-x
7. San Francisco Department of Public Health, A Retroactive Health Impact Assessment of Traffic, 2008, https://www.pewtrusts.org/~/media/assets/2008/07/stilllyellairqualityanalysis.pdf
8. California Air Resources Board, CARB, South Coast Air Quality Management Plans, 2019, https://www.arb.ca.gov/planning/sip/planarea/scabsip/scabsip.htm

5. IS IT SAFE FOR CHILDREN TO LIVE NEAR FREEWAYS?

As already mentioned, **children are roughly 10 times more sensitive than adults** when both receive the same exposure to toxins, carcinogens, or air pollutants.[1] Children are so sensitive because they are still developing, their detoxification mechanisms are not yet in place, and they take in proportionately far more air, water, food, and pollutants than do adults, given their body weight. For all these reasons, US EPA and the US National Academy of Sciences recommend doing separate risk assessments for children when they are in situations of great risk, like that posed by freeway-diesel particles.[2]

To understand the health severity of children's near-freeway diesel-particle exposure, consider the effects noted in earlier in FAQ 2. That section pointed out that measured levels of I-210-freeway diesel pollution will prematurely kill 1 in every 526, 625, and 769 adults living for several decades, respectively, near the I-210 near Lake Avenue, Altadena Drive, and Rosemead Avenue. However, because of their 10-times-greater sensitivity, children will be hurt even more. Roughly **1 in every 53**, 63, and 77 **children** living for several decades, respectively, within 100 feet of the I-210 near Lake Avenue, Altadena Drive, and Rosemead Avenue, respectively, will die prematurely because of freeway-diesel pollution. This is an extraordinarily high risk for children, thousands of times higher than allowed.

When adults are exposed to freeway-diesel pollutants, they may contract various diseases. However, when children are exposed to freeway-diesel pollutants, it not only causes various diseases, but it

damages their very ability to develop in a normal way---so that they may have permanent, functional impairment of their lungs and other organs, like the brain. **Children have only once chance** to develop a brain or lungs or heart or other organs. If diesel pollution interferes with their organ development, there is no way to reverse the damage that the pollution causes.[3]

Pregnant women living near freeways have a 20-30-percent chance of having children with permanently impaired lungs.[4] Because diesel particles easily enter the brain, through the nose, they also can cause child delinquency.[5]

Because diesel particles easily and directly enter every organ, either through the lungs and breathing, or through the nose and breathing, they cause a doubling in the near-freeway asthma risk.[6] They also cause a doubling in the near-freeway autism risk.[7]

"In 2003, California state lawmakers prohibited new elementary and secondary schools from being built within 500 feet of highly trafficked freeways – the distance researchers say is the most dangerous for children's developing bodies….The bill's intent was unequivocal: 'To protect school children from the health risks posed by pollution from heavy freeway traffic and other non-stationary sources in the same way that they are protected from industrial pollution' "[8]

Notes

1. US EPA, https://www.epa.gov/sites/production/files/2015-07/documents/apps-10x-sf-for-cra.pdf; see https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2011.0151; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4418502/; and https://global.oup.com/academic/product/only-one-chance-9780190239732?cc=us&lang =en&
2. US National Research Council, https://www.nap.edu/read/2125/chapter/12#211 and p. 11, https://www.nap.ed u/read/2125/chapter/2?term=child#11
3. Exposure to traffic pollution during pregnancy can damage future child's lungs, ScienceDaily, 20 October 2014, https://www.sciencedaily.com/releases/2014/10/141020212512.htm
4. Grandjean, Only One Chance: Howe Environmental Polluton Impairs Brain Development, Oxford University Press, 2013
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