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Omaha Public Power District

OPPD BOARD OF DIRECTORS

BOARD MEETING MINUTES

October 16, 2025

The regular meeting of the Board of Directors of the Omaha Public Power District ("OPPD" or "District") was held on October 16, 2025, at 5:00 p.m. at the Omaha Douglas Civic Center, 1819 Farnam Street, 2nd Floor Legislative Chamber, Omaha, Nebraska and via WebEx audio and video conference.

Joining in person were Directors A. E. Bogner, M. J. Cavanaugh, S. E. Howard, J. L. Hudson, C. C. Moody, M. G. Spurgeon and E. H. Williams. M. R. Core joined virtually. Also present were S. M. Focht, Vice President of Corporate Strategy and Governance, in place of L. J. Fernandez, President and Chief Executive Officer, and Messrs. S. Bruckner and T. Thalken, of the Fraser Stryker law firm, General Counsel for the District, E. H. Lane, Sr. Board Operations Specialist, and other members of the OPPD Board meeting logistics support staff. Vice-Chair M. G. Spurgeon presided, and E. H. Lane recorded the minutes. Members of the executive leadership team joining in person included C.V. Fleener, T. D. McAreavey, T. R. Via and B. R. Underwood.

Board Agenda Item 1: Chair Opening Statement

Vice-Chair Spurgeon gave a brief opening statement, including reminders for using the WebEx audio and video conferencing platform.

Board Agenda Item 2: Safety Briefing

Josh Clark, Manager, Protective Services, provided safety reminders.

Board Agenda Item 3: Guidelines for Participation

Vice-Chair Spurgeon then presented the guidelines for the conduct of the meeting and instructions on the public comment process in the room and using WebEx audio and video conferencing features.

Board Agenda Item 4: Roll Call

Ms. Lane took roll call of the Board. All members were present in person, with the exception of M. R. Core who joined virtually.

Board Agenda Item 5: Announcement regarding public notice of meeting

Ms. Lane read the following:

> *"Notice of the time and place of this meeting was publicized by notifying the area news media; by publicizing same in the Omaha World Herald and Nebraska Press Association, OPPD Outlets newsletter, oppd.com and social media; by displaying such notice on the first level of the OPPD administrative offices; and by e-mailing such notice to each of the District's Directors on October 10, 2025.*

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A copy of the proposed agenda for this meeting has been maintained, on a current basis, and is readily available for public inspection in the office of the District's Corporate Secretary.

Additionally, a copy of the Open Meetings Act is available for inspection on oppd.com."

Board Consent Action Items:

6. Approval of the August 2025 Financial Report, September 2025 Meeting Minutes, and October 16, 2025 Agenda
7. BL-2: Board - Outside General Counsel Relationship Refinement – Resolution No. 6731
8. 2025 COP Excess Expenditure Request – Resolution No. 6732
9. SD-13: Stakeholder Outreach and Engagement Monitoring Report – Resolution No. 6733
10. SD-7: Environmental Stewardship Monitoring Report – Resolution No. 6734

It was moved and seconded that the Board approve the consent action items.

Vice-Chair Spurgeon noted the Board discussed the action items during the All Committees meeting held on Tuesday, October 14.

Vice-Chair Spurgeon then asked for public comment in person and on WebEx. There was one comment in person.

David Corbin, 1002 N. 49th St, provided comments on SD-7 and net zero goals.

Thereafter, the vote was recorded as follows: Bogner – Yes; Cavanaugh – Yes; Core – Abstain; Howard – Yes; Hudson – Yes; Moody – Yes; Spurgeon – Yes; Williams – No. The motion carried (6-1).

Vice-Chair Spurgeon provided comments on the removal of RFP 6208 from the Board agenda, which the Board agreed to during the Tuesday All Committees meeting.

Board Agenda Item 11: President's Report

Vice President Focht next presented the following information:

- September 2025 Baseload Generation
- September 2025 Balancing Generation
- September 2025 Renewables
- Community Volunteering
- Rock the Block – Bellevue
- Swigart Invitational Tournament
- In Memoriam – Michael W. Johnson

Board Agenda Item 12: Opportunity for comment on other items of District Business

Vice-Chair Spurgeon asked for comments from the public in the room on other items of District business. There were 25 comments.

David Begley, 4611 S. 96th Street, Omaha provided comments on the NE Attorney General's lawsuit and presented materials which are attached to the minutes.

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Dan DiLeo, 5817 S.176th St, Omaha, provided comments on environmental justice and the Attorney General's lawsuit.

David Corbin, 1002 N. 49th St, representing the Nebraska Sierra Club, provided comments on data center energy usage and Blue Energy.

John Traudt, 3316 Augusta Ave, provided comments on demand side management and presented materials which are attached to the minutes.

Mele Mason, 9632 N. 34th St, member of the North Omaha ad hoc committee, representing Florence, provided comments on retiring the North Omaha coal plant.

Nate Austic, 9380 Western Ave, provided comments on defending the Attorney General's lawsuit and environmental justice.

Thomas Nenneman, 7212 N. 76th St., provided comments on rate classes and rate increases.

Terrell McKinney, 5319 N. 30th St, representing BOLD Alliance, provided comments on community support for closure of the North Omaha Station and the removal of RFP 6208 from the Board meeting agenda.

Charlene Potter, 4321 Larimore Ave, provided comments on ecosystems, asthma and environmental justice.

John Patrick Murray, 421 N. 38th Ave, professional philosopher, provided comments on climate change.

Terry Crawford, 2nd Vice President, NAACP Omaha, 2221 N. 24th St, provided comments on asthma and COPD cases in North Omaha and environmental justice.

Bill Bevins, 5200 N. 148th St, Waverly, NE provided comments of support for the North Omaha community and environmental justice.

Elaine Wells, 5005 Reed St, provided comments on the Attorney General's lawsuit against OPPD and North Omaha Station coal powered generation.

Connor Herbert, 2430 R. St, Lincoln, provided comments on the removal of RFP 6208 and democratic principles.

Dr. Grace Kelly, 3308 N. 53rd St, provided comments in support of retiring the coal plant in North Omaha and the energy usage of data centers.

Alana Haynes Stein, 900 Farnam St, provided comments on his view of the effects of burning coal on human health.

Jo Williams, 3524 State St., Florence, provided comments of support for the North Omaha community.

Robert Dyer, 3308 N. 53rd St, provided comments on investing in green energy in the future and retiring the North Omaha coal plant.

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Linda Jensen, 3716 Mason St., provided comments of support for the North Omaha community and environmental justice.

Ryan Wishart, 912 N. 49th St, provided comments on global climate change studies and environmental justice.

Adam Sunberg, 3425 California St, provided comments on the Attorney General's lawsuit and procedural justice.

Crystal Ellis, 11909 N. 58th St., provided comments on AMI smart meters and the risks and costs involved and presented materials which are attached to the minutes.

Mary Leask, 7605 Pasadena Ave, provided comments on AMI smart meters and a claimed lack of information for the community.

Dr. Paul Nelson, 6803 N. 68th Plaza, provided comments on community safety nets and presented materials which are attached to the minutes.

Roger Carroll, 417 N. 38th Ave, provided comments of appreciation for the public comments and the Board actively listening.

Vice-Chair Spurgeon asked for comments from the public on WebEx. There were five comments.

April Thompson, 5863 S. 104th Ave, provided comments on the removal of RFP 6208 from the Board agenda.

John Pollack, 1412 N. 35th Street, Omaha, provided comments on the effects of climate change on health and provided a weather update.

Cheryl Weston, 1823 Emmett St, Omaha, provided comments on standing up for the interests of the North Omaha community.

Richard Miller, 14011 Seward St, provided comments on environmental justice, climate change and alleged health impacts, and emailed materials which are attached to the minutes.

Marshall Biven, 3935 N. 54th St, provided comments on the alleged health effects of burning coal on the North Omaha community.

There being no further business, the meeting adjourned at 6:38 p.m.

Signed by:
S. M. Focht
B626AD4392E3483...

S. M. Focht
Vice President – Corporate Strategy & Governance and Assistant Secretary

DocuSigned by:
Erin H. Lane
965CE2363A0A42C...

E. H. Lane
Sr. Board Operations Specialist

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IN THE DISTRICT COURT OF
DOUGLAS COUNTY, NEBRASKA

THE STATE OF NEBRASKA, ex rel. MICHAEL T. HILGERS, Attorney General,	)	Case No. CI _____
Plaintiff,	)	COMPLAINT
v.	)	
OMAHA PUBLIC POWER DISTRICT, JAVIER FERNANDEZ, President and CEO of Omaha Public Power District, AMANDA BOGNER, District 1 Member of the Omaha Public Power District Board of Directors, SARA HOWARD, District 2 Member of the Omaha Public Power District Board of Directors, MARY SPURGEON, District 3 Member of the Omaha Public Power District Board of Directors, MATT CORE, District 4 Member of the Omaha Public Power District Board of Directors, CRAIG MOODY, District 5 Member of the Omaha Public Power District Board of Directors, ERIC WILLIAMS, District 6 Member of the Omaha Public Power District Board of Directors	)	The OPPD Board has the luxury to ignore both the law and the facts.
Defendants.		

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From:
To:
Subject:
Date:
Attachments:

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from Richard Miller (privately): 5:22 PM

The board has already voted to phase out coal use by the end of next year. The board representing their constituents has already promised on two occasions to reduce pollution from the North Omaha Coal fired power plant.

The EPA COBRA public health model estimates of the health impacts in Douglas County from a 3-year extension of the North Omaha Coal power plant are

•2-6 additional deaths

•23 asthma onsets

•3,663 incidences of asthma symptoms

•1,110 school loss days

•$2.2-3.8 million in negative health effects

Please keep your promise to phase out coal use by the end of the next year for the health of your constituents and reducing the catastrophic effects of continued greenhouse gas pollution. Please fight Attorney General Hilger's lawsuit.

Thank you,

Richard Miller, Ph.D.

Professor of Sustainability Studies, Creighton University

I am not representing Creighton University, but these are my informed judgements

++

from Public (privately): 5:27 PM

OPPD stop burning coal. It's contributing to warmer weather during the fall months!

++

from Richard Miller (privately): 6:16 PM

I also support the arguments of Dan DiLeo from Sacred Heart Church, Dave Corbin from the Sierra Club, the gentleman arguing for reducing demand, the woman representing the North Omaha ad hoc committee, Nate Austic's position to fight the lawsuit, gentleman from Land Justice, Charlene Potter, John Patrick Murray, Terry Crawford from NAACP whose son died

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from Asthma, Bill Bevins, Elaine Wells, Kyle Herbert, Dr. Kelly, Elona Hinstein, Robert Dire, Linda Jensen, Ryan Wishart, Adam Sundberg,

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OPPD can "Keep the Lights On" without burning coal in its North Omaha station

By Jon Traudt, October 16, 2025

OPPD's management and board members are considering whether to permanently end burning coal at its North Omaha station by the end of 2026. Nebraska's governor and Attorney General seem to think that continuing to burn coal in North Omaha is *safe because it is legal.* Is smoking cigarettes safe because it is legal?

Nebraska's Legislature only requires publicly owned electric utilities to:

1. Reliably "Keep the Lights On".
2. Keep rates low.

Other electric utilities have been profitably using On-Bill financing in ways that help to meet those two goals plus five more:

1. Reliably "Keep the Lights On" even after our nation's dwindling fossil fuel reserves have been depleted by making homes, etc., energy efficient enough to be powered by smaller and less expensive renewable energy systems.
2. Keep rates low by reducing the quantity of generators and fuels required to supply all the electricity its customers need.
3. Protect the health of people, crops, and other living things by reducing the combustion of fossil fuels that emit toxic and radioactive airborne pollution.
4. Improve outdoor air quality by reducing emissions of toxic and radioactive pollutants.
5. Prepare for potential fossil fuel shortages and price acceleration.
6. Improve the resale value of customers' property by upgrading energy efficiency and indoor air quality.
7. Save more of our nation's dwindling reserves of oil, coal, and natural gas for use in the production of lubricants, pharmaceuticals, fertilizers, plastics, gasoline, etc.

Other utility companies have pioneered the way to benefit by using On-Bill financing to help their customers improve the comfort, indoor air quality, energy efficiency, and resale value of new and existing homes, offices, churches, etc.

NOTE: On-Bill financing is an investment, not an expense, for utility companies because customers who participate in On-Bill financing programs have established a long history of reliably repaying their utility's investments, plus interest on the loans. Savings on electricity, *plus savings that many participants enjoy on fuel bills*, help participants to afford their On-Bill financing payments.
https://www.perplexity.ai/searchand /4119e531-700e-4d3b-a931-77f33e856074

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Are federal legal limits for air pollution based on estimates of the health effects of exposure during 24 hours, but not the effects of decades of exposure to toxic and radioactive elements that accumulate in brains and body tissues?

Some chronic exposure effects are considered through annual averages for certain pollutants (such as PM2.5 annual limits), but many toxic and radioactive elements that accumulate in tissues are not fully addressed with standards that reflect decades-long, cumulative exposure.
https://www.perplexity.ai/search/04d5a404-037e-48e6-9baa-95489bb633ab

Can living near a coal-fired power plant in the US that meets government minimum legal standards cause damage to immune systems, mental health, and or physical health?

Excerpt: "Living near a coal-fired power plant in the U.S., even one that meets minimum government legal standards, can cause measurable damage to immune, mental, and physical health for residents in the surrounding area."
https://www.perplexity.ai/search/2346cc1e-208f-44c0-8243-58a87a2bbf4d

In the US, how much higher would the average retail cost per kWh be if electric utilities had to compensate their customers for the damage caused by the utilities' toxic and radioactive emissions to human health, crop yields, and other environmental impacts?

https://www.perplexity.ai/search/d5f6a0e2-418e-48f6-b278-1266c559b5eb

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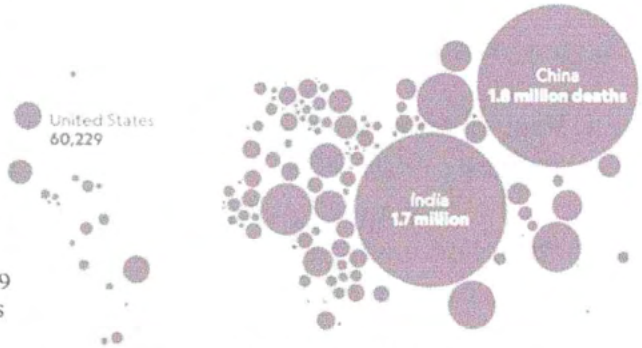
National Geographic, April 2021, Page 64 & 65

POLLUTION'S TOLL ON THE BODY

Dirty air is a complex mix of gases and particles. PM2.5 particles, some of which are so small they pass into the bloodstream, are the deadliest. In 2019 air pollution, indoors and out, is estimated to have contributed to almost seven million deaths worldwide, accounting for nearly 12 percent of the global death toll.



Number of deaths from air pollution
2019, by country

Global percentage of deaths from PM2.5
2019, by ailment

Stroke

Ischemic heart disease

Chronic obstructive pulmonary disease (COPD)

Lung cancer

Lower respiratory infections

Diabetes

Neonatal deaths

Brain
Long-term exposure to particulate matter, sulfur dioxide, and nitrogen dioxide can lead to cognitive declines. Changes in brain structure increase the risk of Alzheimer's disease.

Nervous system
Pollution is linked to neurodevelopmental disorders and deaths from Parkinson's. Particles can travel to the central nervous system and activate immune responses.

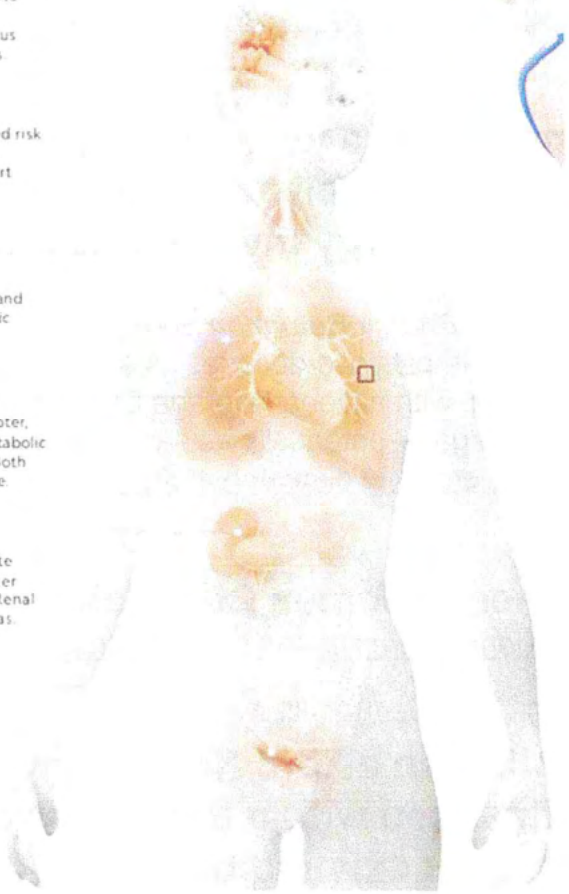
Cardiovascular system
Exposure is associated with heightened risk of death from cardiovascular diseases, including coronary artery disease, heart attacks, strokes, and blood clots.

Respiratory system
Pollution can irritate airways and cause shortness of breath, coughing, asthma, and lung cancer. It can raise the risk of chronic obstructive pulmonary disease (COPD).

Endocrine system
Particulate matter is an endocrine disrupter, contributing to the development of metabolic diseases such as obesity and diabetes. Both are risk factors for cardiovascular disease.

Renal system
Long-term exposure to fine-particulate air pollution is associated with a greater likelihood of chronic kidney disease. Renal disease rates are highest in urban areas.

Reproductive system
Pollution is linked to diminished fertility and unsuccessful pregnancies. Prenatal exposure can lead to premature births, low birth weight, and respiratory diseases.



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Analyses of Human Tissues, *Including Brain*, Containing Environmental Toxic Metal-Tagged Combustion Particulate Matter PM 2.5

Published by Dr. Glenn Lykken, Dr. Tom Ward, Berislav Momčilović, MD, and Jon Traudt

Summary: Diseased tissues show significantly more abundant α and β particle emissions relative to normal control tissues. This difference may be used for differential diagnosis between specific diseases, e.g., Alzheimer's and Parkinson's disease. Furthermore, *coal combustion and internal combustion engines* result in hydrocarbon combustion products that contain particulate matter (PM2.5), including nanoparticles, with toxic heavy metals, which can be inhaled. About 90% of airborne toxic and radioactive radon progeny are attached to airborne particles. Nanoparticles, due to their size, easily travel to the hippocampus and amygdala and may also be transferred by systemic circulation. Once in the target tissues, the particles have negative effects and are *permanently retained* by entering biochemical processes, causing organ damage. These changes may lead to the development of neurodegenerative disorders and cancers. Indoor exposure to PM2.5 particles can be reduced using ordinary fans and filters.
https://www.academia.edu/73419895/Analyses_of_human_tissues_including_brain_containing_environmental_toxic_metal_tagged_combustion_particulate_matter_PM_2_5

How many more years is production of coal, oil, and natural gas in the US likely to continue providing a positive Energy Return on Energy Invested (ERoEI)?

Excerpt: "The *Energy Return on Energy Invested (ERoEI)* for coal in the US has dropped sharply over the past two decades as surface deposits wane and mining shifts to deeper or thinner seams, with national average ERoEI for coal predicted to reach nonviable levels before oil and gas—potentially as early as 2035–2040 under current trends."
https://www.perplexity.ai/search/43af7386-81da-48e1-b05e-cc2234f53186

Zero Energy Homes Cost Less to Own

https://zeroenergyproject.com/buy/cost-less-to-own/

In the US, can a Zero Net Energy home be more affordable when financed with a thirty-year mortgage than the same home built to meet existing building codes barely?

https://www.perplexity.ai/search/34e56beb-233e-4dec-8350-c2bc2e261630

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Since 1978, I have helped thousands of OPPD's customers to reduce electricity and fuel bills while improving indoor comfort, air quality, and property resale value. Many of those buildings:

1. Had much less insulation in the building envelope than the levels currently recommended by the Nebraska Energy Office.
2. Often had excessive air leakage during the heating and air conditioning seasons.
3. Had leakage of moist air into cold cavities during the winter that enabled moisture to condense and accumulate enough to enable mold to grow.

Before the construction of data centers, homes served by OPPD consumed about 40% of the electricity provided by OPPD. Upgrading the energy efficiency of homes and other buildings owned by OPPD's customers/owners can substantially reduce the consumption of electricity by OPPD's customers and help to eliminate the need for burning coal at OPPD's North Omaha station.

Please share your thoughts on these matters.

Jon Traudt
Safe and Energy Efficient Buildings Advisor
Disease Prevention Researcher & Author

Healthy Indoors Advisors
3316 Augusta Avenue, Omaha, NE 68144
Phone: 402-680-4429
Email: jon.traudt@icloud.com

Wisdom is knowing what should be done. Virtue is doing it.

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Dose to red bone marrow from natural radon and thoron exposure

Richardson R., Eatough J., Henshaw D., *Br. J. Radiol.* 1991; 64:608–624. [PubMed] [Google Scholar]
https://www.birpublications.org/doi/10.1259/0007-1285-64-763-608

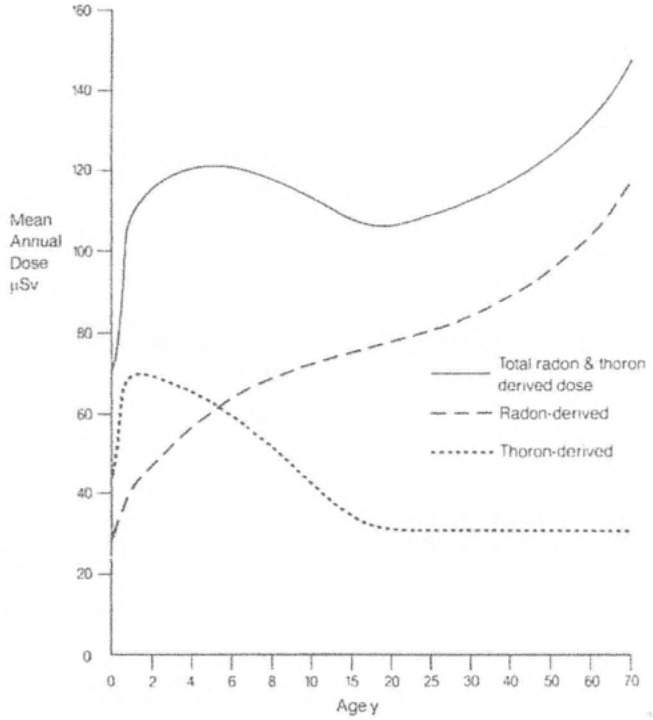
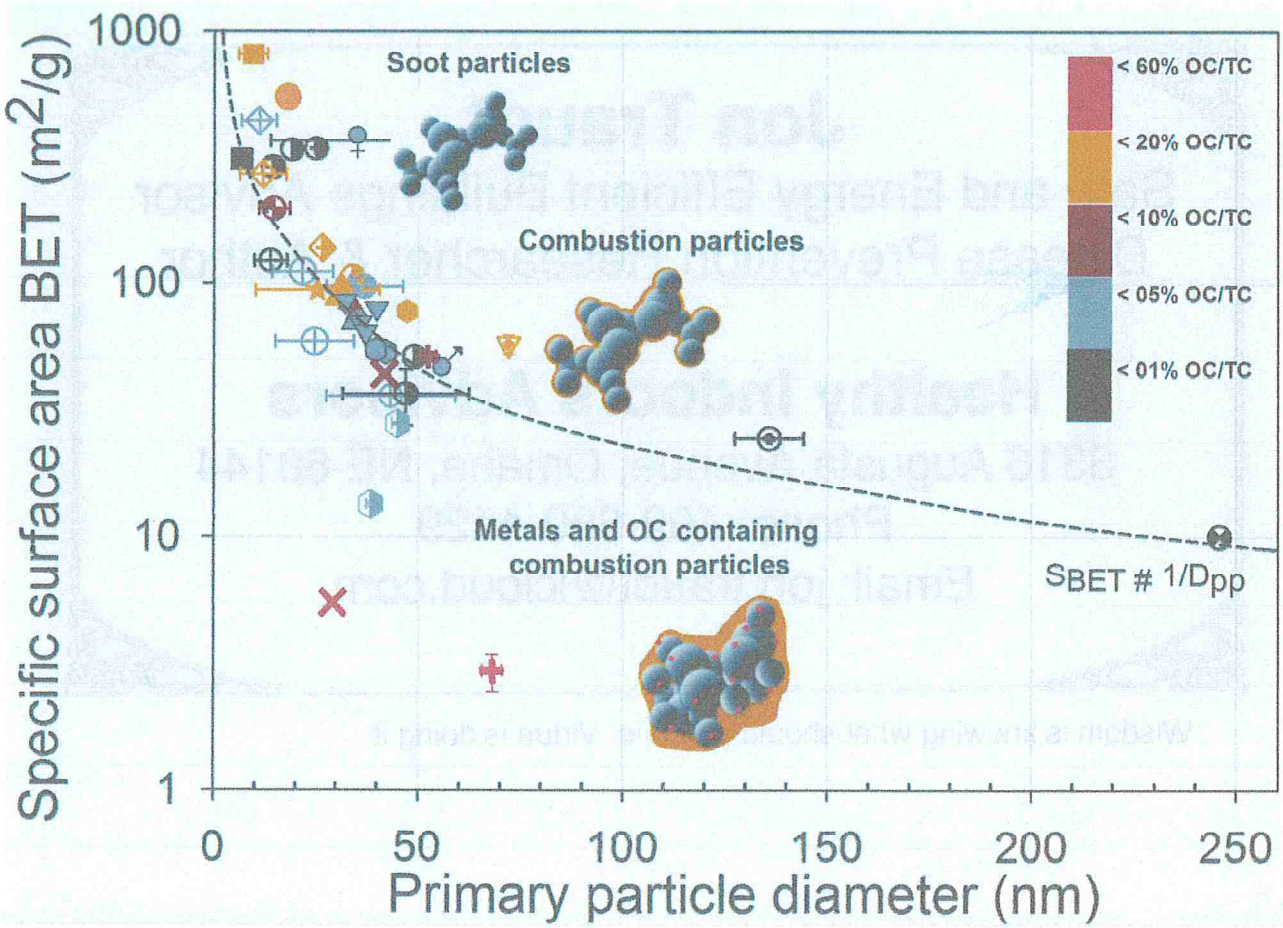


Figure 8. The mean values of the total dose to haematopoietic marrow from radon-derived (^{222}Rn and daughters) and thoron-derived (^{220}Rn and daughters) at average UK exposure, estimated from birth to 70 years of age. No range values are depicted; uncertainty limits are discussed in the text.

Soot particles are extremely small and can have more than 100 square meters of surface area per gram, enabling them to accumulate large quantities of toxic and radioactive radon progeny, 90% of which accumulate on airborne particles.



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10 Harsh Realities of the US Coal Industry

Excerpted from the Union of Concerned Scientist Clean Energy report

A typical-sized 500 megawatt coal-fired electricity plant in the United States puts out each year:

1. 3.7 million tons of carbon dioxide. Carbon dioxide (CO2) is the main greenhouse gas, and is the leading cause of global warming. There are no regulations limiting carbon dioxide emissions in the U.S.

2. 10,000 tons of sulfur dioxide. Sulfur dioxide (SOx) is the main cause of acid rain, which damages forests, lakes and buildings.

3. 10,200 tons of nitrogen oxide. Nitrogen oxide (NOx) is a major cause of smog, and also a cause of acid rain.

4. 500 tons of small particles. Small particulates are a health hazard, causing lung damage. Particulates smaller than 10 microns are not regulated, but may be soon.

5. 220 tons of hydrocarbons. Fossil fuels are made of hydrocarbons; when they don't burn completely, they are released into the air. They are a cause of smog.

6. 720 tons of carbon monoxide. Carbon monoxide (CO) is a poisonous gas and contributor to global warming.

7. 125,000 tons of ash and 193,000 tons of sludge from the smokestack scrubber. A scrubber uses powdered limestone and water to remove pollution from the plant's exhaust. Instead of going into the air, the pollution goes into a landfill or into products like concrete and drywall. This ash and sludge consists of coal ash, limestone, and many pollutants, such as toxic metals like lead and mercury.

8. 225 pounds of arsenic, 114 pounds of lead, 4 pounds of cadmium, and many other toxic heavy metals. Mercury emissions from coal plants are suspected of contaminating lakes and rivers in northern and northeast states and Canada. In Wisconsin alone, more than 200 lakes and rivers are contaminated with mercury. Health officials warn against eating fish caught in these waters, since mercury can cause birth defects, brain damage and other ailments.

9. Trace elements of uranium. All but 16 of the 92 naturally occurring elements have been detected in coal, mostly as trace elements below 0.1 percent (1,000 parts per million, or ppm). A study by DOE's Oak Ridge National Lab found that radioactive emissions from coal combustion are greater than those from nuclear power production.

10. A 500 megawatt coal-fired electrical plant burns 1,430,000 tons of coal, uses 2.2 billion gallons of water and 146,000 tons of limestone a year.

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Will Air Pollution Kill You?

October 16, 2025

Is there anything you own, or dream of owning, that you would rather have than having enough *mental and physical health* to enjoy living longer?
The following information can help you minimize your exposure to toxic and radioactive air pollutants that can damage your mental and physical health.

"Nothing is as elemental, as essential to human life, as the air we breathe. Yet around the world, in rich countries and poor ones, it is quietly poisoning us. It's not just the obvious ailments like asthma and bronchitis. Over the past decade and a half, scientists' understanding of air pollution's harms has advanced rapidly, and a powerful body of evidence now links it to a long and growing list of health woes, including heart attacks, strokes, birth defects, many kinds of cancer, dementia, diabetes, and Parkinson's disease."

- Beth Gardiner's book, ***Choked: Life Breath in the Age of Pollution***

Everywhere on earth, the air contains some toxic and radioactive soot from the combustion of coal, oil, wood, grass, etc. Scientists at the Massachusetts Institute of Technology estimate that Air pollution causes 200,000 early deaths each year in the U.S.[i]

The safest, most comfortable, and energy-efficient buildings:

- Have fresh air delivered through a very efficient filter to minimize the entry of air pollutants from outdoor sources.[ii]
- Have a ventilation rate based on measurements of indoor levels of carbon dioxide and relative humidity. Keep the indoor level of carbon dioxide near 600 parts per million to enhance brain functions during use of heating and cooling systems. Maintain a relative humidity above 20% to protect your respiratory system and below 50% to control dust mites.[iii]
- Help occupants to maintain a high level of productivity by minimizing exposure to air pollutants that can temporarily degrade cognitive abilities: information processing, initiative, crisis response, etc.[iv]
- Help occupants to slow the aging process and avoid, delay, or reduce the severity of, dementia by minimizing exposure to toxic and radioactive airborne pollutants that can kill cells throughout brains and bodies.
- Has an air pressure in the lowest room that is equal to, or slightly greater than, the pressure of water vapor, insecticides, radon, etc. in the soil.
- Have a tight building envelope to save energy and minimize entry of allergens, irritants, toxic particles, insects, etc.
- Typically sell faster and at a higher price.

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Filtration of incoming fresh air can substantially reduce the entry of air pollution from outside sources. The combustion of coal creates small, porous particles that contain arsenic, lead, mercury, and radioactive elements. After entering through the lungs and olfactory bulb (the organ of smell), those toxic and radioactive pollutants gradually accumulate throughout our bodies and brains.

Improving the energy efficiency of buildings and using renewable energy will help to reduce emissions of toxic combustion particles and greenhouse gases

NOTE: Manufacturing wind and solar energy systems is very energy-intensive, so the transition to renewable energy will be easier if it is done before fossil fuels become scarce and expensive.

Coal for use as fuel may end in less than twenty years

The Gillette coalfield, within the Powder River Basin in east-central Wyoming, is the most prolific coal source in the United States. In 2006, it provided *37 percent* of the USA's total yearly production. The 10.1 billion tons of economically accessible coal noted in the USGS 2008-1202 assessment might only last until about 2033 at the 2008 production rate of approximately 454 million tons of coal per year.[v] Other coalfields throughout the USA will also become worthless as *fuel sources* when mining another ton of coal requires more money than it is worth and/or more energy than it contains.

Jon Traudt
402-680-4429

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[i] Study: Air pollution causes 200,000 early deaths each year in the U.S.
http://news.mit.edu/2013/study-air-pollution-causes-200000-early-deaths-each-year-in-the-us-0829

[ii] Ventilation System Effectiveness and Tested Indoor Air Quality Impacts
https://www.nrel.gov/docs/fy14osti/61128.pdf

[iii] Instruments to simultaneously monitor indoor levels of indoor temperature, humidity, carbon dioxide, volatile organic chemicals, particles, ozone, etc. are available via the Internet.

[iv] The Impact of Green Buildings on Cognitive Functions
http://naturalleader.com/thecogfxstudy/study-1/cognitive-function-tests-scores-doubled/

[v] Assessment of Coal Geology, Resources, and Reserves in the Gillette Coalfield, Powder River Basin, Wyoming
https://pubs.usgs.gov/of/2008/1202/pdf/ofr2008-1202.pdf

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October 16, 2025

Mary Spurgeon

SENT: In Person, Via Certified Mail and Email

Dear Ms. Spurgeon,

As a government official, your decisions affect the lives of others. You may, however, be mistaken in believing that as a government official you are afforded qualified immunity - de facto - for the decisions you make.

This is not true.

The courts have ruled government officials cannot avail of qualified immunity if you are aware of harm - or even potential harm – that may result from your decisions.

When it comes to smart meters, attached is a Building Biology Institute Report that provides an indepth analysis. This report summarizes the harm/potential harm of smart meters and EMF and RFR exposure.

You have now been notified and given the scientific evidence. You cannot therefore avail yourself of qualified immunity if any customers and community members are harmed.

This means as an individual, you will be held personally liable - be sued -, if any of your customers or our community members are harmed from smart meters. To be clear, you will have to get your own attorney to defend any claims brought against you, and your personal hard-earned assets are exposed in such litigation.

Therefore, take personal responsibility for your decisions. I request, at a minimum, you delay any decisions on requiring <u>any</u> costs for community members who want to opt out for a smart meter before you do your own diligence, given the harm smart meters may cause to your customers or our community members physically and economically.

Thank you for your attention.

Yours sincerely,

Crystal Ellis
11909 N 58th St
Omaha, NE 68152

Mary Leask
7605 Pasadena Ave
Omaha, NE 68124

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October 16, 2025

Amanda Bogner

SENT: In Person, Via Certified Mail and Email

Dear Ms. Bogner,

As a government official, your decisions affect the lives of others. You may, however, be mistaken in believing that as a government official you are afforded qualified immunity - de facto - for the decisions you make.

This is not true.

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Michael J. Cavanaugh

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BUILDING BIOLOGY INSTITUTE REPORT

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IN THE SUPREME COURT OF PENNSYLVANIA
MIDDLE DISTRICT

RE: No. 34 MAP 2021, *Povacz, M, et al. v. PUC*
Associated Case(s):
35 MAP 2021 Consolidated
36 MAP 2021 Consolidated
37 MAP 2021 Consolidated
38 MAP 2021 Consolidated
39 MAP 2021 Consolidated
40 MAP 2021 Consolidated
41 MAP 2021 Consolidated
42 MAP 2021 Consolidated
43 MAP 2021 Consolidated
44 MAP 2021 Consolidated
45 MAP 2021 Consolidated

THE BUILDING BIOLOGIST INSTITUTE REPORT

General Statement

1. My name is Lawrence James Gust. I am the President of the Board of Directors of the Building Biology Institute (BBI).[1] I have a degree in electrical engineering and an MBA. I have been an environmental consultant for over 20 years and have trained hundreds of environmentally safer buildings consultants via the BBI.

2. The Building Biology Institute (BBI) is a 501(c)(3) non-profit corporation. BBI was founded in the US in 1993 and it follows the Principles of

[1] https://buildingbiologyinstitute.org/about/our-mission/

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the Institute fur Baubiologie und Ecologie in Germany.[2] Our mission is to help meet the ever-increasing public demand for proven methods that secure homes, schools, and workplaces from toxic indoor air, tap-water pollutants, and hazards posed by electromagnetic fields ("EMF") and radiofrequency radiation ("RFR") exposure.

3. BBI offers three professional certifications: (1) Building Biology Environmental Consultant (BBEC); (2) Electromagnetic Radiation Specialist (EMRS); and (3) Building Biology New Build Consultant (BBNC). Each certification requires the participants to complete online courses, participate in a multi-day on-site seminar, undergo a mentored final project and pass various tests. To be listed as a practicing professional on the BBI website,[3] certified BBEC professionals must obtain approved continuing education credits.

4. Our trained RF/EMF mitigation consultants measure the electromagnetic fields and radiation at the site, provide a plan on how to mitigate these emissions and work with other professionals such as electricians and IT professionals to put in place the identified mitigating measures.

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[2] https://www.ibo.at/en/

[3] https://buildingbiologyinstitute.org/find-an-expert/certified-consultants/electromagnetic-radiation-specialists/.

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5. Most of our clients are people who are sick or have family members who have adverse reactions to RFR exposure. As with other environmental toxins, and according to doctors, avoidance is the main and most effective treatment for those who are affected. Our services help them mitigate exposures in their homes, so they are part of the medical regimen prescribed by doctors. Many physicians encourage their patients to contact building biologists to optimize their living environment.[4]

6. We have a unique perspective and specific protocols driven by our extensive science-based knowledge, methods as well as experience working with those who suffer. Every day we see the widespread sickness caused by wireless devices and infrastructure. We personally witness how devastating this sickness is. Most important, we know our methods significantly improve the health and well-being of those who must avoid RFR. Remediation efficacy is well documented and undeniable.

7. Our knowledge and experience will provide the court valuable and important information necessary to reach a just decision in this case.

Smart Meters

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[4]https://www.womenscollegehospital.ca/assets/pdf/environmental/Preliminary%20Clinical%20Guidelines%20%20for%20EHS.pdf#page=18.

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8. We often confront sickness caused or exacerbated by smart meters. Simply removing the meter often leads to immediate and consequential health improvement. Unfortunately, we also routinely witness intolerable suffering by those forced to have smart meters as a condition of service without any means to opt-out.

9. People can turn off their cell phones, they can turn off the Wi-Fi in the router and use hard-wired internet. They cannot turn off the smart meters and therefore are forced to be exposed to the toxin that caused them to be sick 24/7, in their home. It is a torture.

Demand increase correlates with exposure growth

10. There has been a significant increase in requests for our RFR mitigation services over the last 20 years. Wireless services were first commercialized for the mass market in the mid-1980s. Back then and for around 10 years RFR mitigation was a very small part of our work. But that began to change in the early 2000s. Demand for our services has skyrocketed. RFR mitigation is now the most frequently requested service in our portfolio and constitutes about 75% of what we do. BBI consultants have a hard time fulfilling the demand. This directly correlates with and is the clear result of with the exponential growth in public exposure to wireless related pulsed RFR from wireless devices and infrastructure. Pervasive and chronic exposure leads to

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endemic sickness. We see it every day in our work, and it is devastating for those who are afflicted.

11. This increase in demand is also reflected in the number of professionals who are taking the certification course and become a certified "building biologist." Since we started to operate, 27 years ago, we have certified approximately 308 building biologists. Thirty percent of them, approximately 100, were certified in 2020/2021.

Collaborating With Treating Physicians

12. We collaborate with doctors whose patients suffer from electro-sensitivity. The only effective treatment is avoidance and in many cases the house is the cause or at least an aggravating factor for their patients' illness. Doctors refer their patients to us, as ensuring that the home environment of those affected is as clean as possible from pulsed RF radiation is critical for any improvement.

Human Consequences

13. The human dimension of electro-sensitivity is tragic. People with the condition call me and other building biologists in ever increasing numbers. In many cases, people who used the technology "normally" and had no medical issues suddenly become ill. They share with me the overwhelming and life-altering changes confronting them when they or their children become sick. They literally beg us to help them return to a normal life.

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14. These people endure tremendous physical suffering. Frequent and debilitating headaches. Inability to sleep. Heart arrhythmia. Pain in extremities. Burning skin. Mental confusion, cognitive problems, and memory loss. Non-stop ringing in the ears. Persistent nosebleeds are also common, especially with children. For many the symptoms are disabling and prevent them from functioning. They endure social isolation. They cannot work, go or be anywhere. Their lives are becoming increasingly impossible. In addition, they have to deal with ignorant and cruel denial of their condition because their sickness is an inconvenient problem to those promoting wireless technology.

15. The problem is real and overwhelming. BBI's certified practitioners operate at ground zero. They alleviate the suffering of a rapidly growing number of people across the United States. Building Biologists often care for clients who are severely ill and desperately struggling simply to survive even in their own homes. For these individuals and their families, the implementation of mitigative measures recommended by BBI's certified consultants offer the first and last resort. For these clients and thousands like them, the services of Building Biologists are lifesaving.

16. Many of our clients are unable to work because places of employment are saturated with wireless devices. They are unable to drive to work because roadways are flanked by cell towers irradiating passing vehicles with very high and

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ever-growing RF levels. They are unable to live in urban and suburban areas because houses are being irradiated by ever increasing numbers of cell phone antennas, neighbors' wireless devices and – as here – from utility smart meters.

17. However, when remediation reduces pulsed RFR radiation by shielding the residence, symptoms usually abate or reduce, depending on the initial power density and the overall ability of the shield.

RF Levels

18. The levels of pulsed RF radiation we measure (shown in power density) are usually well below the FCC guidelines. However, power density is still significantly millions and trillions of times above natural environmental levels,[5] and sometimes millions and more times higher than the levels that can cause adverse health effects reported in peer-reviewed research.

19. The FCC guidelines are not biologically-based and not evidence-based. The FCC guidelines do not address non-thermal effects or pulsation and they average exposure over 30 minutes (which hides the true biological response to exposure) and test for exposure from only one device. They do not protect from chronic long-term exposure or from exposure to multiple devices, radiation sources, frequencies, and modulations. They do not protect the public health, or at

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[5] https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30221-3/fulltext.

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least not for a significant part of the population. Our clients are the evidence, and the growing sickness is a clear proof this is so.

20. The FCC's averaging does not account for pulsed digital signals occurring in milliseconds. Therefore, they vastly underate the power density (typically measured in milliwatts per square centimeter, or mW/cm^2) that the human body must deal with on account of unremitting exposure to pulsed, modulated radiofrequency radiation. We see the peaks and pulses hidden by averaging, and witness first-hand what it does to people. BBI practitioners measure the aggregate RF exposure on the human body when in clients' homes.

Shielding

21. Those affected by RF/EMF face a living hell. They cannot be or go anywhere. Their home is their only refuge. Even this refuge is constantly under threat, and many are required to shield their homes. Reducing RF levels enough to be effective is a costly process. Unfortunately, the expense prevents many people from effecting the best remediation plan or any plan at all.

22. Shielding is expensive because the shielding materials are metal based, as metal blocks radiation. For example, shielding a parent's queen size bed with an RF protection tent ranges from $1,250 to $1,700 depending on the shielding capability of the material. Shielding a child's single bed will cost between $1,000 to $1,400. Instead, it is possible to shield the bedroom itself by

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painting the walls with RF protection paint and putting RF protection film on the windows instead of tenting the bed. The cost for an average 12' x 12' bedroom is $2,450. A family with two children would have to spend about $7,350.

23. Building Biologists focus on shielding sleeping areas because this is where people are most vulnerable to RF radiation. But this alone does not adequately protect people who are home all day.

24. Whole-house RF Radiation reduction requires painting the outside of the house and the inside ceiling on the top floor with an RF protection paint. The cost for 2,000 square feet is approximately $14,000. This cost is for two coats of paint. But with growing RF levels, three coats are often needed, so the cost is higher.

25. Metal reflects RF back into a shielded area. Therefore, whenever these materials are applied, a careful analysis is required to ensure the materials do not actually increase exposure. Shielding requires experts to do the job and this increases total cost.

26. People sick from environmental exposure should not be forced to be exposed in their home to the toxin that makes them severely sick. The considerable cost of creating a livable environment is unfairly shifted to the injured, who have no ability to recover from those who caused the injury.

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Shielding & Smart Meters

27. Shielding materials attenuate the radiation, they do not entirely block it. Reducing exposure enough to have a salutary effect is becoming increasingly difficult because of the densification of wireless infrastructure including 5G, and because home devices are becoming more powerful.

28. Smart Meters are without a doubt one of the most significant problem sources. In 2013 I filed a letter with the FCC in response to the agency's 2013 inquiry whether it should review its 1996 guidelines. I wrote to the FCC that the most significant frequent initial sensitizing event we have seen over the last two years has been the installation of smart meters. Now, 8 years later, this is still true. Smart meters are the most significant sickness agent we must confront. 5G antennas near homes is yet another major sickness agent, but they, at least, do not typically also cause conduction through the homes' over the cage of wiring that encircles the entire living space– in the walls, ceiling and floor.

29. Smart meters' antennas send intense RF pulses every few seconds and these emissions affect the entire house. Proximity of the RF radiation-emitting source directly impacts our ability to attenuate the radiation, as radiation drops with distance. Smart meters' location on or in close proximity to the house is why they are the worst offenders for those who suffer from pulsed RFR.

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30. The radiation from meters installed further away from the house still creates RF inside the house. The RF frequencies from the antenna and from the switch mode power supply are conducted through the house electric wiring. This pulsed RF radiation enters the living spaces through the floors, walls, and ceilings and via the power cords on all plugged-in electrical devices.

31. While one can take measures to reduce the radiation from smart meters' antennas, shielding from the RF emissions that go into the house electric wiring system from the RF antenna and from the switch mode power supply (SMPS) is complex, expensive, and not very effective.

32. There are filters that help reduce the RF "noise" created by the meter's switch mode power supply that conducts through the electric wiring. However, some are very expensive. Others emit high magnetic fields that are also problematic for those who are sick. Filters provide only partial solution as many reduce higher frequencies while creating new, lower frequencies that are below the typical measurement range of the meter.

33. Shielding is used to block radiation coming from the outside. Shielding materials should be installed only when no pulsed RF-based wireless devices are in the house.[6] Otherwise, the shielding would be counterproductive and

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[6] Part of our remediation includes eliminating all other emission sources inside the house, including things like SMPS used in laptop computers or other electronic devices or wireless "Internet of Things" devices. Our clients can control such

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even increase exposure because the inside-home emissions become "trapped" within the house because of the shielding. For that reason, shielding the house from outside sources can aggravate the problem caused by smart and digital meters.

34. A smart or digital meter on a house with resident adults and children who adversely react to RF/EMF harms them both directly and indirectly. They directly suffer from the meter effects, and they cannot shield emissions from the outside like from cell towers, or neighbors' smart meters and Wi-Fi networks.

Conclusion

35. People are being told that wireless technology is safe. That smart meters are safe. They trust the government and the equipment manufacturers to have their best interests and safety at heart. Nothing is further from the truth as the recent case of the Children's Health Defense against the FCC exposed. We see the devastating sickness daily in our work. We hope this court will protect those who need it the most.

36. The only reasonable accommodation for those who suffer from pulsed RF radiation is an analog meter. They are the only meters that do not emit RFs and do not aggravate the situation of those whose life is already a torturous nightmare. Analog meters are inexpensive, last much, much longer than digital meters - they

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things. But they cannot control what the smart or digital meter does nor can they turn it off.

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ARTICLE Communicated by Anne Steinemann

Diplomats' Mystery Illness and Pulsed Radiofrequency/Microwave Radiation

Beatrice Alexandra Golomb
bgolomb@ucsd.edu
UC San Diego School of Medicine, La Jolla, CA 92093, U.S.A.

Importance: A mystery illness striking U.S. and Canadian diplomats to Cuba (and now China) "has confounded the FBI, the State Department and US intelligence agencies" (Lederman, Weissenstein, & Lee, 2017). Sonic explanations for the so-called health attacks have long dominated media reports, propelled by peculiar sounds heard and auditory symptoms experienced. Sonic mediation was justly rejected by experts. We assessed whether pulsed radiofrequency/microwave radiation (RF/MW) exposure can accommodate reported facts in diplomats, including unusual ones.

Observations: (1) Noises: Many diplomats heard chirping, ringing or grinding noises at night during episodes reportedly triggering health problems. Some reported that noises were localized with laser-like precision or said the sounds seemed to follow them (within the territory in which they were perceived). Pulsed RF/MW engenders just these apparent "sounds" via the Frey effect. Perceived "sounds" differ by head dimensions and pulse characteristics and can be perceived as located behind in or above the head. Ability to hear the "sounds" depends on high-frequency hearing and low ambient noise. (2) Signs/symptoms: Hearing loss and tinnitus are prominent in affected diplomats and in RF/MW-affected individuals. Each of the protean symptoms that diplomats report also affect persons reporting symptoms from RF/MW: sleep problems, headaches, and cognitive problems dominate in both groups. Sensations of pressure or vibration figure in each. Both encompass vision, balance, and speech problems and nosebleeds. Brain injury and brain swelling are reported in both. (3) Mechanisms: Oxidative stress provides a documented mechanism of RF/MW injury compatible with reported signs and symptoms; sequelae of endothelial dysfunction (yielding blood flow compromise), membrane damage, blood-brain barrier disruption, mitochondrial injury, apoptosis, and autoimmune triggering afford downstream mechanisms, of varying persistence, that merit investigation. (4) Of note, microwaving of the U.S. embassy in Moscow is historically documented.

Conclusions and relevance: Reported facts appear consistent with pulsed RF/MW as the source of injury in affected diplomats.

Neural Computation **30, 2882–2985** (2018)
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Nondiplomats citing symptoms from RF/MW, often with an inciting pulsed-RF/MW exposure, report compatible health conditions. Under the RF/MW hypothesis, lessons learned for diplomats and for RF/MW-affected civilians may each aid the other.

1 Introduction

More than two dozen American diplomats in Cuba (Lederman, 2018; Perlez & Myers, 2018) and their families (Lederman & Lee, 2017), plus a smattering of Canadian diplomats in Cuba (Cochrane, 2017; Lederman, Weissenstein, Lee, & Associated Press, 2017) and their families (Panetta, 2017), reportedly developed a "mystery" illness (Associated Press in Washington, 2017; Cochrane, 2017; "Cuba's sonic attacks," 2017; Associated Press, 2017a) that "has confounded the FBI, the state department and US intelligence agencies" (Associated Press in Washington, 2017), "baffling US officials" (Lederman, Weissenstein, & Lee, 2017): "'It's just mystery after mystery after mystery'" (Lederman, Weissenstein, & Lee, 2017). Problems began in 2016, began to be widely reported in 2017, and as of January 2018, "'We are not much further ahead than we were in finding out why this occurred,' Undersecretary of State Steve Goldstein said" (Lederman, 2018). Similar problems first were recognized in China in April 2018, and "a number of diplomats at the US consulate in Guangzhou, China, had been sent home with similar symptoms" (Buckley & Harris, 2018; Harris, 2018a; Perlez & Myers, 2018; Stone, 2018)—by June's end, "at least eight" from the consulate in Guangzhou, and "at least 11" from China more broadly (Myers, 2018).

Media reports have long characterized these so-called health attacks (Associated Press, 2017a, 2017b; Robles & Semple, 2017a, 2017b) as "sonic attacks" (Associated Press in Washington, 2017; Board, 2017; "Cuba's sonic attacks," 2017; Gearan, 2017; Lederman, 2017a; Lederman, Weissenstein, & Lee, 2017; Perlez & Myers, 2018; Associated Press, 2017c).

This characterization persisted despite rejection of sonic explanations by experts (Associated Press in Washington, 2017; Lederman, Weissenstein, & Lee, 2017; Associated Press, 2017c; Zimmer, 2017a, 2017b), for example, "No single, sonic gadget seems to explain such an odd, inconsistent array of physical responses" (Lederman, Weissenstein, & Lee, 2017). According to psychoacoustics expert Joseph Pompei, "'Brain damage and concussions, it's not possible.' . . . 'Somebody would have to submerge their head in powerful ultrasound transducers'" (Lederman, Weissenstein, & Lee, 2017). Some suggested a viral hypothesis (Lederman, 2018), but this fails to explain many features of these cases, including the strange noises associated with inciting events in some, and there is not a known viral illness with a compatible profile of symptoms. Though "officials told senators the US government knew of no weapon, sonic or otherwise, that could produce

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the effects seen in the Cuba patients" (Lederman, 2018), to this date, some media sources continue to reference sonic attacks (Perlez & Myers, 2018).

A different explanation is proposed that, it is suggested, better accommodates the facts, including the "odd, inconsistent array of physical responses" (Lederman, Weissenstein, & Lee, 2017) and other "mysterious" and protean features reported. Reported features are assessed for compatibility to known effects of radiofrequency/microwave radiation (RF/MW), particularly pulsed RF/MW. Symptoms and signs are assessed against symptoms and signs reported by people who report health effects from RF/MW exposure, a condition that has been termed "radiofrequency sickness" (Johnson Liakouris, 1998), "microwave syndrome" (Navarro, Segura, Portoles, & Gomez-Perretta, 2003), or to encompass people experiencing problems from exposures beyond a specific part of the electromagnetic spectrum, "electromagnetic hypersensitivity" (Genuis & Lipp, 2012; Hagstrom, Auranen, & Ekman, 2013; Hardell et al., 2008; Leitgeb, 1998; McCarty et al., 2011), "electrosensitivity" (Woolston, 2010; www.es-uk.info; www.esnztrust Electrosensitivity New Zealand) or "electrohypersensitivity" (Belpomme, Campagnac, & Irigaray, 2015; Carpenter, 2014; Heuser & Heuser, 2017; Johansson, 2006, 2015; Redmayne & Johansson, 2014).

2 Methods

Features of diplomats' "health attacks"—origins, symptoms, and findings—are delineated and examined in relation to evidence regarding symptoms from RF/MW.

Features to be examined for compatibility with an RF/MW-explanation include the following. Strange noises were heard by some diplomats during apparent inciting episodes (Lederman, Weissenstein, Lee et al., 2017; Stone, 2018). The noises that were heard differed markedly for different diplomats (Lederman, Weissenstein, Lee et al., 2017). Descriptions included high-pitched chirping similar to crickets or cicadas, ringing and grinding (Lederman, Weissenstein, & Lee, 2017). The noises were heard primarily at night (Lederman, Weissenstein, & Lee, 2017). Other diplomats heard no noises (Lederman, Weissenstein, Lee et al., 2017) and were not aware of any inciting episodes—just onset of symptoms. In some cases, noises were confined to "parts of rooms with laser-like specificity" (Lederman, Weissenstein, & Lee, 2017). "Others in the immediate vicinity heard nothing" (Golden & Rotella, 2018). Within the area in which a sound was perceived, it seemed to follow the person around the room (Stone, 2018).

Auditory symptoms are a prominently reported and distinctive feature (though not present in all) and include hearing loss (Associated Press, 2017b; Associated Press in Washington, 2017; Lederman, Weissenstein, & Lee, 2017; Panetta, 2017; Robles & Semple, 2017a; Wilkinson, 2017) and tinnitus (Associated Press in Washington, 2017; Harris, 2018b; Lederman,

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Weissenstein, Lee et al., 2017; Panetta, 2017), and, particularly during inciting episodes in some, ear pain (Harris, 2018b; Lederman, 2018).

Other symptoms are protean and vary markedly from individual to individual—"an odd, inconsistent array of physical symptoms"—Lederman, Weissenstein, & Lee, 2017). Sleep symptoms (Associated Press, 2017a; Panetta, 2017; Swanson et al., 2018), headaches (Associated Press in Washington, 2017; Harris, 2018b; Panetta, 2017; Swanson et al., 2018), cognitive dysfunction (Harris, 2018b; Lederman, Weissenstein, & Lee, 2017; Panetta, 2017; Swanson et al., 2018), fatigue (Harris, 2018b; Panetta, 2017), and dizziness (Associated Press in Washington, 2017; Harris, 2018b; Panetta, 2017; Swanson et al., 2018) are prominent among the "nonspecific" symptoms. In some, problems were temporary and apparently recovered with time away from the exposure (Associated Press in Washington, 2017); others experienced persistent problems (Lederman & Lee, 2017; Lederman, Weissenstein, Lee et al., 2017).

Potentially objectively measurable problems with speech (Associated Press in Washington, 2017; Lederman, Weissenstein, & Lee, 2017), balance (Associated Press, 2017a; Associated Press in Washington, 2017; Lederman, Weissenstein, & Lee, 2017; Swanson et al., 2018), and vision (Associated Press, 2017a; Swanson et al., 2018), as well as epistaxis (nosebleed) (Associated Press in Washington, 2017), are a feature in some. Peculiar sensory symptoms of pressure and vibration are reported (Swanson et al., 2018). Brain injury (Associated Press in Washington, 2017; Harris, 2017a; Lederman & Lee, 2017; Lederman, Weissenstein, Lee et al., 2017), white matter abnormalities (Weissenstein, 2018), and brain swelling (Associated Press in Washington, 2017; Lederman, Weissenstein, Lee et al., 2017) have been reported.

To assess compatibility of symptoms in diplomats with those experiencing symptoms from RF/MW, we focus on those who are symptomatic in each group. "Only a minority of embassy staff were stricken" (Stone, 2018), and it is these who have been reported on and studied. The minority who are symptomatic from RF/MW exposures are the appropriate comparator.

Peer-reviewed publications are the primary source of information. However, the most authoritative source for information about symptoms and experiences of individuals is affected individuals themselves, peer review confers no benefit and has no power to adjudicate individuals' reports. For this reason, the peer-reviewed literature to address issues of science is complemented by sources that have elicited and reported on symptoms and experiences of diplomats, or of RF/MW affected individuals, extending to encompass news reports, surveys, statements of affected individuals, or, when applicable, other "gray literature." For diplomats, news and other media reports are complemented by a *JAMA* report focused on neurological symptoms in diplomats (Swanson et al., 2018). Information that references "news" rather than science also cites media sources.

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Mechanisms by which RF/MW may cause reported problems are cursorily addressed. Sources of RF/MW reported to affect the comparator group, and potential RF/MW sources of diplomats' symptoms, are briefly reviewed.

3 Results

Table 1 reviews characteristics of noises reported by diplomats in inciting episodes and compatibility with RF/MW. Pulsed RF/MW in the 2.4 to 10,000 MHz range produces perceived noises that resemble sounds "such as a click, buzz, hiss, knock, or chirp," just as diplomats report (Elder & Chou, 2003). Ability to hear RF/MW "sounds" is reported to depend on high frequency hearing, and on low ambient noise (Elder & Chou, 2003) through a phenomenon termed the *Frey effect*. (Synonyms include *microwave auditory effect*, *RF hearing*, and variations of these.) This fits reports that noises were not universally perceived. The requirement for low ambient noise accounts for perception of "sounds" primarily at night (Lederman, Weissenstein, & Lee, 2017). The primary pitch perceived reportedly relates to head dimensions (Elder & Chou, 2003)—in addition to pulse waveform and other characteristics (Lin, 1980)—accounting for different "sounds" perceived by different diplomats. Sounds were localized with "laserlike" specificity in some cases, supposedly defying known physics (Lederman, Weissenstein, & Lee, 2017). This may defy the physics of sound but not the physics of RF/MW: lasers *are* electromagnetic radiation (EMR). One diplomat reported that the sound seemed to follow him within the space in which it was heard (Stone, 2018). Frey sounds also follow the person, often perceived as slightly behind the head, regardless of the body orientation relative to the source of radiation (Bolen, 1988; Elder & Chou, 2003; Frey, 1961). Covering ears did not lessen noise, consistent with RF/MR "sounds" (Tucker, 2018). Frey induction is not governed by average radiation intensity but the energy in a single pulse (Elder & Chou, 2003). (Analogously, if a jackhammer hit each 2 minutes, the low time-averaged pressure would not explain the damage.)

Table 2 reviews diplomats' symptoms and signs, and compatibility of these with RF/MW. Auditory symptoms, including tinnitus, hearing loss, and ear pain or pressure, are prominent in diplomats (Swanson et al., 2018) and in persons affected by RF/MW (Conrad & Friedman, 2013; Halteman, 2011; Kato & Johansson, 2012; Lamech, 2014). Symptoms are protean in both groups. Prevalent among nonauditory nonspecific symptoms are sleep problems, headaches, cognitive problems, and, to a lesser degree dizziness and nausea (Associated Press in Washington, 2017; Conrad & Friedman, 2013; Halteman, 2011; Harris, 2018c; Kato & Johansson, 2012; Lamech, 2014; Lederman, Weissenstein, & Lee, 2017; Swanson et al., 2018). Additional more specific symptoms that are in principle objectively measurable include problems with balance, speech, vision, and epistaxis (nosebleed) (Associated Press in Washington, 2017; Conrad & Friedman, 2013; Halteman, 2011;

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Table 1: Features of Noises Reported by Diplomats during Apparent Inciting Episodes.

Diplomats' Reports	Compatibility with RF/MW
Strange noises were heard by many "of the 24 'medically confirmed"' affected U.S. diplomats (Lederman, 2018), during what were perceived as inciting episodes (Lederman, Weissenstein, & Lee, 2017).	Sound ordinarily results from air-pressure waves (which are longitudinal waves—variation occurs along the direction of travel of the wave), whereas radiation arises from electromagnetic waves (which are transverse waves—variation occurs perpendicular to the direction of travel of the wave). In each case, a frequency is defined by the number of cycles of the wave (that pass, say, a given point) per second, for the respective wave type. Though electromagnetic signals are not themselves sound, RF/MW can lead to perceived noises through the so-called Frey effect (Elder & Chou, 2003) (also called the microwave auditory effect or RF hearing). A 1976 Defense Intelligence Agency report stated, "Sounds and possibly even words which appear to be originating intracranially can be induced by signal modulation at very low average-power densities" (Adams & Williams, 1976). A 1988 Air Force Materiel Command report stated, based on knowledge at the time, that "individuals exposed to pulsed RF/MW radiation have reported hearing a chirping, clicking or buzzing sound emanating from inside or behind the head. The auditory response has been observed only for pulsed modulated radiation emitted as a square-wave pulse train. The pulse width and pulse repetition rate are factors that appear to determine the type of sound perceived. . . . James Lin . . . reports that the sensation of hearing in humans occurs when the head is irradiated at an average incident power density level of about 0.1 mW/cm^2 and a peak intensity near 300 mW/cm^2. Auditory responses have been observed for a frequency range of 200–3000 MIHz and for pulse widths from 1-100 us" (Bolen, 1988). The frequency range within which sounds can be heard was broadened by 2003: it was reported that sounds can be perceived by persons exposed to RF/MW in the 2.4 to 10,000MHz range (Elder & Chou, 2003). It was noted that the same frequency did not produce the same sound from person to person.
Not all diplomats heard noises (Lederman, Weissenstein, & Lee, 2017).	Ability to hear RF/MW-induced "sounds" (using the term to refer to the perception, not the stimulus) at all depends on individuals' high-frequency hearing (Elder & Chou, 2003), as well as on low ambient noise (Elder & Chou, 2003).

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Table 1: Continued.

Diplomats' Reports	Compatibility with RF/MW
Among those who heard noises, the noises reported differed markedly for different diplomats (Lederman, Weissenstein, Lee et al., 2017).	In RF hearing/microwave hearing, the "sound" perceived reportedly relates not to the radiation frequency (cycles/sec) but to head dimensions and pulse characteristics (Elder & Chou, 2003; Lin, 1980). This comports with reports that different sounds were heard by different diplomats, even if they were exposed to the same frequency (or, conceivably, frequencies) of radiation. Of note, whether sound is perceived from RF/MW is not governed by the average radiation level but the energy in a single pulse. Injury to cells (in part through membrane damage) is also materially greater with pulsed radiation (Bonnafous, Vernhes, Teissie, & Gabriel, 1999; Shil, Sanghvi, Vidyasagar, & Mishra, 2005). (Analogously, if a jackhammer hit very hard but very briefly at 2 minute intervals, the low time-averaged pressure would not explain the effects produced.) The relatively high proportion of affected diplomats reporting Frey-type noises suggests the possibility of comparatively high intensity of pulses and frequencies within the designated 2.4 to 10,000 MHz range.
These noises included a high-pitched "chirping," ringing and "grinding" (Lederman, Weissenstein, & Lee, 2017; Associated Press, 2017c).	Frey "sounds" are "similar to other common sounds" "such as a click, buzz, hiss, knock, or chirp," consistent with sounds that diplomats reported (Elder & Chou, 2003). In a 2007 Dutch survey completed by 250 persons with electrosensitivity (ES), queries related to noise included buzzing (reported by 96), hissing (reported by 80), strong low-frequency sounds (reported by 56), and "sound of bells clanging" (reported by 28) (Schooneveld & Kuiper, 2007). The term *chirping* (if there is a Dutch equivalent) was not included among inquiries. Of note, the "strong low frequency sounds" are potentially consistent with the "blaring, grinding noise" reported by a diplomat ("blaring" indicative of "strong," and "grinding" consistent with low frequency), while the "sound of bells clanging" is consistent with reports of diplomats who awoke to hear ringing "and fumbled for their alarm clocks, only to discover the ringing [clanging] stopped when they moved away from their beds" (Lederman, Weissenstein, Lee et al., 2017).

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Table 1: Continued.

Diplomats' Reports	Compatibility with RF/MW
	In the Maine Smart Meter survey report (Conrad & Friedman, 2013), comments by affected persons were included. Exemplars involving Frey noises included these: "The noise I have in my head since smart meters is almost unbearable, sleep is at times impossible because it is so loud" (Conrad & Friedman, 2013) and "I became electrically sensitive almost immediately upon smart meter installation. My ears buzz, hum, and click constantly, pressure in the head and ears, . . . agitation and irritability all since the PLC smart meter was placed on my home. . . . I was able to vacation where there was no smart meter installed and it felt as if a vice had been loosened from around my head" (Conrad & Friedman, 2013). A post regarding a woman who removed her smart meter after becoming symptomatic repeated several times that the exposure caused her to hear "grinding" ("Smart meters or no power at all?" 2012), confirming this descriptor as among perceived RF/MW-hearing induced noises. Among those with ES who communicated with the UCSD ES Survey group, one stated that in proximity to "electrosmog producing devices, 'I hear sounds like beehives and similar [buzzing].'" Another stated, "The hissing in my ears is unbearable sometimes." One wrote "annoying noise" was among other symptoms.
Sound doesn't lessen when cover ears (Tucker, 2018).	RF/MW noises do not lessen with ear occlusion, and may intensify (Frey, 1961). [After] "72 Itron AMI smart meters [were installed] near me in my townhome complex. . . I hear a constant buzzing that is driving me crazy. It keeps me awake and makes it hard to think. I am not sure if it is an actual sound, or if it is being generated inside my head, because when I put my fingers in my ears I still hear it. . . . In addition, at about every 15 or 20 minutes, a more intense whine is added that lasts about 12–15 seconds, that hurts and gives me a mild headache which stops when the whine stops. . . When I go out into the state and regional parks around me where there are NO smart meters for miles, I no longer hear the buzzing and my heart doesn't race."
The noises were heard primarily at night (Lederman, Weissenstein, & Lee, 2017).	Ability to hear RF/MW-induced sounds at all depends on low ambient noise (Elder & Chou, 2003). Night is generally a time of low ambient noise.

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Table 1: Continued.

Diplomats' Reports	Compatibility with RF/MW
A sound that has been recorded in Cuba and reported to be "similar" to some sounds heard is consistent with chirping of crickets or cicadas (Lederman & Weissenstein, 2017). Frey effect sounds should not be able to be recorded.	Recorded sounds, if *similar* to what was "heard" by some, need not *be* what was "heard." (Just as Frey sounds are "similar to other common sounds," so those other common sounds can resemble the Frey sound.) The recorded sound does not cause symptoms in listeners. The sound does not fit reports by other diplomats of either the character of the sound or of strict sound localization (such as reports that when one moved from the bed, sound disappeared). Some diplomats had cited perceived sounds similar to crickets or cicadas, the recorded noises were reportedly very similar to the chirping of crickets or cicadas that are abundant along the northern coast of Cuba (Weissenstein & Rodriguez, 2017). Since Frey effects can sound like crickets chirping, presumably recordings of crickets chirping could resemble those Frey effect sounds. Dr. Allen Sanborn, an expert in Latin American cicadas, listened to a dozen recordings made by Havana diplomats, and stated, "They sounded to me like cicadas" (Golden & Rotella, 2018). Those deploying causative devices could, of course, capitalize on misguided sonic hypotheses to lead the United States astray by adding a recorded sound resembling Frey sounds; however, there seems little need to postulate this.
There was apparent laser-like localization of sounds in some cases.	For diplomats, "at least some of the incidents were confined to specific rooms or even parts of rooms with laser-like specificity, baffling U.S. officials who say the facts and the physics don't add up" (Lederman, Weissenstein, & Lee, 2017). One incident was described in media as follows: "The blaring, grinding noise jolted the U.S. diplomat from his bed in a Havana hotel. He moved just a few feet, and there was silence. He climbed back into bed. Inexplicably, the agonizing sound hit him again. It was as if he'd walked through some invisible wall cutting straight through his room. Soon came the hearing loss and speech problems" (Lederman, Weissenstein, & Lee, 2017). Even for sounds described as loud, others close by heard nothing (Golden & Rotella, 2018). In claims that "the facts and the physics don't add up" (Lederman, Weissenstein, Lee et al., 2017), it was the physics of *sonic* devices that was inconsistent. The physics of EMR is, to the contrary, compatible: lasers are themselves focused EMR. Tautologically, EMR can be focused in "laser-like" fashion.
Within the room or parts of the room where sounds were heard, the sound follows the listener (Stone, 2018).	A diplomat reported that "a really odd loud noise seemed to follow him in the room" (Stone, 2018). Frey "sounds" are also reported to "follow" the listener, often perceived as slighty behind the head, regardless of the body orientation relative to the source of radiation (Bolen, 1988; Elder & Chou, 2003; Frey, 1961). In other cases, "sounds" are perceived inside or above the head (Cain & Rissmann, 1978; Elder & Chou, 2003; Ingalls, 1967).

Note: Though "sound" refers to air pressure waves, we will refer to what diplomats "heard" as (perceived) sound.

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Table 2: Symptoms and Signs.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
Distinctively prominent auditory symptoms	Auditory symptoms are prominent in reports of diplomats' experience, including ear pain or pressure (Swanson et al., 2018), sometimes within minutes of the perceived attack (Lederman, 2018); tinnitus (Associated Press in Washington, 2017; Harris, 2018b; Lederman, Weissenstein, & Lee, 2017; Lederman, Weissenstein, Lee et al., 2017; Panetta, 2017) and hearing loss (Associated Press, 2017a, 2017b; Associated Press in Washington, 2017; Lederman, Weissenstein, & Lee, 2017; Robles & Semple, 2017a; Swanson et al., 2018; Wilkinson, 2017). This, coupled with the strange noises in diplomats' reports, likely launched the sonic theory. These idiosyncratic features are key to winnowing potential causes. Symptoms like headache and fatigue arise with many exposures and in many conditions. New onset of tinnitus and hearing loss is far more distinctive. It is particularly so in the context of the spectrum of other reported symptoms and effects, and in the context of characteristics of instigating episodes. These distinctive auditory problems are similarly prominent in people reporting symptoms from RF/MW (Halteman, 2011; Lamech, 2014) Tinnitus and hearing loss were cited by 80% and 34%, respectively, in the UCSD survey of 202 individuals with current symptoms from EMR, with pulsed RF/MW causing symptoms in the vast majority (Golomb, 2015a). "Initial" symptoms were reported to include tinnitus in 50%, ear pain in 30%, and hearing loss in 11%. Case descriptions shared by affected individuals underscore auditory effects. From the UCSD survey: "I bought a Kindle W-Fi. I charged it not realizing the default setting was 'on.' After 5–10 minutes exposure, I became nauseated, had a headache, loud tinnitus . . . and was dizzy. I turned the Wi-Fi off and the symptoms completely resolved in 5–10 minutes" (Golomb, 2015a). A description by former educator Brinchman (2011) characterizes her abrupt development of headaches and hearing loss following introduction of pulsed RF/MW-emitting smart meters to her (and her neighbors') homes. Similarly, physicians and physician groups that assessed patients with health effects from RF/MW and recognized the connection also highlight effects on hearing. A psychotherapist in Germany with a long-time practice described a new group of patients with a physiological illness profile encompassing organic brain disease, with constellation of symptoms compatible with other reports of RF/MW injury. She was the one to discern the tie between patients' symptoms and their proximity to RF/MW sources (a connection that her patients had often missed obviating nocebo effects as a source; see Table 4), and to note recovery with removal from those sources (Aschermann, 2009). She describes "sudden hearing loss" as among the symptoms (in addition to sleep problems described as an "almost ubiquitous" headache as extremely frequent, also noting, for example, fatigue, cognitive problems, and tinnitus).

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
	A group of 114 physicians, referencing their analysis of medical complaints of 356 people in Oberfranken, signed an open Letter to the Prime Minister of Germany in 2004 (referred to as the Bamberg Appeal), stating, "The pulsed high frequency electro magnetic fields (from mobile phone base stations, from cable-less DECT telephones, amongst others), led to a new, previously unknown pattern of illnesses with a characteristic symptom complex" (Waldman-Selsam, 2004). Prominent and repeated mention is made of hearing loss: "People suffer from one, several or many of the following symptoms: Sleep disturbances, tiredness, disturbance in concentration, forgetfulness, problem with finding words, depressive mood, ear noises, sudden loss of hearing, hearing loss, giddiness, nose bleeds, visual disturbances, frequent infections, sinusitis, joint and limb pains, nerve and soft tissue pains, feeling of numbness, heart rhythm disturbances, increased blood pressure episodes, hormonal disturbances, night-time sweats, nausea. . . . It is no way only a subjective sensitivity disturbance. Disturbances of rhythm, hearing problems, sudden deafness, hearing loss, loss of vision, increased blood pressure, hormonal disturbances, concentration impairments, and others can be proved using scientific objective measures" (Waldman-Selsam, 2004). Note also the mention of "ear noises" (the Frey effect).
	Some studies that experimentally examine effects of RF/MW on hearing show effects, though not all do (See Table 4 for discussion of "inconsistent" effects.) A material consideration is that evidence is consistent with a vulnerable subgroup.
	One experimental study in humans found that 60 minutes of close exposure to EMR from a mobile phone "had an immediate effect on HTL [hearing threshold limits] assessed by pure-tone audiogram and inner ear (assessed by DPOAE) in young human subjects. It also caused a number of other otologic symptoms" (Alsanosi et al., 2013).
	Of note, melatonin, which can be depressed by EMR (see Table 4) and is low in those with EHS (Belpomme et al., 2015), protects against oxidative radiation injury (see Table 4), including to the inner ear (Karaer et al., 2015).
	Pulsed RF/MW (more than continuous) has been shown to increase tympanic temperature, even when, for instance, colonic temperature is not increased (Frei, Jauchem, & Heinmets, 1988). Since blood flow is critical for cooling and oxidative stress leads to endothelial dysfunction and may compromise blood flow, affected individuals (see below; by hypothesis those with greater oxidative stress effects) may experience greater impairment in blood flow—so less cooling and also impaired delivery (via impaired blood flow) of oxygen, glucose, and other energy substrates as well as antioxidant defenses. The downstream effects of oxidative stress (e.g., apoptosis, inflammation; see below) and impaired cell energy/ mitochondrial dysfunction (cell dysfunction and death) may contribute to auditory pathology.

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
	In a study examining the histopathology of cochlear nuclei of rats "exposed continuously for 30 days" to "a GSM-like 2100 MHz EMF" "with a signal level (power) of 5.4 dBm (3.47 mW) to simulate the talk mode on a mobile phone," compared to a control group of rats not similarly exposed, "an increase in neuronal degeneration and apoptosis in the auditory system" was observed in the RF/MW exposed group (Celiker et al., 2016). "The histopathologic analysis showed increased degeneration signs in the study group ($p = 0.007$). In addition, immunohistochemical analysis revealed increased apoptotic index in the study group compared to that in the control group ($p = 0.002$)" (Celiker et al., 2016). In another animal study, "a prominent effect of EMS [electromagnetic stimulation] was . . . severe cochlear damage and permanent sensorimotor hearing loss in experimental animals" (Counter, 1993).
Protean symptoms	Beyond the auditory symptoms, the profile of symptoms in diplomats varies from person to person. Different people report markedly different symptoms (Lederman, Weissenstein, Lee et al., 2017). It was said that "the symptoms and circumstances reported have varied widely, making some hard to tie conclusively to the attacks" (Lederman, 2017b), and "The cases vary deeply: different symptoms, different recollections of what happened. That's what makes the puzzle so difficult to crack" (Lederman, Weissenstein, Lee et al., 2017). Reported symptoms encompass sleep problems (Associated Press, 2017a, 2017b; Panetta, 2017), headaches (Associated Press, 2017a; Lederman, Weissenstein, & Lee, 2017; Panetta, 2017; Robles & Semple, 2017a), cognitive problems (Associated Press, 2017a; Lederman, Weissenstein, & Lee, 2017), nausea (Lederman, Weissenstein, & Lee, 2017), fatigue (Panetta, 2017), and dizziness (Lederman, Weissenstein, & Lee, 2017; Robles & Semple, 2017a).
	Similar concerns had been raised with RF/MW injury. As Aschermann noted (translated from German), "In the *Deutsche Aerzteblatt* [official journal of the German medical association—Bundesaerztekammer] did an article ask the incredulous question: How could so many different symptoms possibly be attributed to one common underlying mechanism?" (Aschermann, 2009).
	Despite the protean character of symptoms, multiple survey studies verify that a strikingly reproducible suite of protean symptoms *are* reported in setting after setting, and in people citing development of symptoms in response to EMR including RF/MW (see Table 3). The profile of symptoms is strongly similar from study to study, with sleep/fatigue, headache, and cognitive problems commonly topping the list and auditory and visual symptoms, dizziness, and nausea figuring in it.

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
	A similar primary list (sometimes augmented with a few additional symptoms, often including heart rhythm problems) is mentioned in other settings. Aschermann's (2009) analyses of 65 patients cite symptoms of learning concentration and behavioral problems, headaches, insomnia, exhaustion, tinnitus, hearing loss, dizziness, nerve and soft tissue pain, "inner agitation," as well as arrhythmia problems. In the 2004 Bamberg Appeal signed by 114 physicians to the German prime minister, based on analysis of 356 patients: "The pulsed high frequency electro magnetic fields (from mobile phone base stations, from cable-less DECT telephones, amongst others), led to a new, previously unknown pattern of illnesses with a characteristic symptom complex. People suffer from one, several or many of the following symptoms: Sleep disturbances, tiredness, disturbance in concentration, forgetfulness, problem with finding words, depressive mood, ear noises, sudden loss of hearing, hearing loss, giddiness, nose bleeds, visual disturbances, frequent infections, sinusitis, joint and limb pains, nerve and soft tissue pains," also nausea, and "feeling of numbness, heart rhythm disturbances, increased blood pressure episodes, hormonal disturbances, night-time sweats. . . . The symptoms occur in temporal and spatial relationship to exposure. It is no way only a subjective sensitivity disturbance. Disturbances of rhythm, hearing problems, sudden deafness, hearing loss, loss of vision, increased blood pressure, hormonal disturbances, concentration impairments, and others can be proved using scientific objective measures" (Waldman-Selsam, 2004).
	Among individuals participating in a physiological provocation study examining heart rate variability with RF/MW, among 25 patients, 40% of whom believed themselves to be moderately or severely electrosensitive, "the most common symptoms of exposure to electrosmog, as identified by this group of participants, included poor short-term memory, difficulty concentrating, eye problems, sleep disorder, feeling unwell, headache, dizziness, tinnitus, chronic fatigue" (Havas et al., 2010).
	Of note, the same symptoms also arise in the vulnerable subgroup of persons who develop health problems following other exposures that share a documented ability to cause mitochondrial impairment and oxidative stress (Chen et al., 2017; Golomb et al., 2014; Golomb, Koslik et al., 2015; Koslik, Hamilton, & Golomb, 2014; Steele, 2000). However, the profile, which symptoms dominate, differs from exposure to exposure, based on factors such as what part(s) of the body the exposure may differentially reach and whether additional mechanisms of injury are involved that potentiate damage to one domain.

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
	Sleep and auditory effects are clearly disproportionately represented, in diplomats and with RF/MW exposure, relative to their prevalence following other exposures that cause oxidative stress. The strong effects on sleep may relate to depressions in melatonin that can be produced with EMR/ RF/MW (see Table 4). Auditory effects are addressed above.
	A 1990 study commissioned in response to a petition by residents who cited adverse health experiences from a shortwave radio transmitter in their small town of Schwarzenburg, funded in part by Swiss Telecom, reported that sleep disruption in association with transmitters related directly to the EMR field strength of the transmitter and affected 55% of those over age 45 (Altpeter et al., 1995; Lamech, 2014). (There the denominator is *not* restricted to those who were symptomatic.)
	A 1988 Air Force Materiel Command reports that "pulsed RF/MW radiation was reported to have an analeptic effect in animals. Experimental results presented by R. D. McAfee in 1971 showed that anesthetized animals could be awakened by irradiation from a pulsed 10 GHz RF/MW source. . . Experiments conducted on rats showed that these animals were aroused from states of deep sleep by irradiation" (Bolen, 1988).
	The prominence of auditory effects (see above for more on these symptoms) may relate in part to the absence of a skull structure to protect the inner ear, producing an incident stimulus that is of greater effective intensity.
	The coherence of symptoms in response to RF/MW, with findings in Cuba (and China) diplomats, adds further support to the case for a common cause within each group – and across the two groups.

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
Symptoms that are (potentially) objectively measurable: *speech* (Associated Press, 2017a; Associated Press in Washington, 2017; Lederman, Weissenstein, & Lee, 2017); *vision* (Associated Press, 2017a). *balance* (Associated Press, 2017a; Lederman, Weissenstein, & Lee, 2017). Nosebleeds in some (Associated Press in Washington, 2017; Golden & Rotella, 2018).	The symptoms reported in media and Swanson et al. (2018) for diplomats, extending to the more specific (e.g., dizziness/balance, vision and speech problems), are also reported in survey studies of those affected by RF/MW (see Table 3). *Speech* problems, mentioned in diplomats, were also among symptoms elicited and reported in a survey study examining effects of RF/MW following "smart meter" introduction in Australia (Lamech, 2014). Reported cases illustrate speech problems arising following RF/MW exposure. In a case referenced in the *LA Times*, a woman reported that if someone fails to turn off their cellphone on entering her home, she gets symptoms within 2 hours: "'After four hours I can't speak anymore"" (Woolston, 2010). In a case described in a 2015 Australian presentation on ES (Weller, 2015), "Within hours, it felt as if someone had tied a thick rubber band around her head. Then came nausea, fatigue, ringing in her left ear–an onslaught of maladies all at once, and she had no idea why. . . . A week or two into the job, whatever was affecting her wasn't abating, and before long her speech became so jumbled that she couldn't form a complete sentence in front of an audience. . . . She went outside to inspect the place and found no fewer than 17 new 'smart' electricity meters strapped to the side of the building." In a case reported to UCSD investigators, new-onset right-sided ear pain and hearing loss attended the inciting episode (seated for 6 hours, unknowingly, directly across the wall from a bank of multiple smart meters for a building, slightly toward her right), along with vise-like headache, concentration problems, and two nights of no sleep (followed by chronic lesser sleep impairment), and, abating over months, continued to be triggered, always exclusively or predominantly on the right side, by previously tolerated RF/MW exposures thereafter. Many months later, left ear predominant ear symptoms developed for the first time. A bank of smart meters was identified to the left of where she had sat, hidden by plants so missed in an initial reconnaissance. That occasion, the only one with left predominant ear and hearing symptoms, was accompanied by speech difficulty, which resolved over about a week. In these two cases, aphasia was associated with left predominant ear symptoms (Broca's area, damage of which leads to expressive aphasia, is left prefrontal). It is an empirical question whether left-predominant auditory involvement will prove more often tied to affected speech. *Balance* is multifactorial, involving vision, muscle strength, and vestibular function, for example. In some media reports of diplomat health, the term *vertigo* is used (Harris, 2018b, 2018c). Balance and vestibular testing were performed in diplomats (Swanson et al., 2018). Clinical examinations and objective measures raised concern for balance problems in 81% (higher than the percent reporting subjective dizziness or balance problems) (Swanson et al., 2018).

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
	Vestibular function involves the same (eighth) cranial nerve as hearing. Vertigo, hearing loss, and tinnitus can arise (as adverse effects) as a triumvirate (Porto Arceo, 2003; Sepcic et al., 2010). Dizziness more generally, in contrast to vertigo, is a nonspecific finding that arises with many forms of brain insult, including brain hypoperfusion (low blood flow). Of note, cerebral hypoperfusion has been reported in persons with symptoms following RF/MW (Belpomme et al., 2015).
	In some surveys of RF/MW-affected individuals, dizziness and balance are queried together (Lamech, 2014); other surveys use only the term *dizziness*. Individual reports of balance and dizziness problems were included among participant narrative reports in the Maine survey—for example: "'Balance problems have worsened since installation of the smart meter, leading to several falls"' (Conrad & Friedman, 2013) and "'I could not understand the dizzineness which was scary. I actually thought I had a brain tumor all of a sudden"' (Conrad & Friedman, 2013). The Cuba diplomat study considered nausea as a vestibular symptom (Swanson et al., 2018). Though it need not necessarily be, it was linked to dizziness in some RF/MW/EMR affected cases: "'Daily nausea and dizziness"' (Conrad & Friedman, 2013).
	Loss of balance, with dizziness and disorientation, was identified as one of six clusters of symptoms seen in each of two smart meter surveys from different nations, with the clusters represented nearly in the same order: (1) sleep disruption, (2) headache, (3) ringing or buzzing in ears, (4) fatigue, (5) loss of concentration, memory or learning ability, and (6) disorientation, dizziness, or loss of balance) (Powell, 2015).
	Vision: Vision is affected by oxidative stress and mitochondrial impairment (see Table 4, mechanisms) (Argun et al., 2014; Beatty, Koh, Phil, Henson, & Boulton, 2000; Javaheri, Khurana, O'Hearn T, Lai, & Sadun, 2007; King, Gottlieb, Brooks, Murphy, & Dunaief, 2004; Liang, Green, Wang, Alssadi, & Godley, 2004; Totan et al., 2001), not just to the eye but to cortical systems involved in vision (Pachalska et al., 2002). Effects of these mechanisms include optic nerve damage (Javaheri et al., 2007; Qi, Lewin, Sun, Hauswirth, & Guy, 2007; Rucker, Hamilton, Bardenstein, Isada, & Lee, 2006), age-related macular degeneration (Beatty et al., 2000; Feher et al., 2005; Feher, Papale, Mannino, Gualdi, & Balacco Gabrieli, 2003; Liang & Godley, 2003; Modi, Heckman, & Saffer, 1992; Totan et al., 2001; Yu, Wu, & Lin, 1997), retinal thinning (Sandbach et al., 2001), and cataracts (Gul, Rahman, Hasnain, Salim, & Simjee, 2008; Karslioglu et al., 2005; Ottonello, Foroni, Carta, Petrucco, & Maraini, 2000; Tarwadi & Agte, 2004; Taylor, Jacques, & Epstein, 1995). Where brain swelling ensues (see Table 4), this can affect the shape of the lens, affecting vision.

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Table 2: Continued.

Diplomats' Symptoms and Signs	Compatibility with RF/MW
	Effects of RF/MW on the eye and on vision have long been reported (Birenbaum, Grosof, & Rosenthal, 1969; Bolen, 1988; Cleary, 1980; Cutz, 1989; Daily, Wakim, Herrick, Parkhill, & Benedict, 1952; McCally, Farrell, Bargeron, Kues, & Hochheimer, 1986; Williams & Finch, 1974; Zaret, 1973). Particular attention has gone to effects on the lens, and on cataracts. RF/MW, via oxidative mechanisms, promotes aging of the lens, which can lead to cataracts. Cataracts have been a reported complication, sometimes in young people, among persons working with microwave radiation (Birenbaum et al., 1969; Bolen, 1988; Cleary, 1980; McCally et al., 1986; Zaret, 1973). A Swiss study (Hassig, Jud, & Spiess, 2012) documented increased cataracts in calves born near cell towers: "We examined and monitored a dairy farm in which a large number of calves were born with nuclear cataracts after a mobile phone base station had been erected in the vicinity of the barn. Calves showed a 3.5 times higher risk for heavy cataract if born there compared to Swiss average. All usual causes such as infection or poisoning common in Switzerland could be excluded."
	Vision problems are reported in RF/MW-affected persons. In a study in Spain, in persons in proximity to two GSM (Global System of Mobile Communications) cell tower base stations, analysis of the closer group, with exposure in the range 0.25–1.29 V/m2, in a model adjusted for age, sex, and distance, showed that vision problems were elevated with an odds ratio of 5.8 (95% CI 1.7–19.8, $p = 0.005$) (Oberfeld, Navarro, Portoles, Maestu, & Gomez-Perretta, 2004).
	Eleven percent reported problems with eyes or vision in the Australian smart meter study. Since this includes respondents who are unaffected, rates are lower than in purely symptomatic individuals (Lamech, 2014). Twenty-Six percent of survey participants reported eye/vision problems in the Halteman smart meter impacts survey (Halteman, 2011). Vision problems were reported by 17% as "severe and new," by 38% as "moderate and new," and by 12% as "severe and worsened" in the Maine smart meter survey (Conrad & Friedman, 2013).
	An assessment of neurological problems in U.S. diplomats in Cuba underscores the potential importance of eye movement dysfunction (Swanson et al., 2018), which is also tied to oxidative and mitochondrial mechanisms (Chen, Li, Wu, Qi, & Wu, 1998; Dodson, Patten, Hyman, & Chu, 1976; Goto, Koga, Horai, & Nonaka, 1990; Hyman, Patten, & Dodson, 1977; Kao, 1994; Land, Hockaday, Hughes, & Ross, 1981; Pineda et al., 2004; Schaefer, Blakely, Griffiths, Turnbull, & Taylor, 2005; Smits, Westeneng, van Hal, van Engelen, & Overeem, 2012).

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Diplomats' Symptoms and Signs	Compatibility with RF/MW
	Epistaxis (nosebleed): In a study in Selbitz, Bavaria, nosebleed was significantly more frequently reported ($p = 0.01$) in those less than 200 m from a cell phone base station than 200 m to 400 m away (Eger & Jahn, 2010). Nosebleed was a reported symptom in each of several surveys of ES and symptoms associated with RF/MW, including in a study of smart meter symptoms (Conrad & Friedman, 2013; Golomb, 2015a; Halteman, 2011; Lamech, 2014) (see Table 3). The Bamberg appeal (on behalf of 114 physicians referencing assessment of medical complaints of 356 people with symptoms from cell tower base stations and DECT phones in their homes in Oberfranken) noted the more characteristic RF/MW symptoms (above) as well as nosebleed (Waldman-Selsam, 2004). Comments from participants in survey studies include the following (all from Conrad & Friedman, 2013): "Severe headaches, gushing nosebleeds for the first time ever. . . . They all went away when the smart meter was removed"; "After the first day I was getting bloody noses and not understanding"; "Nosebleeds, nausea, dizziness, . . . ringing ears and intermittent strong agitation. . . . When I am away from wireless devices the symptoms subside"; "Had it not been for the severe nose bleeds I'm not sure I would ever have found out what was causing my health problems".
Peculiar sensory symptoms of "vibration" and "pressure" reported (Swanson et al., 2018)	"Associated sensory symptom" of "pressure" or "vibration" were reported in 43% and 14%, respectively, in a neurological evaluation of diplomats (Swanson et al., 2018). The distinctive sensory symptoms of "pressure" and "vibration" are also reported by subsets of those who report symptoms from RF/MW. Neither were commonly elicited as symptoms in surveys. However, some surveys listed head pressure separately from headache, and in some cases, it was more frequent. Eye pressure (Halteman, 2011) and ear pressure (Conrad & Friedman, 2013) have also been reported in surveys of RF/MW/EMR-affected persons. The UCSD ES survey did include "internal pressure," which was reported as a symptom in 71% of participants who cited symptoms from EMR/RF/MW (Golomb, 2015a). Spontaneous reports of vibration symptoms by different EMR/RF/MW affected persons, shared in a different survey study, include the following (all from Conrad & Friedman, 2013): "I experienced internal shaking and vibrating throughout my body" (along with sleep, mood, headache, head pressure, and other problems, after smart meter installation); "I can't think clearly, or find words when speaking; my body feels like it is vibrating"; and "Have uncontrollable jelly-like quivering throughout whole body." In online comments posted in response to articles on related topics, in which persons describe their ES symptoms, statements include "vibration through my body" (F. Wallace, 2017), and "I have a smart meter on my house and I have been experiencing strange vibrations when I watch TV or use the computer" (Wright, 2013). An email to us from an affected patient (9-2017) sharing her symptoms stated that it "feels like my brain is vibrating and spinning at night—and my tinnitus gets much worse."

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Diplomats' Symptoms and Signs	Compatibility with RF/MW
Brain swelling in some diplomats (Associated Press in Washington, 2017; Lederman, 2017a; Lederman, Weissenstein, Lee et al., 2017).	1. RF/MW may alter blood-brain barrier function via oxidative stress. (a) An analysis reported that of 100 peer-reviewed studies examining whether low-intensity RF/MW causes oxidative stress, 93 found that it did (Yakymenko et al., 2015). (b) Oxidative stress disrupts the blood-brain barrier (Al Ahmad, Gassmann, & Ogunshola, 2012; Blasig, Mertsch, & Haseloff, 2002; Enciu, Gherghiceanu, & Popescu, 2013; Haorah et al., 2007; Hurst, Heales, Dobbie, Barker, & Clark, 1998; Katsu et al., 2010; Lochhead et al., 2010; Nittby et al., 2009; Salford, Brun, Sturesson, Eberhardt, & Persson, 1994; Sirav & Seyhan, 2009, 2011; Takemori, Murakami, Kometani, & Ito, 2013; Tang et al., 2015). (c) Consistent with this, blood-brain barrier disruption has been shown in multiple studies with RF/MW (Nittby et al., 2008, 2009; Salford et al., 1994; Sirav & Seyhan, 2009; Soderqvist, Carlberg, Hansson Mild, & Hardell, 2009; Soderqvist, Carlberg, & Hardell, 2009; Tang et al., 2015). Other studies have not shown blood-brain barrier effects (de Gannes et al., 2009; Finnie, Blumbergs, Cai, Manavis, & Kuchel, 2006; Finnie et al., 2002; Franke, Ringelstein, & Stogbauer, 2005; Franke, Streckert et al., 2005; Fritze et al., 1997; McQuade et al., 2009). Studies vary in many respects (e.g., exposure duration, EMR exposure characteristics, model (in vivo versus in vitro, animal, age), delay between exposure and blood-brain barrier assessment, and blood-brain barrier assessment used, for example). The blood-brain barrier is functional, and barrier function need not be affected for all substances equally. (d) Since genetics of oxidative stress management (De Luca et al., 2014) and levels of key antioxidants (Belpomme et al., 2015) relate to both RF/MW injury and oxidative stress, these factors, together with specifics of the RF/MW exposure, may guide blood-brain barrier disruption with RF/MW. (e) A study that examined gene expression in the brains of rats exposed to GSM radiation, radiation that encompasses the multiple frequencies and pulsed waveforms present in GSM exposures, identified altered gene expression of a marker of blood-brain barrier function (Belyaev et al., 2006). 2. Altered blood-brain barrier can lead to brain edema and "malignant brain edema" (Adair, Baldwin, Kornfeld, & Rosenberg, 1999; Witt, Mark, Sandoval, & Davis, 2008). (Oxidative stress-associated blood-brain barrier disruption is, for instance, thought to underlie neuroleptic-induced cerebral edema (Elmorsy, Elzalabany, Elsheikha, & Smith, 2014).)

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Diplomats' Symptoms and Signs	Compatibility with RF/MW
	3. Among case experiences, perceived head pressure occurs with brain swelling and is reported by many with ES. As also noted in relation to the sensory symptom of "pressure," some surveys collate head pressure separately from headache (which, in some studies, it surpasses: Conrad & Friedman, 2013; Lamech, 2014; Schooneveld & Kuiper, 2007). One survey included eye pressure (Halteman, 2011), and in one, several participants spontaneously reported ear pressure (Conrad & Friedman, 2013). Communications to the UCSD ES study included the write-in comment, "Brain feels like it's swelling" (Golomb, 2015a). One man with severe ES who communicated with the UCSD study group and shared documentation of his approval for Social Security disability for his ES reported that the severe brain swelling he experienced in response to EMR had led an eyeball to be pushed from the socket.
Findings are reported to be compatible with traumatic brain injury (Harris, 2017a, 2017b, 2018c; Harris & Goldman, 2017a, 2017b; Rogers, 2017).	1. Based on findings in an fMRI study of electrosensitive individuals it was stated that "the differential diagnosis for the abnormalities seen on the fMRI includes head injury" (Heuser & Heuser, 2017). 2. Six of the 10 ES individuals assessed reported prior head injury (Heuser & Heuser, 2017). However, 4 did not, and also showed evidence consistent with brain injury. Moreover, prior head injury is reported to also be present in at least some, but an unstated fraction of, affected diplomats (Stone, 2018). 3. Head injury could predispose to ES. Head injury, like RF/MW, promotes oxidative stress, and blood-brain barrier disturbance; and melatonin (which is low in those with ES), protects from these effects in head injury (Dehghan, Khaksari Hadad, Asadikram, Najafipour, & Shahrokhi, 2013; Ding et al., 2014; Ozdemir et al., 2005; Senol & Naziroglu, 2014), as it protects against injury from radiation (Argun et al., 2014; Bardak, Ozerturk, Ozguner, Durmus, & Delibas, 2000; Bhatia & Manda, 2004; El-Missiry, Fayed, El-Sawy, & El-Sayed, 2007; Goswami & Haldar, 2014a, 2014b; Goswami, Sharma, & Haldar, 2013; Guney et al., 2007; Jang et al., 2013; Karaer et al., 2015; Karslioglu et al., 2005; Kim, Shon, Ryoo, Kim, & Lee, 2001; Koc, Taysi, Buyukokuroglu, & Bakan, 2003a, 2003b; Liu, Ren, Yang, Zhao, & Mei, 2014; Manda, Anzai, Kumari, & Bhatia, 2007; Manda & Reiter, 2010; Manda, Ueno, & Anzai, 2007, 2008; Naziroglu, Tokat, & Demirci, 2012; Oliinyk & Meshchyshen, 2004; Ortiz et al., 2015; Sainz et al., 2008; Sener, Atasoy et al., 2004; Sener, Jahovic, Tosun, Atasoy, & Yegen, 2003; Sharma & Haldar, 2006; Shirazi et al., 2011; Shirazi, Mihandoost, Mohseni, Ghazi-Khansari, & Rabie Mahdavi, 2013; Taysi, Koc, Buyukokuroglu, Altinkaynak, & Sahin, 2003; Taysi et al., 2008; Vasin et al., 2004; Yilmaz & Yilmaz, 2006)—and from RF/MW . . . (Ayata et al., 2004; Aynali et al., 2013; Koylu, Mollaoglu, Ozguner, Naziroglu, & Delibas, 2006; Lai & Singh, 1997; Meena et al., 2014; Naziroglu, Celik et al., 2012; Oksay et al., 2012; Oktem, Ozguner, Mollaoglu, Koyu, & Uz, 2005; Ozguner, Bardak, & Comlekci, 2006; Ozguner, Oktem, Armagan et al., 2005; Sokolovic et al., 2008; Tok, Naziroglu, Dogan, Kahya, & Tok, 2014; S. Xu et al., 2010).

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Diplomats' Symptoms and Signs	Compatibility with RF/MW
	4. One RF/MW affected man who communicated with the UCSD study group indicated his ES was precipitated by a serious occupational head injury. (He also had occupational exposure to EMR, but until the head injury, it had not affected him.) 5. The study did not report the presence or absence of features indicative of greater severity of head injury, such as loss of consciousness or symptoms or sequelae. Both because of this and point 5, there is no clarity about whether prior head impacts were in fact greater in number or intensity than in the general population. But it might be expected that past head injury would be a risk factor. 6. Given findings consistent with low melatonin in those with ES (Belpomme et al., 2015), this condition (and/or common cause) may also predispose to more significant damage from a given impact and character of head injury, so there is a so greater likelihood that a given head impact causes problems and is remembered and reported as a head injury. 7. ES symptoms are sometimes experienced as similar to a head injury. For instance, a Rhode Island teacher likened effects experienced with RF/MW to a concussion ("Math teacher raises concerns about WIFI comparing the effects to a concussion," 2014). Just as it is important to avoid even minor head trauma following traumatic concussion until healing has occurred, so avoidance of RF/MW (or more generally EMR) aggravation may prove important following pulsed RF/MW injury. RF/MW injury may be cumulative (Sadchikova & Glotova, 1973), and in addition to the intensity-duration profile, the interval between exposures may be important in the clinical course (Zaret, 1973).
White matter abnormalities reported (Weissenstein, 2018) in some diplomats.	In diplomats: "Medical testing has revealed that some embassy workers had apparent abnormalities in their white matter tracts that let different parts of the brain communicate" (Weissenstein, 2018). 1. White matter changes were observed in some with ES, in the fMRI study of persons affected by RF/MW/EMR (Heuser & Heuser, 2017). 2. Oxidative stress and mitochondrial dysfunction (to which RF/MW can contribute; see Table 4) are associated with white matter injury (Back et al., 2005; Casta, Quackenbush, Houck, & Korson, 1997; Ikeda, Choi, Yee, Murata, & Quilligan, 1999; Miller, Lawrence, Mondal, & Seegal, 2009; Miyamoto et al., 2013; Munoz-Cortes et al., 2013; Rosenzweig & Carmichael, 2013).

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Diplomats' Symptoms and Signs	Compatibility with RF/MW
	Among potential mechanisms, oxidative stress increases vulnerability of proteins (and, e.g., lipids, DNA, RNA) to autoimmune attack, which can include attacks on myelin (Gelderman et al., 2007; Iborra, Palacio, & Martinez, 2005; Iuchi et al., 2010; Kalluri, Cantley, Kerjaschki, & Neilson, 2000; Kumagai, Jikimoto, & Saegusa, 2003; Liu et al., 2003; Maes et al., 2013; Profumo, Buttari, & Rigano, 2011; Shah & Sinha, 2013; Wang, Cai, Ansari, & Khan, 2007). Indeed, antibodies directed to O-myelin were reported in a subset of the 675 persons with ES who were included in a French study (Belpomme et al., 2015), affirming one mechanism by which white matter changes might occur. 3. Following GSM radiation exposure (study cited previously), examination of gene expression in rat brain showed alterations in myelin-related products (myelin-related glycoprotein) (Belyaev et al., 2006).

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Lamech, 2014; Lederman, Weissenstein, & Lee, 2017; Swanson et al., 2018). Peculiar sensory symptoms are reported in both, including pressure and vibrations (Conrad & Friedman, 2013; Swanson et al., 2018). Reported brain findings have included brain swelling, problems consistent with traumatic brain injury, and white matter abnormalities. Each such feature is also observed in those with symptoms ascribed to RF/MW.

Table 3 lists symptoms commonly reported in diplomats, together with percentages reporting each symptom, for symptoms assessed in the neurological appraisal of Cuba diplomats or mentioned in news reports (Associated Press in Washington, 2017; Harris, 2018c; Lederman, Weissenstein, & Lee, 2017; Swanson et al., 2018). These symptoms (when elicited) are ranked by prevalence in surveys of persons exposed to specific sources of RF/MW or with symptoms ascribed to EMR exposure (Conrad & Friedman, 2013; Halteman, 2011; Kato & Johansson, 2012; Lamech, 2014). Fractions of symptomatic diplomats who report each symptom (Swanson et al., 2018) appear similar to fractions of those symptomatic with EMR symptoms, who do so. Comparing rates in diplomats (Swanson et al., 2018) to those in a peer-reviewed study of EMR-affected individuals (Kato & Johansson, 2012) on symptoms tallied in both, symptom rates were: headache, 81% versus 81%; cognitive problems, 81% versus 81%; sleep problems, 86% versus 76%; irritability, 67% versus 56%; nervousness/anxiety, 52% versus 56%; dizziness 67% versus 64%; and tinnitus, 57% versus 63% (Kato & Johansson, 2012; Swanson et al., 2018). Thus, rates conform closely.

The rates of symptoms reported for diplomats appear within reported variation for studies of persons affected by RF/MW/EMR. Sleep problems were reported somewhat less frequently in EMR-affected persons in the Kato study (76%), than in diplomats, but reported sleep problems, or their by-product, fatigue (for which prevalence was not recorded in the diplomat study), dominate the number one symptom position in studies of RF/MW affected persons (see Table 3), and prevalence of sleep problems was higher than for diplomats in some other studies of RF/MW-affected persons (Golomb, 2015a). Of note, the Kato study was performed in Japan, where the traditional diet is rich in fish, which supplies the long-chain omega-3 fatty acids that reportedly benefit sleep and reduce irritability (Conklin et al., 2007; Peet & Horrobin, 2002), the two symptoms that were more than 3% lower than in affected diplomats.

The protean character of symptoms in diplomats (Lederman, 2017a), as for RF/MW-affected individuals, has led some to infer that a single cause cannot account for all. But a number of reports, in a number of nations and settings, tie RF/MW exposure (in vulnerable individuals) to each of the problems reported in diplomats. The coherence of findings in those citing affects of RF/MW, with findings in diplomats, supports a common cause within each group and across the two groups. Of note, a protean suite of generally the same symptoms, though in a different distribution, is reported in other conditions that are tied to mitochondrial alteration and oxidative

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Table 3: Symptoms in Diplomats: Comparison to Symptom Rankings in Survey Studies That Report Symptoms with EMR or in Those with ES.

	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Citation	Study of diplomats (Swanson et al., 2018) News media	Lamech (2014)	Halteman (2011)	Conrad & Friedman (2013)	Santini, Santini, Danze, Le Ruz, & Seigne (2002)	Kato & Johansson (2012)	Golomb (2015c)	Schooneveld & Kuiper (2007)	Johansson (2006); cites Swedish-language article Holmboe & Johansson (2005)	Hagstrom et al., (2013)	Durusoy, Hassoy, Ozkurt, & Karababa (2017)
EMR- or ES-related characteristic	NA	Smart meter exposure	Smart meter exposure	Smart meter exposure	Proximity to cell phone base station	ES	ES	ES	ES, acute phase	ES, acute phase	Cell phone use symptoms during

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Table 3: Continued.

	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Sample characteristics	About 24 U.S. and 2 Canadian diplomats to Havana reporting symptoms attributed to "health attacks" in news: 24 U.S. embassy community members with neurological findings often seen after mild traumatic brain injury/concussion (Swanson et al., 2018)	92 residents of Victoria, Australia, after exposure to smart meter radiation	318 U.S. respondents from 28 states	210 respondents, 68% ES (142)[b]	530 people living near cellular phone base stations	75 Japanese with ES or sensitive to EMF	202 persons with current ES	250 Dutch respondents with ES	22 with ES-ranked symptoms; most common were listed (not ranked)	194 with ES	2150 students in 26 high schools in Turkey
All have symptoms	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No

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	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Symptom rankings				Two rankings given: for severe or moderate and new/severe and new							
Sleep	86% Swanson et al. (2018). Also see Panetta (2017).	#1	#1	#4/#1	#3	#4 (76%)	#1 (94%)	#5	Yes	#2	#6
Headache	81% Swanson et al. (2018). See also Lederman, Weissenstein, Lee et al. (2017); Panetta (2017); Robles & Semple (2017a)	#2	#3	#1/#3 (pressure in head; headache is listed separately and would be #5/#5	#2 (81%)	#2 (81%)	#2	#7, #9, #10 (separated into three questions; #10 is pressure in head; #7 is numb feeling in head)	Yes	#4	#2

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Table 3: Continued.

	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Cognitive	81%. Swanson et al. (2018). Also see Lederman (2017a); Panetta (2017); Associated Press (2017d).	#5	#5	#2/#4	#4, #7	#3 (81%)	#3 (85%)	#2, #13	Yes	#7, #10	#4, #5
Stress anxiety irritability	67% irritability; 57% nervousness; 52% more emotional; 29% sadness. Swanson et al. (2018)	#11	#2	#8/#7 (agitation)	#6 (irritability)	#9 and #10. For "irritation" and "anxiety" (56% and 55%).	#6 in "initial symptoms," irritability (45%)				
Tinnitus	57% Swanson et al. (2018). Also see Lederman, Weissenstein, Lee et al. (2017), Panetta (2017).	#3	#4	#3/ #2	Not queried (except as "hearing")	#7 (63%)	#5 (80%)	Not in main symptom list, but based on number affected in auditory symptom list, #13		Not queried	

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	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Fatigue	Not elicited[c] in Swanson et al. (2018). Mentioned in news media; Panetta (2017)	#4	#6	#10/#9	#1	#1 (and possibly #5, "sluggish" in the head (85%)	"Exhaustion" was a write-in symptom (not queried).	#1	Yes	#6	#1
Dizziness or balance	67%[d] Swanson et al. (2018). Also see Lederman, Weissenstein, Lee et al. (2017); Panetta (2017); Robles and Semple (2017a)	#7	#7	#7/#7	#14	#6 (64%)	#4 Initial: 49%	#11	Yes	#12	#9

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	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Vision problems	76%. Swanson et al. (2018). Also see Associated Press (2017a).	#12	#8	#10/#11	#12	—	#8 in initial Symptoms (38%)	#6	—	#13 (photosensitivity)	#10
Nausea	Associated Press in Washington (2017); Lederman, Weissenstein, Lee et al. (2017); Panetta (2017)	#9	#12	—	—	—	#9 "Gastrointestinal symptoms" (64%). Nausea not separately asked.	—	Yes "Symptoms from the gastrointestinal tract."	#20	#15
Epistaxis (nose bleed)	Not elicited in Swanson et al. (2018). Mentioned in news/media: Associated Press in Washington (2017); Golden & Rotella (2018).	#17	#13	#15 in symptoms that intensified. New onset in several write-ins.	—	—	"Nosebleeds" as a write-in symptom (not queried).	— #12 is "nose problems."	—	—	—

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Table 3: Continued.

	Cuba Diplomats	Australia, 2014	United States, 2011 (Wireless Utility Meter Safety Impacts Survey)	United States, 2013[a] (Maine Smart Meter Health Effects Survey & Report)	France, 2002	Japan, 2012	United States, 2015[a]	Netherlands, 2007	Sweden, 2006	Finland, 2013	Turkey, 2017
Hearing loss	43% Swanson et al. (2018). Also see Associated Press (2017b); Associated Press in Washington (2017); Panetta (2017); Robles & Semple (2017a); Wilkinson (2017)	#18 (with ear pain)	—	—	#5	—	#11 (34%)	#3	—	—	#14
Speech problems	Not elicited[e] in Swanson et al. (2018). Mentioned in Associated Press in Washington (2017)	#30	—	—	—	—	f	—	—	—	—
Comment			g	h	i		j	k		l	

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Note: — = Not queried. Surveys in the smart meter era were prioritized for inclusion; proximity of emitting devices to homes may make these more comparable to diplomat experience. Studies of ES were also prioritized, as these focus on those who are symptomatic, providing symptom rates better suited for comparison to those in affected diplomats. Other studies on similar themes report similar findings. (An exception is that older studies from Scandinavia that focused on exposure to video display terminals from that time report high rates of skin problems.) For instance, in a 2007 study of 85 persons living near the first mobile phone station antenna in Menoufiya governorate, Egypt reported that "the prevalence of neuropsychiatric complaints as headache (23.5%), memory changes (28.2%), dizziness (18.8%), tremors (9.4%), depressive symptoms (21.7%), and sleep disturbance (23.5%) were significantly higher among exposed inhabitants than controls: (10%), (5%), (5%), (0%), (8.8%) and (10%), respectively ($P < 0.05$)." Sleep, headache, and cognitive again topped the list in frequency (Abdel-Rassoul et al., 2007).

Some studies focus not on ranking, but dose-effect/distance relation. For instance, in Selbitz, Bavaria, those within 200 m of a cell phone base station were compared on reported symptoms to those 200 m to 400 m away and were found to report significantly more sleep problems, headache, concentration problems, "cerebral affections," depression, auditory/vestibular problems, visual problems, GI problems, dizziness, and nosebleed along with cardiovascular problems, joint problems, infections, and skin problems ($p = 0.01$ for dizziness and nosebleed, $p = 0.001$ for the rest; Eger & Jahn, 2010). A 2003 survey study of the "microwave syndrome" "in Murcia, Spain, in the vicinity of a Cellular Phone Base Station working in DCS-1800MHz" reported that symptoms included fatigue, irritability, headache, nausea, insomnia, depression, discomfort, difficulty in concentration, memory loss, visual dysfunction, auditory dysfunction, dizziness, (and several other symptoms) (Navarro et al., 2003). These were more prevalent within 150 m of the station, relative to more than 250 m, in most cases significantly so. It was noted that symptoms abated with removal from the RF/MW source (Navarro et al., 2003). A follow-on study examined rates of problems in relation to measured electric fields and showed significance for 13 of 16 assessed symptoms, with symptom odds ratios as high as 59 (Oberfeld et al., 2004).

Our rankings do not include as a symptom "onset of electromagnetic hypersensitivity syndrome" or "aggravation of electromagnetic hypersensitivity syndrome." We used the highest ranking if several cognitive queries were used (e.g., memory problems or concentration difficulties) or several head queries were used (e.g. headache, head pressure, heat or strange sensation in head), and exclude later exemplars of the category in ranking the lower-ranked items.

[a]There was no barrier to participation from outside the United States, but participants are predominantly from the United States.

[b]Sixty-eight percent of participants had ES (N =142) of whom 63% felt certain their exposure to smart meter was responsible for initiating the ES. Of the 49 who were ES before smart meter exposure, all 49 (100%) stated that smart meter exposure made their ES not only worse but "much worse."

[c]Though fatigue was not elicited, it is noted that a number reported a "good day bad day" pattern in which mental or physical exertion on one day led to exacerbation for several days.

[d]Separates out balance (67%) and dizziness (63%) and includes nausea (7%) in this category.

[e]Speech problems were not elicited, but speech audiometry, speech therapy, and speech pathology consultation are each mentioned totaling at least six references.

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[f]"Aphasia" was a write-in symptom (not queried).

[g]Seventy-three percent women; 93% over age 40; 43% over age 60; 78% from California; 49% characterize selves as EMF sensitive.

[h]The first number is severe or moderate and new; the second number is severe and new. Pressure in head and headaches were queried separately. The overlap is uncertain. The higher ranking (pressure in head) was used. Concentration and memory were queried separately. The overlap is uncertain. The higher ranking (concentration problems) was used.

[i]Memory and concentration were queried separately, ranked #4 and #7 in the original. Combined might be higher. The higher ranking is used. This analysis provides values at different distances. Orderings for the closest distance are used. Ordering shifts slightly with longer distances, but in general, the more frequently reported symptoms remain the more frequently reported.

[j]Ratings are based on (videotaped) Commonwealth Club slide presentation. Additional symptoms were elicited but not presented.

[k]Notes buzzing ears, hissing sounds, loss of hearing, strong low-frequency sounds, earaches, and sound of bells clanging in 96, 80, 64, 545, 38, and 28 participants

[l]This assesses acute symptoms. It also gives fractions of who report those symptoms before the acute phase, but it is unclear whether someone who reports a symptom (say, headaches, dizziness) before exposure had those symptoms only occasionally.

Note: Percentages are given for diplomats (chosen for being symptomatic) and rankings for studies of persons reporting symptoms with EMR/RF/MW (not restricted to acute stage).

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stress (Golomb et al., 2014; Golomb & Evans, 2008; Golomb, Koslik, & Redd, 2015), mechanisms that each promote the other (Lee & Wei, 1997; Wei & Lee, 2002). RF/MW is tied to these mechanisms (Barnes & Greenebaum, 2015, 2016; Gao, Hu, Ma, Chen, & Zhang, 2016; Turedi et al., 2015; Yakymenko et al., 2015; Yuksel, Naziroglu, & Ozkaya, 2016; Zhu et al., 2014). However the distinctive prominence of sleep and auditory symptoms, the peculiar somatic sensory experiences of pressure and vibration, and the noises perceived during apparent inciting episodes are relatively distinctive features—distinctive to diplomats' reports and reported RF/MW problems.

Table 4 reviews several mechanism considerations. Central to this is the critical role of oxidative stress and the relevance of oxidative stress to potential auxiliary mechanisms, such as mitochondrial dysfunction, blood-brain barrier disruption, membrane alterations, impaired blood flow, apoptosis, effects on voltage-gated calcium and anion channels, and triggering of autoimmune reactions. (In some cases, effects are reciprocal—oxidative stress promotes mitochondrial dysfunction, calcium channel effects, inflammation, and autoimmunity—which in turn can promote oxidative stress.) One analysis found that of 100 evaluated studies that examined the relationship of low-level RF/MW to oxidative stress in biological systems, 93% supported a connection (Yakymenko et al., 2015). A role for oxidative stress in RF/MW/EMR-affected persons is cemented by evidence that gene polymorphisms adverse to antioxidant defense are significantly more prevalent in persons experiencing symptoms from RF/MW/EMR (De Luca et al., 2014). In addition, levels of a particular antioxidant, melatonin, known to be critical for RF/MW and broader EMR defense are consistently low in affected persons (assessed by a urinary metabolite) (Belpomme et al., 2015). Oxidative stress has been tied to each of the symptoms and conditions reported in diplomats and RF/MW-affected persons.

Also noteworthy is the repudiation of psychogenic causation in the evaluation of diplomats (Stone, 2018; Swanson et al., 2018), which holds for RF/MW-affected persons as well. Case narratives for those affected by RF/MW underscore that for many, symptoms developed and progressed when affected parties as yet had no knowledge that an RF/MW-emitting device had been introduced or that one could cause problems (Conrad & Friedman, 2013; Golomb, 2015a). A Swiss Telecom-funded study found that sleep problems related to the electromagnetic field strength of the transmitter and did not correlate with personality traits tied to worry about health (Altpeter et al, 1995; Lamech, 2014). The circumstance that some report being affected severely by levels of exposure that cause others no problem is reviewed in the context of effect modification, variations in antioxidant defenses, and demonstrated variable involvement of secondary mechanisms such as autoimmune activation (Belpomme et al., 2015). In fact, analogous marked differences in harm or development of health effects are well known for other exposures, such as peanuts, penicillin, and pesticides. For EMR-affected persons (De Luca et al., 2014), as for many other

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Table 4: Mechanism Considerations.

Oxidative stress, mediated by free radicals, is involved in RF/MW injury.	Oxidative stress refers to a kind of injury against which "antioxidants" relatively protect, in which "reactive oxygen species" or "free radicals" produce changes/damage that can affect, for instance, lipids, proteins, DNA, and RNA. Mitochondria, the primary source of energy for cells (and they regulate many other phenomena such as steroid hormone production and apoptosis) are a leading source and target of oxidative stress (Gruber, Schaffer, & Halliwell, 2008; Kowald, 2001; Lee & Wei, 1997; Sastre, Pallardo, & Vina, 2003; Wei, 1998). That is, mitochondrial injury not infrequently accompanies oxidative stress and has been shown with RF/MW (see below). RF/MW produces oxidative stress. As above, in an analysis of 100 studies examining if low-level RF/MW produced oxidative injury, it was reported that about 93 found that it did (Yakymenko et al., 2015). Oxidative stress and mitochondrial dysfunction are implicated in the symptoms and health effects that have been reported by diplomats and RF/MW-affected persons (Adamczyk-Sowa et al., 2014; Berr, Balansard, Arnaud, Roussel, & Alperovitch, 2000; Bonne & Muller, 2000; Brubaker, Mohney, & Pulido, 2009; Carelli, Ross-Cisneros, & Sadun, 2002; Feng et al., 2010; Fetoni et al., 2013; Finsterer, 2008; Fukui et al., 2002; Hoshino, Tamaoka, Ohkoshi, Shoji, & Goto, 1997; Ikeda-Douglas, Zicker, Estrada, Jewell, & Milgram, 2004; Insel, Moore, Vidrine, & Montgomery, 2012; Jeyakumar, Williamson, Brickman, Krakovitz, & Parikh, 2009; Kilic, Selek, Erel, & Aksoy, 2008; Koga & Nataliya, 2005; Koillinen, Jaaskelainen, & Koski, 2009; Kuruppu & Matthews, 2013; Liang et al., 2004; Manwaring et al., 2007; Massin et al., 1995; Neri et al., 2006; Ottonello et al., 2000; Reynolds, Laurie, Mosley, & Gendelman, 2007; Riordan-Eva, 2000; Rosen, 2008; Sandbach et al., 2001; Savastano, Brescia, & Marioni, 2007; Seidman, Khan, Bai, Shirwany, & Quirk, 2000; Sharma et al., 2013; Someya et al., 2009; Tiwari & Chopra, 2013; Vurucu et al., 2013; D. Wallace, 2001; Yamasoba et al., 2007; Zhang et al., 2013; Zoric et al., 2008). For instance, oxidative stress is tied to tinnitus, antioxidants modestly alleviate it, and markers of oxidative stress in tinnitus are reported to be greater in jugular blood (near the ear) than the more commonly measured brachial blood (Neri et al., 2006; Savastano et al., 2007; Van Campen, Murphy, Franks, Mathias, & Toraason, 2002). Two findings substantially cement a role for oxidative stress in RF/MW health effects. First, persons who are "electrosensitive" (i.e., who experience symptoms at levels of radiation that many others tolerate) are significantly more likely to harbor gene variants that confer less avid protection against oxidative injury (De Luca et al., 2014). This is an extremely important finding. People cannot manipulate their genes in response to suggestibility and did not know their genes when they reported their sensitivity status. This powerfully supports a causal role for oxidative stress in the injury experienced.

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	Second, a French study in electrically and chemically sensitive individuals (93% with ES), found consistently low levels of a urinary melatonin metabolite (Belpomme et al., 2015). Since melatonin is an antioxidant that protects against damage to many toxins, but has been shown in numerous studies to be particularly vital for defense specifically against oxidation injury due to radiation across the electromagnetic spectrum (Argun et al., 2014; Bhatia & Manda, 2004; El-Missiry et al., 2007; Goswami & Haldar, 2014b; Goswami et al., 2013; Griefahn, Kunemund, Blaszkewicz, Lerchl, & Degen, 2002; Guney et al., 2007; Imaida et al., 2000; Jang et al., 2013; Karaer et al., 2015; Karslioglu et al., 2005; Kim et al., 2001; Koc, Taysi, Buyukokuroglu, & Bakan, 2003a, 2003b; Manda, Anzai et al., 2007; Manda & Reiter, 2010; Manda et al., 2008; Naziroglu, Tokat, & Demirci, 2012; Ortiz et al., 2015; Sener, Atasoy et al., 2004; Sener, Jahovic et al., 2003; Sharma & Haldar, 2006; Shirazi et al., 2011, 2013; Taysi et al., 2003, 2008; Vasin et al., 2004; Yilmaz & Yilmaz, 2006), including due to RF/MW (Ayata et al., 2004; Aynali et al., 2013; Koylu et al., 2006; Lai & Singh, 1997; Meena et al., 2014; Naziroglu, Celik et al., 2012; Oksay et al., 2012; Oktem et al., 2005; Ozguner et al., 2006; Ozguner, Oktem, Armagan et al., 2005; Sokolovic et al., 2008, 2013; Tok et al., 2014), this dovetails with the genetic data to compellingly support a role for oxidative stress and to show that that those with ES (those who experience symptoms with radiation that others tolerate) are also experiencing greater cellular and subcellular injury from this radiation.
Many studies show the importance of antioxidant defenses, including melatonin, in protection against	RF/MW injury. For instance, melatonin and, to a lesser degree, caffeic acid protect against cell phone–induced oxidative stress in rats, and melatonin increased the activity of other endogenous antioxidant enzymes, superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase, which were depressed with the cell phone radiation (Ozguner et al., 2006). Melatonin protected against laryngotracheal oxidative injury from wireless (2.45 GHz) radiation in rats (Aynali et al., 2013). It also protected against skin oxidative injury in an experimental mobile phone model in rats (Ayata et al., 2004). It protected against 900 MHz microwave radiation–induced lipid peroxidation in rats (Koylu et al., 2006); reversed the oxidative damage of microwaves to rat testes including protecting testosterone level and sperm count, and protecting against DNA fragmentation (a marker of cell death) (Meena et al., 2014) and protected against oxidative damage from cell phone radiation to rat brain (Sokolovic et al., 2008). Melatonin protects against oxidative damage from Wi-Fi to the lens of rats (Tok et al., 2014). Vitamins E and C protect against "900 MHz radiofrequency-induced histopathologic changes and oxidative stress in rat endometrium" (Guney, Ozguner, Oral, Karahan, & Mungan, 2007). Ginkgo biloba protected against cell phone–induced oxidative injury in rat brain (Ilhan et al., 2004). And so on.

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	Antioxidants work together, for instance, to recycle one another to the reduced form in which they are active as antioxidants. The importance of antioxidant defenses in protection against radiation injury from RF/MW extends what is well known for injury from radiation throughout the electromagnetic spectrum, including so-called ionizing radiation (which includes gamma)—for instance, "A positive correlation was found between GPx activity, glutathione content and cell survival following ionizing irradiation"; Bravard et al., 2002). Glutathione depletion increased with gamma radiation–induced DNA damage (Dutta, Chakraborty, Saha, Ray, & Chatterjee, 2005) and cell death (Dethmers & Meister, 1981). Glutathione determined the survival "shoulder" for X-ray radiation in hypoxic cells (Evans, Taylor, & Brown, 1984), and melatonin protected against X-ray-induced lung injury (Jang et al., 2013). Melatonin protected against radiation–induced cataract (Karslioglu et al., 2005) and increased activity of other critical antioxidant enzymes, SOD and GPx. SOD protected against fractionated radiation–induced esophagitis (and reduced the effect of that radiation on glutathione) (Epperly et al., 2001). Melatonin protected against UVB radiation-induced oxidative skin injury (Goswami & Haldar, 2014a, 2014b), as did glutathione (Hanada, Gange, & Connor, 1990) and chocolate, which is rich in antioxidant polyphenols (Williams, Tamburic, & Lally, 2009). Melatonin has specifically been reported to protect the inner ear against radiation injury in rats exposed to "radiotherapy" at 4 KHz to 6 KHz (Karaer et al., 2015)
	A role for oxidative stress in radiation injury transcends labels of "ionizing" versus "nonionizing," and "thermal" versus "nonthermal" radiation. For this reason, those labels are of questionable utility in understanding radiation damage.
Radiation may depress melatonin—more so in some—and, in part through depressed melatonin, may depress other antioxidants	A number of studies report that EMR, including but not limited to RF/MW, can depress melatonin (Bergqvist et al., 1997; Burch, Reif, & Yost, 1999, 2008; Fernie, Bird, & Petitclerc, 1999; Griefahn et al., 2002; Halgamuge, 2013; Qin et al., 2012; Reiter, 1993a, 1994; Weydahl, Sothern, Cornélissen, & Wetterberg, 2000). Evidence suggests that (like virtually all other biological effects), a subgroup is more vulnerable (Parry et al., 2010; Wood, Loughran, & Stough, 2006). (Note that sunlight, which provides EMR of a kind "expected" evolutionarily, is well recognized to govern (depress) melatonin, toward producing day-night and seasonal effects.)
	Light (a portion of the electromagnetic spectrum) inhibits melatonin as part of establishing circadian and seasonal rhythms (Gammack, 2008; Glickman, Byrne, Pineda, Hauck, & Brainard, 2006; Navara & Nelson, 2007). Evolution did not plan for man-made radiation sources, and one hypothesis is that such radiation sources may induce similar effects in some people.

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"EMF [electromagnetic fields] are known to affect Ca2+ homeostasis and suppress melatonin activity in a wide wavelength range. Ca2+ ions in pinealocytes are involved in regulation of cAMP synthesis that mediates conversion of serotonin into melatonin. Their leakage from pinealocytes results in a decrease of the cAMP level and thereby suppresses production of melatonin" (Rapoport & Breus, 2011). Longterm radar workers reportedly have increased serotonin and depressed melatonin, consistent with this impaired conversion and effects in the RF/MW frequency range (Singh, Mani, & Kapoor, 2015). Electronic repair workers have also been reported to have lower melatonin than controls and more sleep problems (El-Helaly & Abu-Hashem, 2010).
Melatonin and its derivatives, though better known for effects on sleep, provide a critical antioxidant defense system that protects against toxicity of an extraordinary array of toxins and conditions (Abdel Moneim et al., 2015; Antunes Wilhelm, Ricardo Jesse, Folharini Bortolatto, & Wayne Nogueira, 2013; Bandyopadhyay, Ghosh, Bandyopadhyay, & Reiter, 2004; Baxi, Singh, Vachhrajani, & Ramachandran, 2013; Chabra, Shokrzadeh, Naghshvar, Salehi, & Ahmadi, 2014; Chen, Gao, Li, Shen, & Sun, 2005; Ebaid, Bashandy, Alhazza, Rady, & El-Shehry, 2013; El-Missiry et al., 2014; Fuentes-Broto et al., 2010; Garcia-Rubio, Matas, & Miguez, 2005; Jindal, Garg, Mediratta, & Fahim, 2011; Korkmaz, Uzun, Cakatay, & Aydin, 2012; Laothong et al., 2010; Mehta et al., 2014; Melchiorri et al., 1995; Montilla, Vargas et al., 1998; Ochoa et al., 2011; Othman et al., 2014; Shokrzadeh et al., 2014; Skaper, Floreani, Ceccon, Facci, & Giusti, 1999; Sousa & Castilho, 2005; Souza et al., 2014; Thomas & Mohanakumar, 2004; Uygur et al., 2013; S. C. Xu et al., 2010; L. Zhang et al., 2013; Aranda et al., 2010; Carrillo-Vico et al., 2005; Das, Belagodu, Reiter, Ray, & Banik, 2008; El-Sokkary, Nafady, & Shabash, 2010; Esrefoglu, Gul, Ates, & Selimoglu, 2006; Esrefoglu, Gul, Emre, Polat, & Selimoglu, 2005; Fagundes, Gonzalo, Arruebo, Plaza, & Murillo, 2010; Y. K. Gupta, Gupta, & Kohli, 2003; Hu, Yin, Jiang, Huang, & Shen, 2009; Kacmaz et al., 2005; Kerman et al., 2005; Omurtag, Tozan, Sehirli, & Sener, 2008; Ozacmak, Barut, & Ozacmak, 2009; Ozacmak, Sayan, Arslan, Altaner, & Aktas, 2005; Ozcelik, Soyoz, & Kilinc, 2004; Rao & Chhunchha, 2010; Rezzani, Buffoli, Rodella, Stacchiotti, & Bianchi, 2005; Sadir, Deveci, Korkmaz, & Oter, 2007; Sahna, Parlakpinar, Turkoz, & Acet, 2005; Sahna, Parlakpinar, Vardi, Cigremis, & Acet, 2004; Saravanan, Sindhu, & Mohanakumar, 2007; Suke et al., 2006; Tunez, Montilla, Del Carmen Munoz, Feijoo, & Salcedo, 2004; Wang, Wei, Wang et al., 2005; Wang, Wei, Zhang et al., 2005; Watanabe et al., 2004; Zavodnik et al., 2004) (Abdel-Wahab, Arafa, El-Mahdy, & Abdel-Naim, 2002; Bagchi et al., 2001;

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Behan, McDonald, Darlington, & Stone, 1999; Bruck et al., 2004; Cadenas & Barja, 1999; Chen, Lin, & Chiu, 2003; Dabbeni-Sala, Floreani, Franceschini, Skaper, & Giusti, 2001; El-Sokkary, 2000; Gazi, Altun, & Erdogan, 2006; Hara et al., 2001; Herrera et al., 2001; Karbownik & Reiter, 2002; Lankoff, Banasik, & Nowak, 2002; Martin et al., 2002; Mayo, Tan, Sainz, Lopez-Burillo, & Reiter, 2003; Mayo, Tan, Sainz, Natarajan et al., 2003; Montilla, Tunez, Munoz de Agueda, Gascon, & Soria, 1998; Mor et al., 2003; Morishima et al., 1998, 1999; Ortega-Gutierrez et al., 2002; Othman, El-Missiry, & Amer, 2001; Popov et al., 2015; Princ, Maxit, Cardalda, Batlle, & Juknat, 1998; Sener, Kacmaz et al., 2003; Sener, Paskaloglu et al., 2004; Sener, Sehirli, & Ayanoglu-Dulger, 2003; Shen et al., 2002; Shifow, Kumar, Naidu, & Ratnakar, 2000; Shokrzadeh et al., 2015; Soyoz, Ozcelik, Kilinc, & Altuntas, 2004; Spadoni et al., 2006; Sutken et al., 2007; Tomas-Zapico et al., 2002; Tunez et al., 2003).
For this reason, to the extent that EMR does depress melatonin, it is expected to potentiate the array of adverse health outcomes tied to these toxins, and other sources of injury.
Again, melatonin specifically protects against radiation injury at frequencies across the electromagnetic spectrum (Bardak et al., 2000; Cruz et al., 2003; Dogan et al., 2017; Goswami & Haldar, 2014a; Guney et al., 2007; Jang et al., 2013; Karaer et al., 2015; Kim et al., 2001; Koc et al., 2003a, 2003b; Koylu et al., 2006; Liu et al., 2014; Manda, Anzai et al., 2007; Manda & Reiter, 2010; Manda et al., 2008; Naziroglu, Celik et al., 2012; Oliinyk & Meshchyshen, 2004; Ortiz et al., 2015; Sener, Atasoy et al., 2004; Sener, Jahovic et al., 2003; S. Sharma & Haldar, 2006; Sokolovic et al., 2008, 2013; Taysi et al., 2003, 2008; Tok et al., 2014; Yilmaz & Yilmaz, 2006).
A study examining gene expression in rat brain reported that brain expression of N-acetyltransferase-1, the rate-limiting enzyme in melatonin production (Reiter, 1993b), had significantly reduced expression following 915 MHz GSM-consistent RF/MW radiation (encompassing pulsed RF/MW) in rats, fold difference 0.48 ± 0.13, $p < 0.0025$ (Belyaev et al., 2006).
Suppressed melatonin or sleep deprivation in turn increases damage to the pineal gland (Lan, Hsu, & Ling, 2001), which produces most of the circulating melatonin. Thus, sufficiently depressed melatonin can beget still further depressed melatonin—and heightened vulnerability to injury from future EMR exposure.
The ability to sustain adequate melatonin production in the face of EMR/RF/MW, may be a critical determinant of pineal vulnerability. The pineal gland has high antioxidant needs (Lan et al., 2001; Razygraev, 2010), and in the absence of such protections, it is vulnerable to involution (Lin'kova, Poliakova, Kvetnoi, Trofimov, & Sevost'ianova, 2011; Polyakova, Linkova, Kvetnoy, & Khavinson, 2011).

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	Age-related involution of the pineal gland may help to explain why more middle-aged persons are reportedly affected by ES than younger people (Gruber, Palmquist, & Nordin, 2018), though presumably younger adults may be more exposed to technology. (Older persons, however, may have had more years of EMR exposure and injury may be cumulative (Sadchikova & Glotova, 1973).)
	Melatonin supports the levels and activity of other antioxidants, including in the setting of radiation exposures (Karslioglu et al., 2005; Ozguner et al., 2006; Tok et al., 2014). Modest exposure to oxidative stressors (including from radiation) in persons or animals or plants whose system is not overwhelmed can lead to antioxidant upregulation, a phenomenon called *oxidative preconditioning*, seen with many sources of limited oxidative stress, including limited exposure to radiation (Chen, 2006). In part because of this, the net effect of an oxidant exposure on antioxidant levels depends on factors like intensity and duration of exposure, other oxidative exposure (so, mitochondrial dysfunction state), and the status of antioxidant defenses, as well as time from exposure to assessment. Some studies in some systems show antioxidant upregulation (Irmak et al., 2002) or mixed direction effects on different antioxidants (Tok et al., 2014), but many show depression of assessed antioxidants following EMR exposure (Duan et al., 2013; Goswami & Haldar, 2014a, 2014b; Martinez-Samano, Torres-Duran, Juarez-Oropeza, Elias-Vinas, & Verdugo-Diaz, 2010) or specifically RF/MW exposure (Akpinar, Ozturk, Ozen, Agar, & Yargicoglu, 2012; Bahreymi Toossi et al., 2017; Ceyhan et al., 2012; Esmekaya, Ozer, & Seyhan, 2011; Guney et al., 2007; Megha et al., 2015; Ozguner, Altinbas et al., 2005; Oktem et al., 2005; Ozguner et al., 2006; Ozguner, Oktem, Armagan et al., 2005; Ozguner, Oktem, Ayata, Koyu, & Yilmaz, 2005; Tok et al., 2014; Yurekli et al., 2006). Such depressions, coupled with melatonin depressions, may increase vulnerability to future EMR exposures, particularly where genetics provide for less effective variants of one or more antioxidants (De Luca et al., 2014).
	It is expected that mitochondrial impairment (J. Gruber et al., 2008; Lee & Wei, 1997; Sastre et al., 2003; Wei, 1998) or brain inflammation (sometimes itself a result of oxidative stress, amenable to reduction with melatonin; Guney et al., 2007; Halliday, 2005), since associated with greater production of free radicals and an expected less favorable balance of oxidative stress to antioxidant defenses, may be a risk factor for problems with the added oxidative stress from RF/MW or from the depression in antioxidant defenses to which RF/MW may contribute.

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RF/MW may depress xenobiotic protections	RF/MW is reported to depress butyrylcholinesterase (McRee, 1980), a key xenobiotic defense; low levels are tied to higher cardiovascular and all-cause mortality (Calderon-Margalit, Adler, Abramson, Gofin, & Kark, 2006).
Oxidative stress contributes to auxiliary mechanisms of radiation injury, such as mitochondrial dysfunction.	Oxidative stress contributes to multiple documented auxiliary mechanisms of RF/MW damage that likely contribute to health effects in subsets, including membrane alterations—cell membranes (Benderitter, Vincent-Genod, Pouget, & Voisin, 2003) and mitochondrial membranes (Shonai et al., 2002; Thomas, Gebicki, & Dean, 1989; Vayssier-Taussat et al., 2002; Wang et al., 2002), blood-brain barrier disruption (Al Ahmad et al., 2012; Barichello et al., 2011; Freeman & Keller, 2012; Gasche, Copin, Sugawara, Fujimura, & Chan, 2001; Haorah, Knipe, Leibhart, Ghorpade, & Persidsky, 2005; Haorah et al., 2007; Hurst et al., 1998; Lochhead et al., 2010; Nittby et al., 2009; Salford et al., 1994; Zehendner et al., 2013), effects on voltage gated calcium channels (Cui et al., 2012) affected by and affecting oxidative stress—(Nishiyama, Nakano, & Hitomi, 2010; Pall, 2015)—but also on voltage-gated anion channels that are an important part of the outer mitochondrial membrane (Ferrer, 2009) potentially contributing to mitochondrial impairment and amplification of oxidative stress, EEG spiking (Naziroglu, Celik et al., 2012), impaired mitochondrial function (Aitken, Bennetts, Sawyer, Wiklendt, & King, 2005; Xu et al., 2010)—bidirectionally related to oxidative stress (Houston, Nixon, King, De Iuliis, & Aitken, 2016; Mancuso, Coppede, Migliore, Siciliano, & Murri, 2006; Wei & Lee, 2002)—and protected by melatonin (Tan, Manchester, Qin, & Reiter, 2016), impaired blood flow—e.g., via oxidative stress-driven endothelial dysfunction (Engin, Sepici-Dincel, Gonul, & Engin, 2012; Indik, Goldman, & Gaballa, 2001; Jarasuniene & Simaitis, 2003; Loscalzo, 2002), autoantibodies (Ahsan, Ali, & Ali, 2003; Fiorini et al., 2013; Gilgun-Sherki, Melamed, & Offen, 2004; Kirkham et al., 2011; Kumagai et al., 2003; Maes et al., 2013; Ryan, Nissim, & Winyard, 2014), and apoptosis (Aoki et al., 2001; Bresgen et al., 2003; Espino et al., 2010; Filomeni, Cardaci, Da Costa Ferreira, Rotilio, & Ciriolo, 2011; France-Lanord, Brugg, Michel, Agid, & Ruberg, 1997; Li et al., 2015; Li et al., 2008; Salido & Rosado, 2009; Yalcinkaya et al., 2009; Zhang, Zhang, Rabbani, Jackson, & Vujaskovic, 2012)—programmed cell death, which in turn triggers inflammation and coagulation activation (Reutelingsperger & van Heerde, 1997). Laboratory correlates for some of these were reported in ES participants in the French study: about 15% of those with ES had elevated markers of blood-brain barrier permeability; 29% in those with ES (23% in those with ES and multiple chemical sensitivity, MCS) had antibodies to O-myelin (Belpomme et al., 2015).

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Melatonin considerations: RF/MW/EMR versus diplomats	While depressions in a melatonin metabolite were the norm in participants with ES in a French study (Belpomme et al., 2015), this need not necessarily be the case for diplomats, even if a related cause (pulsed RF/MW) and related processes (e.g., tied to oxidative stress) are involved in symptom induction. In persons with "ES," lowered defenses are needed for nominally modest exposures to produce problems. But if exposures in affected diplomats were more intense or otherwise injurious, lowered defenses would not be required to produce injury. To evaluate this, it may be prudent to assess urine melatonin metabolites at the time diplomats are identified with symptoms.
Psychogenic illness has been dismissed	Psychogenic causation has been repeatedly suggested as the basis for diplomats' symptoms (Buckley & Harris, 2018; Myers, 2018; Stone, 2017). This has been correctly dismissed, however, for the Cuba and China diplomats (Harris, 2018c; Stone, 2018; Swanson et al., 2018). Psychogenic causation has similarly been suggested for symptoms from RF/MW (Maisch, 2012) and has been similarly repudiated (Aschermann, 2009; Tressider, 2017). The Swiss Telecom-funded study that documented a relation of sleep problems to transmitter field strength also showed that symptoms were not related to a health-worrying personality (Altpeter et al., 1995; Lamech, 2014). The concordance of symptom profiles across studies, the emergence of RF/MW problems in people unaware of the exposure or its potential for problems, the concordance of symptoms and objective signs with known documented mechanisms of RF/MW injury, the presence of objective markers, and ties to genetics that each cohere with known mechanisms of RF/MW injury (Belpomme et al., 2015; De Luca et al., 2014; Havas et al., 2010) effectively preclude a psychogenic basis for the problem—were such a diagnosis meaningful. (See below, in the entry for study inconsistency, for provocation studies.) The notion that chronic symptoms can arise from psychogenic sources dates to Freud, who also pioneered the flaws associated with its application (Crews, 2017). The foundation is substantially circular, a mechanism has never been physiologically defined or substantiated (much less documented to be operating in cases where the label is applied), and the label is deployed without the most basic scrutiny of the tacit assumptions (Golomb, 2015b). Historically, many conditions that were presumed psychogenic (such as ulcers, seizures) were recognized as organic as evidence emerged (Golomb, 2015b).

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Not all are affected—a subset of embassy personnel (Stone, 2018) and of RF/MW exposed	How might some people experience symptoms and signs of injury from what seem to be "low levels" of an exposure, seemingly well below levels that other people tolerate? For toxins, we designate an LD50 (Baiomy, Attia, Soliman, & Makrum, 2015; Jagetia & Baliga, 2003; Jagetia, Venkatesh, & Baliga, 2004; Pal & Chatterjee, 2006; Shafiee et al., 2010; Shimoda, Akahane, Nomura, & Kato, 1996) (dose lethal in 50%) or an LD5. This reflects the recognition that for each potentially toxic exposure, there is a range in which some will experience an outcome and others will not. One can also define an SD50 (symptoms in 50%)—or an SD25, or SD5. It would be surprising if a highly useful and lucrative technology were not pushed as far into this intensity range as possible. Genetic variations in a range of free radical detoxification systems, competition for those systems, alterations in gene expression based on prior exposures, differences in vulnerability of the tissue affected (via factors like mitochondrial "heteroplasmy," past injury of that organ), and variations in secondary mechanisms triggered by oxidative stress provide among the mechanisms by which variability is produced.
	The de facto intensity of the "same" exposure may differ radically (no pun intended) from person to person.[a] A further mode of variability arises from immune activation. Considering a more familiar allergen, one person can eat a jar of peanut butter without a problem, while another is hospitalized for exposure to a crumb of peanut. As above, oxidative stress can modify substances in a fashion that makes them vulnerable to autoimmune attack. Immune or autoimmune activation is a documented feature in a subset of those citing symptoms from RF/MW/EMR (Belpomme et al., 2015).
Effect modification	"Effect modification" refers to differences in effect in different individuals, and it is the rule rather than the exception in biology. Particular considerations are germane when the exposure has potential for prooxidant or antioxidant effects (Golomb, 2018). Many prooxidants can be antioxidant at low doses in some people (via "oxidative preconditioning" in which low-level exposure to prooxidants may upregulate native antioxidant defenses; this can lead to net antioxidant effects in persons whose defenses are not already overwhelmed or maximally upregulated—as above). Conversely, many substances thought of as antioxidants are prooxidant in some settings, often including high dose (Azam, Hadi, Khan, & Hadi, 2003; Bowry, Mohr, Cleary, & Stocker, 1995; Gerster, 1999; Hiramoto, Ohkawa, Oikawa, & Kikugawa, 2003; Hu, Chen, & Lin, 1995; Kontush, Finckh, Karten, Kohlschutter, & Beisiegel, 1996; Lee, Kim, Park, Chung, & Jang, 2003; Palozza, Luberto, Calviello, Ricci, & Bartoli, 1997; Young & Lowe, 2001). So the same exposure can produce even opposite-direction effects in different persons. Exemplifying the principle, statin cholesterol-lowering drugs are net antioxidant in many people (often tested in nonelderly males without metabolic syndrome factors),

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	but are reproducibly prooxidant in a subset, and prooxidant dominance is tied to side effects (Sinzinger, Lupattelli, & Chehne, 2000; Sinzinger, Lupattelli, Chehne, Oguogho, & Furberg, 2001). These side effects, attended by net prooxidant effect (Sinzinger et al., 2000; Sinzinger et al., 2001) arise disproportionately with higher doses and in persons with conditions like older age and metabolic syndrome factors, that are statistically tied to mitochondrial impairment (Golomb & Evans, 2008). Side effects, too, occur disproportionately in women (Golomb & Evans, 2008). Women show higher rates of adverse effects from many drugs and environmental toxins (and many medical procedures); they are also more often affected by EMR (Gruber et al., 2018; Levallois et al., 2002; Röösli, Möser, Baldinini, Meier, & Braun-Fahrlander, 2004; Santini et al., 2002; Schooneveld & Kuiper, 2007). There are many potential sources of effect modification from genetics (De Luca et al., 2014), level of exposure, and past and current environment that influence biology. Some exposures may cause mitochondrial injury or oxidative stress or depress concentrations of antioxidants, boosting vulnerability. Others may have protective effects.
Chemical exposures may serve as one source of effect modification	Many drugs and chemical exposures cause oxidative stress, cause mitochondrial injury (which also increases intracellular oxidative stress), depress antioxidant defenses, and/or compete for or inhibit detoxification systems. Through these and other mechanisms, these exposures may magnify harm from RF/MW and vice versa. Preliminary evidence comparing Swedish ES-affected persons versus controls identifies higher levels of some organic pollutants in those with ES (Hardell et al., 2008), though larger studies are needed. Chemical exposures that cause oxidative stress compete for or inhibit detoxification systems may magnify harm from RF/MW and vice versa. Melatonin and glutathione (and other antioxidants) can be "radioprotective" (Bravard et al., 2002; Jensen & Meister, 1983; Shirazi et al., 2013; Simone, Tamba, & Quintiliani, 1983). (Here the root *radio* refers to radiation, not specifically to radiofrequency radiation.) Other agents or conditions can be "radiosensitizing." As might be expected, glutathione depletion can be radiosensitizing, though the status of other antioxidants may be important (Hodgkiss, Stratford, & Watfa, 1989; Koch & Skov, 1994; Vallis, 1991; Vos, van der Schans, & Roos-Verheij, 1986). The tie between low melatonin (assessed by the principal metabolite) and ES in the French study (Belpomme et al., 2015) supports the expectation that melatonin depletion is radiosensitizing as well. Radiosensitization is used therapeutically to enhance killing by radiation of tumor cells (Yi, Ding, Jin, Ni, & Wang, 1994), but its existence there is a reminder that chemicals interact with radiation to modify

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radiation effects. Radiation itself may be radiosensitizing—as potential effects on antioxidant systems, reviewed elsewhere, suggest—and reportedly ultrahigh-frequency radiation is a particularly effective radiosensitizer (Holt, 1995). Oxidative stress is an important, but not the only, means by which radiosensitization occurs (Park et al., 2005), consistent with multiple downstream mechanisms of injury.

Of note, because critical systems that are involved in radiation defense (e.g., melatonin, glutathione, and other antioxidant systems) are also involved in defense against toxicity of chemicals and drugs (Mitchell & Russo, 1987) and because factors that adversely affect antioxidant:oxidant balance may be adverse for oxidative stress–mediated injury from either type of source, it is expected, as it is observed, that there will be overlap between chemical and electrical sensitivity (Belpomme et al., 2015; Golomb, 2015a).

Two illustrations where we can see the radiosensitizing effect occur with ultraviolet (uv) light, since due to its high frequency, the effect is primarily on the skin. Photosensitizing agents and radiation recall are the illustrations.

Photosensitizing or phototoxic or photoallergic agents are agents that magnify damage observed with uv radiation. (For simplicity we use *photosensitizing* to encompass each of these.) In some cases, radiation breaks down a chemical to something toxic. Drugs may also photosensitize, for instance, by augmenting one of the mechanisms of radiation injury, such as oxidative stress or mitochondrial dysfunction (Shea, Wimberly, & Hasan, 1986). Fluoroquinolone antibiotics, which can cause serious problems in a vulnerable subset through oxidative stress and mitochondrial dysfunction (Golomb et al., 2015), are strongly reported to photosensitize and to be phototoxic (Agrawal, Ray, Farooq, Pant, & Hans, 2007; Akter et al., 1998; Bilski, Martinez, Koker, & Chignell, 1996; Boccumini, Fowler, Campbell, Puertolas, & Kaidbey, 2000; Burdge, Nakielna, & Rabin, 1995; Chetelat, Albertini, & Gocke, 1996; Ferguson & Johnson, 1990, 1993; Fujita & Matsuo, 1994; Granowitz, 1989; Kimura, Kawada, Kobayashi, Hiruma, & Ishibashi, 1996; Man, Murphy, & Ferguson, 1999; Nedorost, Dijkstra, & Handel, 1989; Oliveira, Goncalo, & Figueiredo, 2000; Scheife, Cramer, & Decker, 1993; Snyder & Cooper, 1999; Trisciuoglio et al., 2002; Wagai & Tawara, 1991; Wagai, Yamaguchi, Sekiguchi, & Tawara, 1990). Fluoroquinolones have been tied to development of persistent phototoxicity (following withdrawal of the drug; Sailer et al., 2011)—that is, ongoing higher vulnerability to this radiation—consistent with evidence that a vulnerable group experiences persistent damage from fluoroquinolones in which oxidative stress and mitochondrial injury play a role (Golomb et al., 2015). This "vulnerability" may be acquired, as mitochondrial injury can be cumulative, and a serious reaction sometimes follows a previous course of

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fluoroquinolones with a milder and time-limited reaction or none at all (Golomb et al., 2015). (Mitochondrial injury from radiation can also be cumulative; Prithivirajsingh et al., 2004.) Fluoroquinolones have led to reported "photosensitivity" reactions to fluorescent lighting (Jaffe & Bush, 1999). Statins, which as elsewhere are sometimes prooxidant (Sinzinger et al., 2001) and sometimes mitochondrially toxic (Golomb & Evans, 2008), are also sometimes linked to photosensitivity (Morimoto, Kawada, Hiruma, Ishibashi, & Banba, 1995; Thual, Penven, Chevallier, Dompmartin, & Leroy, 2005). (The information that follows about photosensitivity in Smith-Lemli-Opitz syndrome explains one reason that statins can be prooxidant, though they also have antioxidant mechanisms.)
Given oxidative mechanisms of radiation injury that apply across the electromagnetic spectrum, it is expected that some agents that photosensitize may sensitize to other forms of radiation, potentially including RF/MW. Others have noted that photosensitizing drugs have played an apparent role in other radiation injury (Dawson, Brown, & Tellefsen, 2009). (Data we have presented, but not published, showed that past use of fluoroquinolones was significantly tied to the development of ES. Past adverse effects to fluoroquinolones, which signify oxidative-mitochondrial injury to a point producing symptoms (at least, they surpassed the symptom threshold for a time), showed a particularly strong connection (Golomb, 2015a).)
There are also disease conditions tied to the magnified photosensitivity (Murphy, 2001). Where these are tied to depressed antioxidant defenses, or increased mitochondrial injury, they might be predicted to be tied to increased risk of ES development (accounting for radiation exposure). In Smith-Lemli-Opitz syndrome, which many studies have tied to photosensitivity, cholesterol levels are low (Anstey, 1999, 2001, 2006; Anstey, Azurdia, Rhodes, Pearse, & Bowden, 2005; Anstey et al., 1999; Anstey & Taylor, 1999; Azurdia, Anstey, & Rhodes, 2001; Charman et al., 1998; Chignell, Kukielczak, Sik, Bilski, & He, 2006; Eapen, 2007; Martin, Taylor, Trehan, Baron, & Anstey, 2006; "[A new congenital photosensitivity syndrome. Smith-Lemili-Opitz syndrome]," 1999). Cholesterol transports critical fat-soluble antioxidants (Golomb & Evans, 2008).
In the phenomenon of "radiation recall," injury to tissue initially caused by radiation can be made to reappear by another agent with shared mechanisms of injury (e.g., oxidative stress and mitochondrial injury), such as fluoroquinolone antibiotics, best recognized for skin reactions, since we are able to see these (Cho, Breedlove, & Gunning, 2008; Jain, Agarwal, Laskar, Gupta, & Shrivastava, 2008; Wernicke, Swistel, Parashar, & Myskowski, 2010).

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Hypothesis: One possible vulnerable group	Evidence supports a relationship between genetics of intellectual promise, and a different condition in which oxidative stress and mitochondrial impairment play a critical role: autism spectrum disorder (ASD; Frye, Delatorre et al., 2013; Frye, Melnyk, & Macfabe, 2013; Frye & Rossignol, 2011; Rose et al., 2012; Rossignol & Frye, 2012). (EMR exposure has been considered as a possible factor (Herbert & Sage, 2013a, 2013b.) It was found that gene profiles that increase risk of ASD (polygenic risk) are tied to higher intelligence in the general population (Clarke et al., 2015): "We report that polygenic risk for ASD is positively correlated with general cognitive ability (beta = 0.07, $P = 6 \times 10^{-7} \ldots$), logical memory and verbal intelligence," findings that were replicated in a different sample by positive relation to full-scale IQ (Clarke et al., 2015). This supports a line of reasoning by which impaired cell energy, through oxidative stress and mitochondrial dysfunction, may disproportionately affect the "best and the brightest," on whom society differentially depends—with implications for vulnerability to RF/MW. Many mechanisms tied to high function are tied to high energy demand. Higher energy demand may create greater vulnerability in the setting of impaired energy supply. (It is the chasm between demand and that guides degree of injury.) Many drugs and chemical exposures cause oxidative stress, cause mitochondrial injury (which also increases intracellular oxidative stress), depress antioxidant defenses, and/or compete for or inhibit detoxification systems. Through these and other mechanisms, these exposures may magnify harm from RF/MW and vice versa.
Are provocation studies contributory?	Several so-called provocation studies have been conducted in persons with ES; some focus on symptoms, some on objective markers. In most of those that focus on symptoms, those with ES fail to reliably distinguish between blinded EMR "exposed" and "unexposed" settings (Rubin, Das Munshi, & Wessely, 2005). Major flaws in the designs have been recognized and reviewed by others (Leszczynski, 2015; Schooneveld & Kuiper, 2007); for instance, studies assume that the details of exposure and time course do not need to be individualized, which is contrary to the evidence. But there are further problems. The most fundamental is the assumption that in ES, symptoms serve as a meter. This is invalid. Consider the analogy of sunburn: a form of radiation injury mediated by oxidative stress that affects some but not others at usual exposure levels. Those who are affected "believe" sun exposure is responsible. They would be unlikely to discern when they are being exposed versus not to ultraviolet radiation. (It is their failure to know when significant injury is occurring or has occurred that leaves them in the sun long enough to receive injury.) What is discerned is the inflammation that follows the oxidative stress that may emerge only late in exposure or after the sun exposure has been "withdrawn." A blinded sham-exposed study would likely also produce inability to discern sham from active treatment.

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Table 4: Continued.

People do not sense the EMR, but the effects produced by it and studies show that those with ES respond to different EMR sources. In RF/MW-affected persons, as in diplomats, the effects can arise after hours of exposure or hours after a short exposure—oxidative stress can cause apoptosis and can then trigger inflammation (Reutelingsperger & van Heerde, 1997) or can cause blood-brain barrier damage allowing brain swelling (see above). Progression of these mechanisms may not peak for hours or, in some cases, even a couple of days. Recovery from effects can take still longer.
For such a study to have a chance to succeed, it would be essential to pretest and individualize both the control/negative exposure condition and the active/positive exposure condition (including exposure and time course) in each individual to define a condition that will be effective in that person—if such conditions can be successfully defined and if cumulative effects do not alter the condition from one trial to the next. For some people, the background EMR at the facility, or its parking lot or lobby, or the exposure during transit to the facility may obviate the ability to define a negative exposure condition for that individual. It would be better to bring the EMR exposure to a place where the affected party is stable and asymptomatic. And the specific EMR and timing must be individualized to produce a positive condition in a suitable time course.
To be valid, such a study must also protect against the possibility of physiological conditioning effects. These are distinct from nocebo effects and arise because the true stimulus produces actual physiological harm. It is known, for instance, that chemotherapy patients may vomit when they enter the room in which they have received chemotherapy. (Chemotherapy agents like EMR also cause toxicity via oxidative stress (Abraham, Kolli, & Rabi, 2010; Brea-Calvo, Rodriguez-Hernandez, Fernandez-Ayala, Navas, & Sanchez-Alcazar, 2006; Husain, Whitworth, Somani, & Rybak, 2001; Shokrzadeh et al., 2014) and mitochondrial injury (Nicolson & Conklin, 2008). The fact that symptoms also occur with expectation of chemotherapy does not mean that the chemotherapy itself lacks toxicity (or that perceived adverse effects are due to a nocebo effect); rather, expectation produces symptoms because the exposure *is* toxic. Expectation of the noxious exposure may, via conditioning processes, produce symptoms ordinarily produced by the noxious exposure. (This is potentially evolutionarily adaptive, serving to encourage persons to avoid settings in which the toxic exposure is expected.) To ensure against conditioned effects arising with expectation, a set of negative exposure visits at the test site before (and between) each positive exposure visit may be required to ensure extinction of physiologically conditioned expectation effects. In essence, the setting that optimizes prospects to identify a real effect, if present, is that in which the participant believes there will not be an active exposure.

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Table 4: Continued.

N-of-1 studies that focus on physiological effects of EMR have proven somewhat more able to identify EMR effects in those with ES, or subsets of them for which that physiological marker is affected. Just as symptoms vary, so physiological changes may do so, so outcomes suited to one person may not apply for all. Physiological markers changed with blinded EMR exposure in a published study of a female physician with ES. She could not discern when the exposure was present or not, but measurable changes occurred and symptoms arose with the positive condition (McCarty et al., 2011). Symptoms were significantly more intense with pulsed (but not continuous) radiation than sham exposure (McCarty et al., 2011). An *N*-of-1 test was reportedly conducted in a former Miami organized crime prosecutor who developed ES and chemical intolerance, with seizures an important part of his clinical profile, following a significant chemical exposure. An EEG was undertaken, turning on and off a TV, with the party blinded to the stimulus (blindfolded and with headphones to prevent him hearing when the TV was turned on or off). When the TV was shielded, no effect on the EEG was seen. With an unshielded television, EEG changes including seizure activity occurred when the television was turned on, and he experienced physical twitching (Bell, 2017). (This particular marker is unlikely to be generally useful, as seizure activity is not a usual part of the clinical profile in those affected by RF/MW.) A provocation study focused in a group of individuals showed changes in heart rate variability (Havas et al., 2010), an index of autonomic function that is tied to hard outcomes like sudden death and coronary artery disease (Hayano, 1990; Singer, Martin, Magid, & et al, 1988). Moreover, three of the four participants who characterized their ES as "intense" (though only persons in this group) exhibited a striking heart rate increase of between 45 and 90 beats per minute virtually immediately with the microwave exposure, associated with marked increase in sympathetic response. Declines in parasympathetic response with RF/MW exposure were seen for 23 of 25 tested people, in all groups, including, though less so, those with no ES.
In general, assessments of objectively measurable quantities of relevance, including both differences in affected vs unaffected persons irrespective of current exposure (Belpomme et al., 2015; De Luca et al., 2014), and changes occurring with exposure (Havas et al., 2010), provide a more promising approach than real-time assessments of subjective outcomes for understanding this condition.

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Table 4: Continued.

Financial conflict of interest is a major source of apparent disparities in results	One key source of disparities in study results is financial conflicts of interest. When present, financial conflicts strongly predict that study results will conform to the financial interests of authors or funders (Barnes & Bero, 1998; Bero, Oostvogel, Bacchetti, & Lee, 2007; Friedman & Richter, 2004; Golomb, 2008; Heres et al., 2006; Smith, 2005, 2006). An analysis examined why some review articles on passive smoking concluded it was harmful while others concluded it was not. The only identified factor that predicted which conclusion was industry conflict by authors—which was often undisclosed (Barnes & Bero, 1998). Financial conflicts have been a concern specifically in relation to RF/MW, for both studies and regulatory decisions (Adlkofer & Richter, 2011; Alster, 2015; Hardell, 2017; Huss et al., 2007; Leszczynski, 2015). In an analysis of studies looking at cell phone effects as a function of funding source, "Studies funded exclusively by industry reported the largest number of outcomes, but were least likely to report a statistically significant result" (So, they report everything that wasn't affected?) "The odds ratio was 0.11 (95% confidence interval, 0.02–0.78), compared with studies funded by public agencies or charities." Analogous to findings for a relation of industry funding to failure to find tobacco-related problems (Barnes & Bero, 1998), "the finding was not materially altered in analyses adjusted for the number of outcomes reported, study quality, and other factors" (Huss et al., 2007). It has been generally assumed that the disproportionately product-favorable results from industry-funded studies (including less evidence of product harm) arise by virtue of choices, selecting study design, exposure specifics, subjects, and outcomes to support the desired result. (These can in fact influence outcomes. See below.) But where harms of lucrative products are concerned, there is precedent for industry-funded studies going beyond those factors to hide even large and lethal harms, even for prespecified or primary outcomes—via means that have the appearance, at least, of fraud ("Did GSK trial data mask Paxil suicide risk?" 2008; Harris, 2010). Special circumstances led the apparent shenanigans in those cases to be uncovered. Whether frank manipulation of data to hide harms of lucrative products is the rule or the exception in industry-funded studies is simply not known. Because a robust body of evidence documents a strong relation of industry conflicts to outcomes, deliberations and standards should be based exclusively on studies in which such conflicts of interest are absent. (Industry-funded studies can be used for hypothesis generation.) This obviates one major source of apparent inconsistency in studies, but it eliminates inconsistencies due to this factor only as far as it is possible to discern when financial conflicts are operating.

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Table 4: Continued.

Study outcomes may appear different without "inconsistency": Details matter, to see an effect	Design features can influence outcomes and may be selected to do so. Details of RF/MW exposure that may influence outcomes include the following (some relevant features have doubtless been missed): • Radiation frequency or frequencies (Belyaev, Sheheglow, Alipov, & Ushakov, 2000; Chen, Yang, Tao, & Yang, 2006; Gupta, Mesharam, & Krishnamurthy, 2018), • Radiation intensity (Adams & Williams, 1976) • Radiation waveform (Adams & Williams, 1976) • Polarization (Belyaev et al., 2000; Pall, 2018; Panagopoulos, Johansson, & Carlo, 2015), • Pulsed versus continuous radiation (Lai, Horita, Chou, & Guy, 1987; Pall, 2018) • Pulse width (Bonnafous et al., 1999) • Time between pulses (Belyaev et al., 2006)/repetition rate (1988) • Pulse waveform (Bolen, 1988; Wood, Armstrong, Sait, Devine, & Martin, 1998), • Pulse intensity (Elder & Chou, 2003), • Exposure duration (Lai & Singh, 1995; Robison, Pendleton, Monson, Murray, & O'Neill, 2002) • Exposure intermittency (Ivancsits, Diem, Pilger, Rudiger, & Jahn, 2002) on every timescale • Environmental conditions: temperature, humidity, air currents (Adams & Williams, 1976; Laszlo et al., 2006) • Concurrent (or preceeding) exposures to other radiation (Adams & Williams, 1976; Bua et al., 2018; Kostoff & Lau, 2017), which can cause synergistic effects (Adams & Williams, 1976) • Concurrent (or preceeding) chemical exposures or environment (Bua et al., 2018; Kostoff & Lau, 2017) • State of health of the animal or subject (Adams & Williams, 1976) • Species (Adams & Williams, 1976) • Size of the subject relative to wavelength (Adams & Williams, 1976) • Genetics of the animal (Belyaev et al., 2000; De Luca et al., 2014) • Antioxidant/nutrient status of the animal or subject (Ceyhan et al., 2012; Gajski & Garaj-Vrhovac, 2009; Guney et al., 2007; Gurler, Bilgici, Akar, Tomak, & Bedir, 2014; Koyu et al., 2009; Li et al., 2014; Oksay et al., 2012; Oktem et al., 2005; Oral et al., 2006; Sokolovic et al., 2013; Zhang et al., 2011; Zhang et al., 2014) • Orientation of the animal or subject relative to the radiation source (Adams & Williams, 1976) • Portion of the body irradiated (Adams & Williams, 1976) • Time between exposure and assessment of effect (Belyaev et al., 2000) • Effect measured • Metric used to measure effect

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Table 4: Continued.

Radiation that is pulsed (i.e., polarized), is applied intermittently, is more intense, and is applied for a longer time may be more likely to produce problems, for instance.
Even for studies nominally examining the "same" RF/MW exposure, different choices may be made. A range of choices are illustrated in this text: "There are 124 different channels/frequencies that are used in GSM900 mobile communication. They differ by 0.2 MHz in the frequency range between 890 and 915 MHz. The test mobile phone was programmed to use channel 124 with the frequency of 915 MHz. The signal included all standard GSM modulations. No voice modulation was applied. A GSM signal is produced as 577 μs pulses (time slots), with an interpulse waiting time of 4039 μs (seven time slots). The test phone was programmed to regulate output power in the pulses in the range of 0.02–2 W (13–33 dBm). This power was kept constant during exposure at 33 dBm, as monitored online using a power meter (Bird 43, USA)" (Belyaev et al., 2006).
Studies that examine symptoms as a function of distance from cell towers and base stations suggest that in important real-world settings, more intense RF/MW exposure is generally a greater problem (Altpeter et al., 1995; Navarro, Sanchez Del Pino, Gomez, Peralta, & Boveris, 2002; Oberfeld et al., 2004; Santini et al., 2002), though there may be an intensity range below which this ceases to be the case.
In some conditions, nonmonotonic effects of radiation have been reported (Chiang et al., 1989; Pall, 2018), and they are arguably expected for agents in the antioxidant-prooxidant spectrum (high-dose antioxidants are often prooxidant; low-dose prooxidants, via oxidative preconditioning, may be antioxidant).
Opposite-direction effects on a critical mechanism can produce opposite-direction effects in a resulting outcome. Thus, lower doses of vitamin E fluidize, and higher concentrations stabilize membranes (Packer & Fuchs, 1993); low vitamin E benefits and higher vitamin E harm vasodilatory function in cholesterol-fed rabbits (Keaney et al., 1994); "low tocopherol concentrations have stronger antiinflammatory effects in PUVA-induced erythema than higher concentrations" (Fuchs & Packer, 1993); low doses are tied to lower mortality in people, higher doses to higher all-cause mortality (Miller et al., 2005). For statins, an agent class that can produce prooxidant or antioxidant effects, bidirectional effects have been shown on many outcomes (Golomb et al., 2015). Such bidirectional effects have been shown for many outcomes with RF/MW (Bergman, 1965). It is common that where a lower amount of something may be favorable (or neutral), a higher amount may be the adverse, with a transition zone in which subject characteristics and covariables matter a lot in determining the direction. There are instances in which this directionality is flipped (Au, Cantelli-Forti, Hrelia, & Legator, 1990); for instance, sometimes a sufficient concentration leads an adaptive protection to be triggered.

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	Beyond characteristics of the radiation, the subject may be exposed to it differently; for example, in animal studies, there may be whole-body radiation (Bilgici, Akar, Avci, & Tuncel, 2013) or head-only exposure (Burdelya et al., 2012; de Gannes et al., 2009), triggering a different spectrum of responses. And with in vitro exposure, even fewer of the variables that might contribute to effects are present. The environment in which exposure occurs may differ in ways that influence toxicity of radiation—for instance, differences in temperature may produce different effects (Laszlo et al., 2006), or concurrent or background electromagnetic exposure (Bua et al., 2018) or chemical exposures (Del Vecchio et al., 2009; Kostoff & Lau, 2017). Amphetamine use represents one exposure that has been reported to magnify problems with RF/MW (Bolen, 1988).
	Characteristics of the "subjects" may differ. In animal and in vitro studies, they may differ in species, strain, genetic features, cell type cell preparation, and cell density, for instance (Belyaev, Sheheglov, Alipor, & Ushakov, 2000; Del Vecchio et al., 2009).
	As above, "effect modification" refers to the phenomenon by which effects, including adverse effects, are not equal in all subgroups. This is a major issue in biology, particularly for exposures mediated by oxidative stress and cell energy impairment. Findings with statin cholesterol-lowering drugs illustrate how massive the disparity may be as a function of participant group. Like RF/MW, these agents have the potential for toxicity through prooxidant and mitochondrial adverse mechanisms (Golomb & Evans, 2008; Sinzinger et al., 2001). RF/MW disproportionately affects sleep and hearing (through its special extra features), but muscle and tendon problems are sometimes reported (Aschermann, 2009; Lamech, 2014; Schooneveld & Kuiper, 2007). Fluoroquinolones disproportionately affect tendons through their extra mechanisms. Statins can do so too, though more rarely (Esenkaya & Unay, 2011; Hoffman, Kraus, Dimbil, & Golomb, 2012; Marie & Noblet, 2009; "Tendon disorders due to statins," 2010). Statins disproportionately affect muscle. The most feared muscle complication is rhabdomyolysis, massive breakdown of muscle that can overwhelm the kidneys and lead to kidney failure and death, which is also reported with fluoroquinolones though more rarely (Eisele, Garbe, Zeitz, Schneider, & Somasundaram, 2009; George, Das, Pawar, & Badyal, 2008; Gupta, Guron, Harris, & Bell, 2012; Hsiao et al., 2005; Khammassi, Abdelhedi, Mohsen, Ben Sassi, & Cherif, 2012; Korzets, Gafter, Dicker, Herman, & Ori, 2006; Petitjeans et al., 2003; Qian, Nasr, Akogyeram, & Sethi, 2012; Sanjith, Raodeo, Clerk, Pandit, & Karnad, 2012).

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October 16, 2025

Mary Spurgeon

SENT: In Person, Via Certified Mail and Email

Dear Ms. Spurgeon,

As a government official, your decisions affect the lives of others. You may, however, be mistaken in believing that as a government official you are afforded qualified immunity - de facto - for the decisions you make.

This is not true.

The courts have ruled government officials cannot avail of qualified immunity if you are aware of harm - or even potential harm – that may result from your decisions.

When it comes to smart meters, attached is a Building Biology Institute Report that provides an indepth analysis. This report summarizes the harm/potential harm of smart meters and EMF and RFR exposure.

You have now been notified and given the scientific evidence. You cannot therefore avail yourself of qualified immunity if any customers and community members are harmed.

This means as an individual, you will be held personally liable - be sued -, if any of your customers or our community members are harmed from smart meters. To be clear, you will have to get your own attorney to defend any claims brought against you, and your personal hard-earned assets are exposed in such litigation.

Therefore, take personal responsibility for your decisions. I request, at a minimum, you delay any decisions on requiring <u>any</u> costs for community members who want to opt out for a smart meter before you do your own diligence, given the harm smart meters may cause to your customers or our community members physically and economically.

Thank you for your attention.

Yours sincerely,

Crystal Ellis
11909 N 58th St
Omaha, NE 68152

Mary Leask
7605 Pasadena Ave
Omaha, NE 68124

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October 16, 2025

Amanda Bogner

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Michael J. Cavanaugh

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Matt Core

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Craig Moody

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Eric Williams

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John Hudson

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When it comes to smart meters, attached is a Building Biology Institute Report that provides an indepth analysis. This report summarizes the harm/potential harm of smart meters and EMF and RFR exposure.

You have now been notified and given the scientific evidence. You cannot therefore avail yourself of qualified immunity if any customers and community members are harmed.

This means as an individual, you will be held personally liable - be sued -, if any of your customers or our community members are harmed from smart meters. To be clear, you will have to get your own attorney to defend any claims brought against you, and your personal hard-earned assets are exposed in such litigation.

Therefore, take personal responsibility for your decisions. I request, at a minimum, you delay any decisions on requiring <u>any</u> costs for community members who want to opt out for a smart meter before you do your own diligence, given the harm smart meters may cause to your customers or our community members physically and economically.

Thank you for your attention.

Yours sincerely,

Crystal Ellis
11909 N 58th St
Omaha, NE 68152

Mary Leask
7605 Pasadena Ave
Omaha, NE 68124

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BUILDING BIOLOGY INSTITUTE REPORT

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IN THE SUPREME COURT OF PENNSYLVANIA
MIDDLE DISTRICT

RE: No. 34 MAP 2021, *Povacz, M, et al. v. PUC*
Associated Case(s):
35 MAP 2021 Consolidated
36 MAP 2021 Consolidated
37 MAP 2021 Consolidated
38 MAP 2021 Consolidated
39 MAP 2021 Consolidated
40 MAP 2021 Consolidated
41 MAP 2021 Consolidated
42 MAP 2021 Consolidated
43 MAP 2021 Consolidated
44 MAP 2021 Consolidated
45 MAP 2021 Consolidated

THE BUILDING BIOLOGIST INSTITUTE REPORT

General Statement

1. My name is Lawrence James Gust. I am the President of the Board of Directors of the Building Biology Institute (BBI).[1] I have a degree in electrical engineering and an MBA. I have been an environmental consultant for over 20 years and have trained hundreds of environmentally safer buildings consultants via the BBI.

2. The Building Biology Institute (BBI) is a 501(c)(3) non-profit corporation. BBI was founded in the US in 1993 and it follows the Principles of

[1] https://buildingbiologyinstitute.org/about/our-mission/

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the Institute fur Baubiologie und Ecologie in Germany.[2] Our mission is to help meet the ever-increasing public demand for proven methods that secure homes, schools, and workplaces from toxic indoor air, tap-water pollutants, and hazards posed by electromagnetic fields ("EMF") and radiofrequency radiation ("RFR") exposure.

3. BBI offers three professional certifications: (1) Building Biology Environmental Consultant (BBEC); (2) Electromagnetic Radiation Specialist (EMRS); and (3) Building Biology New Build Consultant (BBNC). Each certification requires the participants to complete online courses, participate in a multi-day on-site seminar, undergo a mentored final project and pass various tests. To be listed as a practicing professional on the BBI website,[3] certified BBEC professionals must obtain approved continuing education credits.

4. Our trained RF/EMF mitigation consultants measure the electromagnetic fields and radiation at the site, provide a plan on how to mitigate these emissions and work with other professionals such as electricians and IT professionals to put in place the identified mitigating measures.

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[2] https://www.ibo.at/en/

[3] https://buildingbiologyinstitute.org/find-an-expert/certified-consultants/electromagnetic-radiation-specialists/.

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5. Most of our clients are people who are sick or have family members who have adverse reactions to RFR exposure. As with other environmental toxins, and according to doctors, avoidance is the main and most effective treatment for those who are affected. Our services help them mitigate exposures in their homes, so they are part of the medical regimen prescribed by doctors. Many physicians encourage their patients to contact building biologists to optimize their living environment.[4]

6. We have a unique perspective and specific protocols driven by our extensive science-based knowledge, methods as well as experience working with those who suffer. Every day we see the widespread sickness caused by wireless devices and infrastructure. We personally witness how devastating this sickness is. Most important, we know our methods significantly improve the health and well-being of those who must avoid RFR. Remediation efficacy is well documented and undeniable.

7. Our knowledge and experience will provide the court valuable and important information necessary to reach a just decision in this case.

Smart Meters

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[4]https://www.womenscollegehospital.ca/assets/pdf/environmental/Preliminary%20Clinical%20Guidelines%20%20for%20EHS.pdf#page=18.

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8. We often confront sickness caused or exacerbated by smart meters. Simply removing the meter often leads to immediate and consequential health improvement. Unfortunately, we also routinely witness intolerable suffering by those forced to have smart meters as a condition of service without any means to opt-out.

9. People can turn off their cell phones, they can turn off the Wi-Fi in the router and use hard-wired internet. They cannot turn off the smart meters and therefore are forced to be exposed to the toxin that caused them to be sick 24/7, in their home. It is a torture.

Demand increase correlates with exposure growth

10. There has been a significant increase in requests for our RFR mitigation services over the last 20 years. Wireless services were first commercialized for the mass market in the mid-1980s. Back then and for around 10 years RFR mitigation was a very small part of our work. But that began to change in the early 2000s. Demand for our services has skyrocketed. RFR mitigation is now the most frequently requested service in our portfolio and constitutes about 75% of what we do. BBI consultants have a hard time fulfilling the demand. This directly correlates with and is the clear result of with the exponential growth in public exposure to wireless related pulsed RFR from wireless devices and infrastructure. Pervasive and chronic exposure leads to

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endemic sickness. We see it every day in our work, and it is devastating for those who are afflicted.

11. This increase in demand is also reflected in the number of professionals who are taking the certification course and become a certified "building biologist." Since we started to operate, 27 years ago, we have certified approximately 308 building biologists. Thirty percent of them, approximately 100, were certified in 2020/2021.

Collaborating With Treating Physicians

12. We collaborate with doctors whose patients suffer from electro-sensitivity. The only effective treatment is avoidance and in many cases the house is the cause or at least an aggravating factor for their patients' illness. Doctors refer their patients to us, as ensuring that the home environment of those affected is as clean as possible from pulsed RF radiation is critical for any improvement.

Human Consequences

13. The human dimension of electro-sensitivity is tragic. People with the condition call me and other building biologists in ever increasing numbers. In many cases, people who used the technology "normally" and had no medical issues suddenly become ill. They share with me the overwhelming and life-altering changes confronting them when they or their children become sick. They literally beg us to help them return to a normal life.

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14. These people endure tremendous physical suffering. Frequent and debilitating headaches. Inability to sleep. Heart arrhythmia. Pain in extremities. Burning skin. Mental confusion, cognitive problems, and memory loss. Non-stop ringing in the ears. Persistent nosebleeds are also common, especially with children. For many the symptoms are disabling and prevent them from functioning. They endure social isolation. They cannot work, go or be anywhere. Their lives are becoming increasingly impossible. In addition, they have to deal with ignorant and cruel denial of their condition because their sickness is an inconvenient problem to those promoting wireless technology.

15. The problem is real and overwhelming. BBI's certified practitioners operate at ground zero. They alleviate the suffering of a rapidly growing number of people across the United States. Building Biologists often care for clients who are severely ill and desperately struggling simply to survive even in their own homes. For these individuals and their families, the implementation of mitigative measures recommended by BBI's certified consultants offer the first and last resort. For these clients and thousands like them, the services of Building Biologists are lifesaving.

16. Many of our clients are unable to work because places of employment are saturated with wireless devices. They are unable to drive to work because roadways are flanked by cell towers irradiating passing vehicles with very high and

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ever-growing RF levels. They are unable to live in urban and suburban areas because houses are being irradiated by ever increasing numbers of cell phone antennas, neighbors' wireless devices and – as here – from utility smart meters.

17. However, when remediation reduces pulsed RFR radiation by shielding the residence, symptoms usually abate or reduce, depending on the initial power density and the overall ability of the shield.

RF Levels

18. The levels of pulsed RF radiation we measure (shown in power density) are usually well below the FCC guidelines. However, power density is still significantly millions and trillions of times above natural environmental levels,[5] and sometimes millions and more times higher than the levels that can cause adverse health effects reported in peer-reviewed research.

19. The FCC guidelines are not biologically-based and not evidence-based. The FCC guidelines do not address non-thermal effects or pulsation and they average exposure over 30 minutes (which hides the true biological response to exposure) and test for exposure from only one device. They do not protect from chronic long-term exposure or from exposure to multiple devices, radiation sources, frequencies, and modulations. They do not protect the public health, or at

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[5] https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30221-3/fulltext.

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least not for a significant part of the population. Our clients are the evidence, and the growing sickness is a clear proof this is so.

20. The FCC's averaging does not account for pulsed digital signals occurring in milliseconds. Therefore, they vastly underate the power density (typically measured in milliwatts per square centimeter, or mW/cm^2) that the human body must deal with on account of unremitting exposure to pulsed, modulated radiofrequency radiation. We see the peaks and pulses hidden by averaging, and witness first-hand what it does to people. BBI practitioners measure the aggregate RF exposure on the human body when in clients' homes.

Shielding

21. Those affected by RF/EMF face a living hell. They cannot be or go anywhere. Their home is their only refuge. Even this refuge is constantly under threat, and many are required to shield their homes. Reducing RF levels enough to be effective is a costly process. Unfortunately, the expense prevents many people from effecting the best remediation plan or any plan at all.

22. Shielding is expensive because the shielding materials are metal based, as metal blocks radiation. For example, shielding a parent's queen size bed with an RF protection tent ranges from $1,250 to $1,700 depending on the shielding capability of the material. Shielding a child's single bed will cost between $1,000 to $1,400. Instead, it is possible to shield the bedroom itself by

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painting the walls with RF protection paint and putting RF protection film on the windows instead of tenting the bed. The cost for an average 12' x 12' bedroom is $2,450. A family with two children would have to spend about $7,350.

23. Building Biologists focus on shielding sleeping areas because this is where people are most vulnerable to RF radiation. But this alone does not adequately protect people who are home all day.

24. Whole-house RF Radiation reduction requires painting the outside of the house and the inside ceiling on the top floor with an RF protection paint. The cost for 2,000 square feet is approximately $14,000. This cost is for two coats of paint. But with growing RF levels, three coats are often needed, so the cost is higher.

25. Metal reflects RF back into a shielded area. Therefore, whenever these materials are applied, a careful analysis is required to ensure the materials do not actually increase exposure. Shielding requires experts to do the job and this increases total cost.

26. People sick from environmental exposure should not be forced to be exposed in their home to the toxin that makes them severely sick. The considerable cost of creating a livable environment is unfairly shifted to the injured, who have no ability to recover from those who caused the injury.

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Shielding & Smart Meters

27. Shielding materials attenuate the radiation, they do not entirely block it. Reducing exposure enough to have a salutary effect is becoming increasingly difficult because of the densification of wireless infrastructure including 5G, and because home devices are becoming more powerful.

28. Smart Meters are without a doubt one of the most significant problem sources. In 2013 I filed a letter with the FCC in response to the agency's 2013 inquiry whether it should review its 1996 guidelines. I wrote to the FCC that the most significant frequent initial sensitizing event we have seen over the last two years has been the installation of smart meters. Now, 8 years later, this is still true. Smart meters are the most significant sickness agent we must confront. 5G antennas near homes is yet another major sickness agent, but they, at least, do not typically also cause conduction through the homes' over the cage of wiring that encircles the entire living space– in the walls, ceiling and floor.

29. Smart meters' antennas send intense RF pulses every few seconds and these emissions affect the entire house. Proximity of the RF radiation-emitting source directly impacts our ability to attenuate the radiation, as radiation drops with distance. Smart meters' location on or in close proximity to the house is why they are the worst offenders for those who suffer from pulsed RFR.

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30. The radiation from meters installed further away from the house still creates RF inside the house. The RF frequencies from the antenna and from the switch mode power supply are conducted through the house electric wiring. This pulsed RF radiation enters the living spaces through the floors, walls, and ceilings and via the power cords on all plugged-in electrical devices.

31. While one can take measures to reduce the radiation from smart meters' antennas, shielding from the RF emissions that go into the house electric wiring system from the RF antenna and from the switch mode power supply (SMPS) is complex, expensive, and not very effective.

32. There are filters that help reduce the RF "noise" created by the meter's switch mode power supply that conducts through the electric wiring. However, some are very expensive. Others emit high magnetic fields that are also problematic for those who are sick. Filters provide only partial solution as many reduce higher frequencies while creating new, lower frequencies that are below the typical measurement range of the meter.

33. Shielding is used to block radiation coming from the outside. Shielding materials should be installed only when no pulsed RF-based wireless devices are in the house.[6] Otherwise, the shielding would be counterproductive and

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[6] Part of our remediation includes eliminating all other emission sources inside the house, including things like SMPS used in laptop computers or other electronic devices or wireless "Internet of Things" devices. Our clients can control such

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even increase exposure because the inside-home emissions become "trapped" within the house because of the shielding. For that reason, shielding the house from outside sources can aggravate the problem caused by smart and digital meters.

34. A smart or digital meter on a house with resident adults and children who adversely react to RF/EMF harms them both directly and indirectly. They directly suffer from the meter effects, and they cannot shield emissions from the outside like from cell towers, or neighbors' smart meters and Wi-Fi networks.

Conclusion

35. People are being told that wireless technology is safe. That smart meters are safe. They trust the government and the equipment manufacturers to have their best interests and safety at heart. Nothing is further from the truth as the recent case of the Children's Health Defense against the FCC exposed. We see the devastating sickness daily in our work. We hope this court will protect those who need it the most.

36. The only reasonable accommodation for those who suffer from pulsed RF radiation is an analog meter. They are the only meters that do not emit RFs and do not aggravate the situation of those whose life is already a torturous nightmare. Analog meters are inexpensive, last much, much longer than digital meters - they

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things. But they cannot control what the smart or digital meter does nor can they turn it off.

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O P P D P R O J E C T

October 16, 2025

OMAHA SAFETY NET

RESILIENCE MONITORING REPORT

Paul J. Nelson M.S. M.D.

Population Health

DESIGN EPISTEMOLOGY

www.nationalhealthusa.net/prospectus/design-epistemo-logy/

Weekly Report (TBA)

Omaha Household Accounts

Initial Notice for **Delinquent Accounts**

r any **Delinquent Account**

Paul J. Nelson, M.D.

nelsonp60@yahoo.com

"Its better for everybody when it gets better for everybody."
Eleanor Roosevelt

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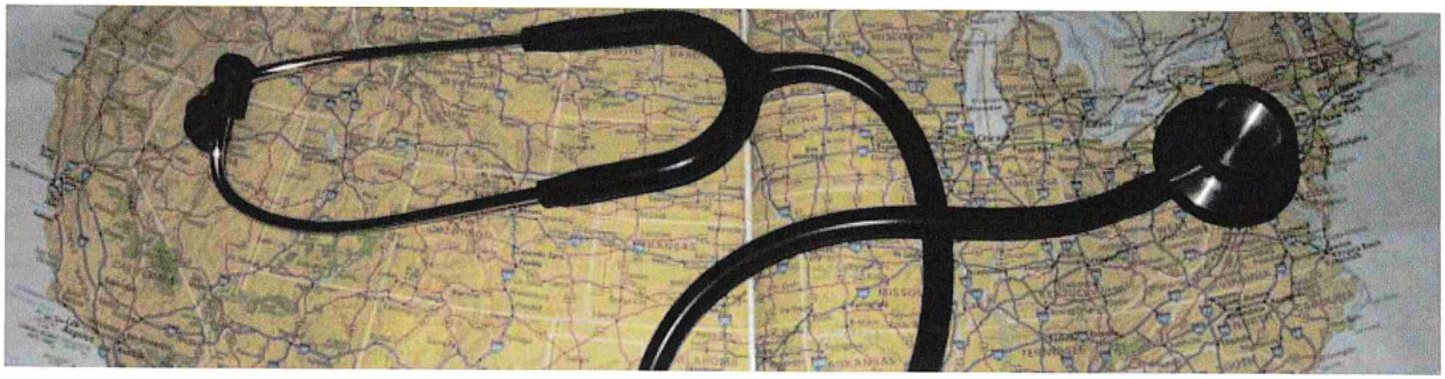
NATIONAL HEALTH USA

Improving our nation's POPULATION HEALTH and >>>>
<<<< its PRIMARY HEALTHCARE "...for everybody."



b. ~~~DESIGN~~~ ~~~EPISTEMOLOGY~~~

Edit

H U M A N S U R V I V A L

AS PURSUED BY A NATION

R E Q U I R E S

A 'Well-Being' & 'Human Dignity' informed
DESIGN EPISTEMOLOGY for guiding the 'Global Tasks'
of a semi-autonomous institution that is 'Nationally Chartered'
as a 'Complex Adaptive System' with a GOAL for the Nation's
POPULATION HEALTH and its PRIMARY HEALTHCARE
to promote the 'Stable Health' resiliency
of every community's resident persons, especially when
'kindness and respect' permeates each person's 'Family',
'Family Culture', 'Extended Family', and 'Close Neighbors;'
'neighborhood' by 'neighborhood.'

PAGES

1. HEALTH PROSPECTUS
   a. PREFACE & CONTENTS
   b. ~~~DESIGN~~~ ~~~EPISTEMOLOGY~~~
   c. FIVE HEALTH STORIES
   d. MINDLESS MENACE
2. VINTAGE TRADITIONS
   a. PROLOGUE
   b. LEGAL
   c. MEDICAL
   d. SOCIAL
   e. ECONOMIC
   f. INNOVATION
3. RECONFIGURED PARADIGM
   a. WELL-BEING
   b. PERSONAL SURVIVAL PIAN
   c. CHAOTIC DISRUPTION
   ** AVAILABLE & ACCESSIBLE HEALTHCARE
   f. GLOBAL TASKS
   g. PARKINSON'S LAW
4. GOALs
   a. SUPPORTIVE GOALs

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

P R E F A C E

"Consideration for others is the basis for a good life, a good society."
Confucius (0551-0479 BC)

"I shall pass this way but once. Any good that I can show to any human being, let me do it now. Let me not defer nor neglect it, for I shall not pass this way again." Etiene de Grillet (1773-1855)

"I've learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel."
Maya Angelou (1928-2014)

"In the absence of justice, what is sovereignty but organized robbery?"
Saint Augustine of Hippo (0354-0430)

"The language of citizenship suggests that self-interests are always embedded in communities of action and that, in serving neighbors, one also serves oneself." Benjamin R. Barber (1939-2017)

"Never doubt that a few committed people can change the world.
In the end, it's the only thing that ever has." Margaret Mead (1901-1978)

b. OPERATIONAL DESIGN
c. INITIATING GOVERNANCE
** INITIAL STRATEGIC PLAN
5. NATIONAL HEALTH Proposal
a. ORGANIZE GOVERNANCE
** PURSUE 'VISION'
** BUILD COMMUNITY
** MANAGE RESOURCES
** DEVELOP SKILLS
6. COMMUNITY HEALTH FORUM
a. INITIAL ADVOCATE SELECTION
b. INITIAL ADVOCATE PANEL
c. RESOURCE MONITORING
d. RESOURCE AGREEMENT
7. FOUR NATIONAL PROJECTS
** PHC BENEFITS PLAN
** PCP EDUCATION PLAN
c. HEALTH SECURITY CERTIFICATION
d. PHC EFFICACY PLAN
8. APPENDIX
** REFERENCES
** GLOSSARY FOR HEALTHCARE
9. LAST WORD
a. AUTHOR BIOGRAPHY
b. HAPPINESS

Top Posts

1. HEALTH PROSPECTUS

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I N D E X

6 THEMES & EACH THEME WITH 6 DEFINITIONS

- WELL-BEING: **WELL-BEING, HUMAN DIGNITY, CLUSTER, CHAOTIC DISRUPTION, HUMAN QUANTUM-COGNITIVE BRAIN, & COMPLEX ADAPTIVE SYSTEM;** **Pg 09**
- PERSON: **EPIGENETICS, CULTURAL SOCIAL-COGNITION, HUMAN CAPABILITY, HUMAN FETUS, PERSON, & BIRTHING PERSON;** **Pg 23**
- FAMILY: **SALUTARY GREETING, SOCIAL INTERACTION, CARING RELATIONSHIP, FAMILY CULTURE, EXTENDED FAMILY, & FAMILY;** **Pg 37**
- NEIGHBORHOOD: **PROSOCIALITY, NEIGHBORHOOD, HEALTH, SOCIAL STIGMA, POVERTY, & POPULATION HEALTH;** **Pg 55**
- COMMUNITY: **SOCIAL DILEMMA, INSTITUTION, COLLECTIVE ACTION, COMMUNITY, SOCIAL CAPITAL, & SURVIVAL COMMONS; AND** **Pg 69**
- NATION: **HEALTH CARE, PRIMARY HEALTHCARE, COMMUNITY DISTRICT, MANAGING THE COMMONS, SOCIAL COHESION, & COMMON GOOD.** **Pg 83**
- EPILOGUE: REVITALIZING A NATION'S ***HUMAN DIGNITY*** PARADIGM **Pg 93**
- REFERENCES: **Pg 108**

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GETTING STARTED

The Thomas Jefferson Presidential Memorial is located on the Tidal Basin south of the Mall in Washington, D.C. Inscribed inside on the Eastern wall of his Memorial is a quotation from President Jefferson (Jefferson 1816). Within the eighth paragraph of a letter to Samuel Kercheval in 1816, he said:

> "I am certainly not an advocate for frequent and untried changes in laws and constitutions. I think moderate imperfections had better be borne with; because, when once known, we accommodate ourselves to them, and find practical means of correcting their ill effects. But, I know also, that laws and institutions must go hand in hand with progress of the human mind. As that progresses, becomes more developed, more enlightened, as new discoveries are made, new truths disclosed, and manners and opinions change with the changes of circumstances, institutions must advance also and keep pace with the times. We might as well require a man to wear still the coat which fitted him when a boy, as a civilized society to remain under the regimen of their barbarous ancestors (Jefferson 1816)."
>
> Thomas Jefferson (1743 – 1826)

The Jefferson Memorial sits prominently with a view of the Washington Memorial to the North and to the Memorials nearby that honor President Franklin D. Roosevelt, The Reverend Doctor Martin Luther King, Jr., George Mason, and Commodore John Paul Jones. I would urge anyone who visits our nation's capital to plan, at a minimum, for a visit to the Tidal Basin.

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QUANTUM PHYSICS: AN EVOLVING PARADIGM SHIFT

"There is no matter, as such! All matter originates and exists only by virtue of a force which brings the particles of an atom to vibration and holds this most minute solar system together. We must assume, behind this force, the existence of a conscious and intelligent mind. This mind is the matrix of all matter."

Max Planck (1857 – 1947)

COMMENT With a focus on this 1918 Nobel Prize honoree, we recognize the accrual of new realms of knowledge that had begun to occur after 1850. For health, it was anesthesia for surgery and asepsis for its success. Subsequently, the early application of calculus for celestial physics had begun by 1880. A 1918 Nobel Prize recognized the discovery of the 'Planck time-Constant' by Max Planck. Specifically, it is:

$$t = 5.391247 \times 10^{-44} \text{ seconds}$$

It is applicable for the evaluation of sub-atomic particle attributes. Soon after 1918, this realm of knowledge was also marked by a Nobel Prize awarded in 1921 to Albert Einstein for his validated theory of Relativity regarding light, mass, and energy (Planck 1959).

ONSET OF THE 'ANTHROPOCENE'

Unfailingly, it is likely that our nation's socio-ecologic evolution from the late nineteenth century through the middle twenty-first century has prompted a profound Paradigm Paralysis involving our nation's Population Health and its Primary Healthcare. Initially triggered by the evolving scientific advances directly and indirectly associated with Quantum mechanics, the steadily evolving cascade of parallel yet disconnected realms of knowledge within the traditional sciences and humanities became vividly prominent to Baron C. P. Snow, viz., *COGNITIVE DISSONANCE.*

Simultaneously, Thomas S. Kuhn wrote a book about the history of science and its highly complex theories that have a propensity to eventually endure paradigm paralysis from *cognitive dissonance,* such as Newtonian Physics. As a complex paradigm expands, it becomes so complex that it eventually becomes less useful, viz., paradigm paralysis (Kuhn 1962). Baron C. P. Snow in post-WWII England noted the *cognitive dissonance* that had occurred between the sciences and humanities (Snow 1959). Together, these authors offer a better view of a

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Design Epistemology that offers a strategy to prevent, mitigate, and ameliorate the adverse effects of a massive Paradigm Shift. His book, published in 1962, is recognizable by its title: THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (Kuhn 1962).

I assume that its message is widely understood. If not, I will add Eric Hoffer who introduced his sentinel book in 1951. Here is its title: "THE TRUE BELIEVER thoughts on the nature of mass movements (Hoffer 1951)." Importantly, a True Believer tends to ignore the adverse attributes of a paradigm's paralytic, conceptual shift.

GETTING STARTED — "WHAT IS LIFE?"

The question posed above by the brief header for this paragraph also introduces an article that proposes a currently recognizable answer to the question (Fantini *et al.,* 2024). I cite from its **Abstract** — "In this article, we focus on the critical parameters such as time, water, entropy, space, quantum properties, and electrostatic potential to redefine the nature of living matter, with special emphasis on biological coding. Where does the DNA double helix come from, why cannot the reproduction of living organisms occur without mutations, what are the limitations of the genetic code, and why do proteins not have a stable three-dimensional structure? There are so many questions that cannot be answered without considering the aforementioned parameters." Here is the full title of the article: "What is life? Rethinking Biology in Light of Fundamental Parameters. (Fantini *et al.,* 2024)"

PARADIGM PARALYSIS

As of 2020, it had been 65+ years since Leon Festinger and Baron C.P. Snow initially publicized their conceptual models which applied then, as well as now, to the future of Human Survival. Professor Festinger, then at Stanford University, finished his book: "A Theory of Cognitive Dissonance" (Festinger 1957). Essentially, this book may be viewed as a systematic analysis of the problems associated with how certain concepts can be viewed by alternative persons with diverse perspectives. In effect, the resulting level of intellectual discordance, ambiguity, and inconsistency prevents a mutually shareable explanation for the original concept. Similarly, Baron Snow described the *cognitive dissonance* that was occurring between the realms of knowledge involving the sciences and the humanities (Snow 1959)."

Also a physician, the analysis by Baron C. P. Snow of the *cognitive dissonance* between the humanities and the sciences, *viz.,* THE TWO CULTURES has prompted a variety of historical reviews (Snow 1959). There were many large worldwide ecological and cultural transitions that began to evolve after WWII. An essay by Guy Ortolano, Ph.D., uses the concept of meritocracy to assess the sociological era surrounding the message of Baron C.P. Snow (Ortolano 2016). Its title will likely prompt

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your curiosity: "Breaking Ranks: C.P. Snow and the Crisis of Mid-Century Liberalism, 1930-1980."

DESIGNERLY THINKING

To explore an initial consideration for any Design Epistemology concept, I recommend four concise essays by Dino Karabeg (Karabeg 2005, 2012, 2013, & 2016). Professor Karabeg presented the third essay during an international conference.

More recently, an essay by two newly collaborating authors offers an advanced, philosophical evaluation of the epistemological and design components of a Design Epistemology. Alger Sans Pinillos (University of Pavia in Pavia, Italy) and Anna Estany (Autonomous University of Barcelona, Spain) co-authored their essay entitled "Concerning the Epistemology of Design: The Role of the Eco–Cognitive Model of *Abduction in Pragmatism* (Sans Pinillos & Estany 2023)." Its authors jointly focused on the Philosophical and Designerly analysis of their essay. The application of an Eco-Cognitive Model for deep computer learning for adaptive hypothetical reasoning is a recent tool to simulate Peircean pragmatic abduction. A colleague of the authors at the University of Pavia, Lorenzo Magnani is prominently associated with this programing endeavor (Magnani 2022).

The title of the Sans Pinollos & Estany essay applies to a recently evolving realm of knowledge for reducing the cognitive dissonance associated while refocusing on a Wicked, very complex, adaptive system involving a social-economic problem. The best applicable article (Laursen & Moller 2019) about Designerly Thinking also reviews the evolution of this concept since 2016. "The shortcomings of Design Thinking when compared to Designerly Thinking (Laursen & Moller 2019)" cites the philosopher C.S. Peirce, who is known for his philosophical analysis of Pragmatism more than 100 years ago.

For the uninitiated, I cite an article from 2023 by Peggy Marshall, entitled: "The role of quantum mechanics in cognition–evolution (Marshall 2023)." The next to last paragraph of the Marshal article ends spectacularly with: "If we define cognition as inductive reasoning; codes as computing; and chemistry as physico-chemical laws; it becomes clear that reductionist models for deduction can never solve these problems." And, the last paragraph ends similarly: "This promises to be one of the greatest discoveries in the history of science, on par with *Quantum Mechanix* itself, *relativity,* the invention of the *transistor,* and the discovery of the *DNA helix* (Marshall 2023)."

Amidst the recently expanding realms of knowledge associated with evolution, 19 authors have contributed to a 'newly considered analysis' for understanding evolution. See their "The Vienna in Theoretical Biology" Gerd B. Muller, Editor-in-chief. Among these books, I

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recommend the book edited by Peter Corning: "EVOLUTION *'ON PURPOSE'* Teleonomy in Living Systems (Corning, *et al.*, 2023a)." The word 'Teleonomy' has been defined as "the quality of apparent purposefulness of structure or function in living organisms due to evolutionary adaptation (Merriam-Webster, 2014)." I cite two References by Peter A. Corning from his book that contribute to The Vienna Series (2023a) and (2023b).

PARADIGM REVIVAL

Please read again the quotations listed on PAGE 2. As combined, do you share their view of human life? If so, it's likely that you may agree with the next sentence. The current national commitment for improving our nation's Population Health and its Primary Healthcare is not working. Remember that our nation's longevity, as in the average age of death, has not improved since 1990,

I propose that a high level of *Cognitive Dissonance* is occurring between the 'humanitarian-political-economic' and 'positivist-reductionist-scientific' realms of knowledge within the daily human discourse for health care. By *Cognitive Dissonance,* I mean that when an isolated, dyadic social interaction involving the health care of another person occurs, one of the social interaction's persons may be thinking about the wrong person. That level of *Cognitive Dissonance* is probably rare, but subtle levels of dissonance are likely to be, much more, common. I refer to *Cognitive Dissonance* as defined by Leon Festinger (Festinger 1957).

The selection of 36 definitions, herein, for a **Design Epistemology** represents an intent to accommodate the realms of knowledge that underlie the cosmological origins of human evolution, now encompassing 13.8 billion years.

IN TIMES OF CHANGE,

LEARNERS INHERIT THE EARTH,

WHILE THE LEARNED FIND THEMSELVES

BEAUTIFULLY EQUIPPED TO DEAL

WITH A WORLD THAT NO LONGER EXISTS.

ERIC HOFFER (1902 – 1985)

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WELL-BEING HUMAN DIGNITY

CLUSTER CHAOTIC DISRUPTION

HUMAN QUANTUM-COGNITIVE BRAIN

COMPLEX ADAPTIVE SYSTEM

WELL-BEING may be postulated for HEALTH as:

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"...when defined as a person's eudaimonia,

Well-Being represents Happiness

In An Objectively Worthwhile Life (Badhwar 2014, p 50)."

Neera H. Badhwar, Ph.D. (1955 –)

COMMENT Professor Badhwar validated the particulars of this definition with a philosophical analysis. She applied alternate lines of reasoning that originated from a diverse cluster of authors. She cites Julia Annis, Aristotle, Albert Einstein, Cicero, Victor Frankl, Stephen Hawking, Immanuel Kant, Carl Rogers, and Amartya Sen, among many other scholars. Eudaimonia is an ancient philosophical theory that ascribes personal Happiness as having reached its "...highest ethical goal..." (Merriam-Webster, 2014).

As an aside, the Merriam-Webster Collegiate Dictionary cites 1582 as the year when Well-Being was first used (Merriam-Webster, 2014). It defines Well-Being as follows: "the state of being happy, healthy, or prosperous." The same Dictionary defines "Health" as Well-Being. My

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

own view is that a person's Well-Being largely arises from the lifelong Cultural Traditions shared lifelong by their Family, their Extended Family, and their home's Close Neighborhood. Population Health Research has affirmed that "self-reported health" and "trust" demonstrate reverse causality with a high level of certainty (Giordano & Linstrom, 2016).

To measure the lifelong impact of a Person's level of Well-Being, I cite (Zaninotto & Steptoe 2019) from the University College London in London, England. Using the English Longitudinal Study Of Aging, they had access to 9761 continuing participants from 2002 to 2019. Their analysis focused on disability-free survival after age 64. A High Level of Well-Being at age 64 for women was associated with another 31.4 years of survival, disability-free. The data for the women with a low level of Well-Being was 20.8 years, disability-free (about 10 years less). Men with a High level of Well-Being at age 64 survived for another 20.8 years, disability-free. The same data for men with low levels of Well-Being at age 64 survived 11.4 years, disability-free (almost 10 years less).

To further strengthen my respect for Professor Badhwar's book, I cite three articles. The first originates from London and Cambridge in the United Kingdom by Harry Walker and Iza Kavedzija: Values of Happiness (Walker & Kavedzija, 2015). I would judge this essay as representing a very high level of excellence among the best ethnographic analyses of Well-Being that I have encountered.

The <u>second</u> article expands our understanding of *eudaimonia* as an attribute of Well-Being, as contributed by Frank Martela of Finland and Richard M. Ryan of Australia. Its title is: "Clarifying *Eudaimonia* and Psychological Functioning to Complement Evaluative and Experiential Well-Being: Why Basic Psychological Needs should be Measured in National Accounts of Well-Being (Martela & Ryan, 2023)."

I also cite from this article's **Abstract** — "Psychological Needs as a category provides a parsimonious set of elements with clear inclusion criteria that are strongly anchored in theory and our current understanding of nature — and could thus form a core part of the third, 'adi' dimension of well-being. The needs for autonomy, competence, and relatedness have especially received broad empirical support. Accordingly, national accounts of well-being should include measures for key psychological needs to gain an enriched and practically useful understanding of the well-being of their citizens (Martela & Ryan, 2023)."

Lastly, the <u>third</u> article (Fuhrer & Cova, 2022) represents an analysis of the results from 2 studies of volunteers, possibly representing phenomenologically unique cultural traditions. When referring to an "Objectively Worthwhile life" as a "meaningful life", I cite from this article's **ABSTRACT** (Fuher & Cova, 2022): "In study (1), we find that individuals who are successful, competent, and engaged in valuable and

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important goals are considered to have more meaningful lives. In study (2), we find that the perceived meaningfulness of life does not depend only on its components but also on how its elements are ordered and how it forms a coherent whole (the 'narrative shape' of this life). Additionally, our results stress the importance of morality in the study participants' assessments of meaningfulness (Fuher & Cova, 2022)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) > added feature

Within each ***Theme*** of the **DESIGN EPISTEMOLOGY,** the definitions postulated for each of its 6 concepts will also review the applicable **ACEs** research that is associated with POPULATION HEALTH. This is intended to expand its underlying knowledge and complexity.

I now cite a report from three colleagues at the Center for Advancing Population Science at the Medical College of Wisconsin, Milwaukee, Wisconsin. It is titled as follows: "Assessing the Relationship between Adverse Childhood Experiences and Their Satisfaction, Psychological Well-being, and Social Well-being: Longitudinal Cohort 1995 – 2014: (Mossley-Johnson, *et al.,* 2019)."

The **Background** of this article's **Abstract** begins: "More than half of the US population has experienced Adverse Childhood Experiences (ACEs), which are eventually linked to physical and mental health issues." The **Conclusion** of the **Abstract** begins and ends with: "In this sample of adults, ACEs were significantly associated with lower life satisfaction, lower psychological well-being, and lower social well-being, especially to those who also report household dysfunction during childhood (Mossley-Johnson, *et al.,* 2019)."

With a focus on WELL-BEING, a person's HEALTH ultimately occurs from their sequential, lifetime encounters involving *) certain adverse cultural and ecological Social Interactions and *) the *Chaotic Disruption* occurring within their home's close neighborhood. See the concept definitions within the NEIGHBORHOOD THEME, *viz.,* page 55, and the FAMILY THEME, *viz.,* page 37. Unfortunately, there is a growing concern about the unique harm to infants, children, and adolescents from ADVERSE CHILDHOOD EXPERIENCES, *viz.,* **ACEs.** This susceptibility is related to the harmful events that damage the brain's sensory consciousness system during childhood, adolescence, and early adulthood from the occurrence of an **ACE.** An **ACE** is known to alter the intuitive, memory processing of a person's brain. The disabling effects of one or more **ACEs** on a person's overall WELL-BEING have become increasingly recognized since @2000.

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HUMAN DIGNITY may be postulated for HEALTH as

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a *Homo Sapiens,* gestationally fertilized ovum that

develops in response to their gestational birthing person to achieve

sustainable viability during 'his or her' birth as a Dependent Person,

acquires developmental differentiation during childhood and adolescence

as occurring from their *uniquely-endowed* Human Capability

to become a person with free will after adolescence and

survives with diverse self-sufficient attributes representing

Intrinsic Value, Moral Autonomy, and Fundamental Equality.

COMMENT Amidst the 36 definitions of this **Design Epistemology,** Human Dignity was the most difficult to establish since there is no identifiable heritage for its presence within a philosophical realm of knowledge. To finally identify a frame of reference for understanding Human Dignity, I have resolved this search by locating the constitutional, international legal scholarship that has evolved since 1947. While the United Nations was institutionally being formed in 1945, Eleanor Roosevelt also convened a large number of international scholars to craft the UNIVERSAL DECLARATION OF HUMAN RIGHTS. It was approved by the United Nations in 1947. It includes a reference to Human Dignity.

Many nation-states and their associated political subdivisions have added Human Dignity to their Constitutional language. There has been an overriding awareness that our nation's Bill of Rights implies the attributes of Human Dignity. To date, Montana is the only State to have specifically added a Human Dignity provision to its Constitution. As a US protectorate, Puerto Rico has also.

After 1969, the Human Dignity concept was progressively studied by a group of scholars that includes Myres S. McDougal (McDougal 1969), Oscar Schachter (Schachter 1983), W. Michael Reisman (Reisman 1990, 2012), Stephen J. Wermiel (Wermiel 1998), Johanna Kalb (Kalb 2010), Doron Shultziner (Shultziner 2003, 2017), Vicki C. Jackson (Jackson 2004), and Kai Moller (Moller 2018, 2021).

THE **Kai Moller 'HUMAN DIGNITY'** DEFINITION

"*Intrinsic Value*" represents each person's contribution to the *Homo Sapiens* species. In that role, each person contributes to the survival of their species, no matter how their contribution becomes distinguishable. As a result of this recognition, each person deserves equitably respectful, acknowledgment of their personhood. Therein lie the issues that degrade

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Humanity, *viz.,* slavery, social caste systems, poverty, corporal punishment, or substance dependence. The intersection of Human Dignity with the Constitutional provisions for Human Rights can become complex given the view that Human Dignity represents the ultimate source of a person's authenticity. In addition, this attribute is commonly associated with the cultural traditions of a specific ethnic tradition. In a sense, each person's Cultural-Social cognition (see below) is a God-given capability to uniquely identify each person's existence among all of the other Hominids and the worldwide biological community. Within that role, every person then becomes responsible, as viewed by proportionality, for maintaining the welfare of all the other biological entities, including their recognition as having lived.

"*Moral Autonomy*" represents each person's acquisition and subsequent expression of moral reasoning as the basis for achieving their ecological and cultural, self-determined survival. Before adulthood, this process is dependent on the cultural and ecological traditions within their Family and their neighborhood home's community to persistently acquire and revise the adaptive skills required for their future, self-sufficient survival. Ultimately, each community is obligated to ensure that meaningful options exist for each resident person's self-sufficient survival given their own community's ecological and cultural heritage. By doing so, each community and its **Survival** Commons, *viz.,* augmented safety net, then becomes responsible to prevent, mitigate, and ameliorate its ecological and cultural heritage that promotes congenital disabilities, childhood maltreatment, suicide, addiction, social isolation, poverty, and mid-life depression. Moral Autonomy then implies an obligation to incorporate *Human Dignity* into each community's resilience management and its associated social cohesion obligations.

"*Fundamental Equality*" represents each person's constitutionally defined Human Rights and each person's equal standing for their economic and political rights as compared to any other person. Any restrictions or advantages granted to a person must reflect justly applied proportionality, given the circumstances involved. This provision for *Human Dignity* requires a community-initiated, neighborhood-by-neighborhood strategy to prevent, mitigate, and ameliorate the inequitable ecological and cultural attributes of their own community's **Survival** Commons, as defined on page 76.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Here is the Multi-Ethnic Study of Atherosclerosis (MESA) Study that represents a population-based analysis of Individual and Neighborhood Social Disadvantages and the progression of 11 Cardiovascular Risk Factors over time (Wang *et al.,* 2022). The Study cohort numbered 6,814 individuals, aged 45-84 years, who were recruited from 6 study sites from 7-2000 through 8-2002 located in Forsyth County, NC; New York City,

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NY; Baltimore, MD; Saint Paul, MN.; Chicago, IL; and Los Angeles, CA. The cohort was chosen to include 4 ethnic participants: White, African-American, non-white Hispanic, and Chinese-American. The study accrued a Socioeconomic data set for each participant that included childhood through adolescent social history and an analysis of their home's neighborhood.

Each study participant was randomly recruited to fulfill the study's socioeconomic purpose with an assumption that their home's location in a 'disadvantaged neighborhood' would involve ACEs with variable intensity. This was an intense effort involving 15 co-authors. With the evaluation of 11 Cardiovascular Risk Factors, they were able to support the hypothesis that neighborhood risk factors, as mediated by DNA methylation, worsen the expression of their cardiovascular risk factors (Wang *et al.*, 2022).

CLUSTER may be postulated for Biological Theory as

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two or more bounded components that form

a uniquely resilient and sustainable survival capability

from their emergent interactions involving

synergy among the components,

affinity between certain components, and

salutary conditions surrounding the components.

COMMENT The preparation of this **Design Epistemology** has encountered many odd issues for which the recognition of a 'Cluster' phenomenon is critical. Strangely, there is no consensus as to its fundamental character, especially for its occurrence as a cosmological attribute OR as a contributing process for biological evolution. And so, the word 'Cluster' appears in 14 of the 36 Definitions, *viz.*, 38.9%. It is particularly applicable to the Family definition. The initial page of each **THEME** lists the definitions that are epistemologically cluster-connected. Each of these definitions may be anchored or enhanced as a Cluster definition. If so, it is identified with an underline.

This 'Cluster' definition is also applicable to commercial, institutional, governance, military, scientific, economic, *et cetera* realms of governance knowledge. Of course, it is most important for understanding the evolutionary dimensions that underlie the evolution of Human survival. In 2014, I encountered Addy Pross and his book "What is Life? How

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Chemistry Becomes Biology" when it was first printed as a paperback (Pross 2012). He has written several essays that are more informative. In 2023, he is listed as an assisting co-author with Peter A. Corning, Stuart A. Kaufman, Dennis Noble, and James A. Shapiro for a book entitled: "Evolution 'ON PURPOSE,' Teleonomy in Living Systems (Corning, *et al.*, eds. 2023)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

This represents the second research advisory that informs each of the 36 Definitions associated with the **DESIGN EPISTEMOLOGY.** Six experts, each originating from a medical school, coalesced to report their research regarding ACEs. When published in 2022, this was its title: "Transmission of the adverse consequences of childhood maltreatment across generations: Focus on gestational biology (Moog, *et al.*, 2022)."

I cite from the report's **ABSTRACT** (a Latin Language term meaning 'summary'): "In this review, the current state of knowledge on the intergenerational effects of maternal exposure to 'childhood maltreatment' is summarized and their transmission pathways are discussed. The specifically directed, as well as, indirect pathways involving variation in gestational biology. The review begins with a definition of childhood maltreatment and an overview of the clinical and neurobiological consequences of childhood maltreatment in the exposed and the offspring generation. The intrauterine period and variation in gestational biology are identified as a potential time window and a mechanism of transmission, respectively. Furthermore, a summary of the available evidence supporting both direct and indirect effects of gestationally biological variation on offspring development is included. Finally, knowledge gaps and challenges in the investigation of the role of gestational biological mechanisms in the intergenerational transmission of childhood maltreatment sequelae are addressed and considerations for future, study designs along with experiences from our current studies are provided (Moog, *et al.*, 2022). "

I also cite a recent report (Ratcliff, *et al.*, 2025), entitled "Adverse Childhood Experiences: Increased Likelihood Of Socioeconomic Disadvantages For Young Adults." It may eventually qualify as a sentinel **ACEs** study, even though that qualification has already been "runneth over." From the middle of the report's **ABSTRACT,** "After childhood socioeconomic status was controlled for, young adults with **ACEs** were more likely to have been charged with felonies, have become teenage parents, live in a household with poverty or housing assistance, be enrolled in Medicaid, not employed, and were less likely to be enrolled in an educational institution. These outcomes were most likely among adults with multiple **ACEs** or lower socioeconomic status (Ratcliff, *et al.*, 2025)."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

And also, read this article from *The Milbank Quarterly* — "The Perils of Medicalization for Population Health and Health Equity (Lantz, *et al.*, 2023)" — especially the report's first page and its 'Policy Points' section. Here is its third of four comments: "The essential and important work of population health science, public health practice, and health policy writ large is being thwarted by a medicalized view of health and an overemphasis on personal services and the health care delivery system as the major focal point for addressing societal health issues and health inequality (Lantz, *et al.*, 2923)."

CHAOTIC DISRUPTION may be postulated for HEALTH as

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an entanglement of Cosmological, Biological, and Socio-Ecological disturbances, each occurring with paradoxical emergence and diverse time-course patterns that evolve continuously to form a cluster of disturbances that variously interact with the persons within each of a community's neighborhoods to uniquely impair the sustainably resilient *Well-Being* of these resident persons within their own so-affected neighborhood.

COMMENT A specific Sub-Page (3c) for Unstable HEALTH attempts to identify the commonly recognized disease categories and their identifiable HEALTH CONDITIONS. It may be found on the PAGES List that occurs as a right-sided column of the first two pages of this **Design Epistemology.** The list of contributing Pages and their Sub-Pages represents partially revised chapters from the 1st edition of BETTER HEALTH FOR AMERICA (Nelson 2021).

The unanticipated occurrence of DISRUPTION within an industrial business institution may occur with any newly planned introduction of a major *innovation.* This can be associated with adverse effects, *viz.*, chaos. I cite Joshua Gans for this isolated arena of knowledge (Gans 2016). For this **Design Epistemology,** Chaotic Disruption is also applied to defining the concept of a "CLUSTER" and its attributes that are potentially associated with the initial initiation of the evolution underlying biological adaptive systems, *viz.*, humans. For a plausible analysis of an initial "biological cluster," I cite Addy Pross (Pross 2012).

Since @2000, hereditary causes have become increasingly recognizable as the origin of many chronic diseases by their **EPIGENETICS.** This is the next major THEME category and begins with a general DEFINITION of this disease process (page 23). Recently, this concept has become

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

implicated as an underlying cause of multi-generational poverty. Its increasingly recognizable complexity requires the exploration of its unique, anthropological ethnography.

CONCEPTUAL KNOWLEDGE: CHOS & DISRUPTION

"Our article helps innovation scholars disentangle the nature of different types of disruption depending on their primary cause and shows how non-technical disruptions can challenge the incumbent's status." Herein, I have cited the ABSTRACT's last sentence from an article entitled: "The multifaceted concept of disruption: A typology (Godart & Pistilli, 2024)." You won't be disappointed by an effort to access the article's "2.0 Theoretical Framework" section that begins on its page 2.

Secondly, amidst the large array of articles focused on CHAOS, I have chosen from the large number of "VERY SHORT INTRODUCTIONS" that have been curated by the OXFORD University Press: CHAOS A Very Short Introduction (Smith 2007) – 4 1/4 " X 6 3/4" 180 Pages, with a bit of quantum cybernetics. Since a typology could become enshrouded by Chaos, I cite an article entitled "Virtual identity crisis: The phenomenology of Lockean selfhood in the 'Age of Disruption' (Deckard & Williamson, 2020)." Here is the first sentence in its article's **ABSTRACT:** "From the end of the seventeenth century to now well into the 21st, John Locke's theory of personal identity has been foundational in the field of philosophy and psychology."

CONCEPTUAL KNOWLEDGE: COMPLEXITY

From the Complexity Sciences Center and Physics Department at the Univ. of Calif., I quote from their article's **Abstract** (James P. Crutchfield 2012): **"Quantifying the notion of pattern and formalizing the process of pattern discovery go right to the heart of physical science. Over the past few decades physics' view of nature's lack of structure — its unpredictability — underwent a major renovation with the discovery of deterministic chaos, overthrowing two centuries of Laplace's strict determination in classical physics. Behind the veil of apparent randomness, though, many processes are highly ordered, following simple rules. Tools adapted from the theories of information and computation have brought physical science to the brink of automatically discovering hidden patterns and quantifying their structural complexity."**

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Here is an exemplary report with a focus on the connection between EPIGENETICS AND **ACEs.** The 'HAPO Fallow-up Study, Cooperative Research Group' published a report from their institutional collaboration (Perak, *et al.*, 2021). From the study's interim report, I cite the study's CONCLUSION AND RELEVANCE portion of its ABSTRACT "In this multi-national cohort, better maternal cardiovascular health at 28 weeks

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

of gestation was associated with significantly better offspring cardiovascular health at the cohort's age of 10-14 years **after** birth (Perak, *et al.,* 2021)."

ACEs are also known to affect an offspring's mental health. Up next, here is a 2023 research report regarding a birth cohort of "fragile families" (#3,474) and the occurrence of child Maltreatment ("harsh parenting" or "neglect"). These families were evaluated with a standardized parent-child conflict tactics scale when their children were assessed at ages 1, 3, 5, & 9 years of age and finally at age 15 years of age with an age-related parent-child conflicts scale. The author and co-authors involved 7 colleagues originating variously from the USA and Europe (Dunn, *et al.* 2023). I cite the report's title: "Sensitive Periods for the Effect of Child Maltreatment on Psychopathology Symptoms in Adolescence (Dunn, *et al.,* 2023)."

The authors of the report were seemingly committed to an understandable analysis of their cohort study that had begun during 1998-2000. The families were selected at the time of a child's birth and were interviewed at the child's birthing hospital (1 of 20 hospitals in the USA). With the age-related follow-up, they identified specific gender-related ages for heightened-externalizing symptoms: age 5 for boys and age 9 for girls. I cite from the **Discussion** section of their report: "To our knowledge, this is the largest study to test the sensitive period hypothesis for neglect in children and adolescents (Dunn, *et al.*, 2023)."

HUMAN QUANTUM-COGNITIVE BRAIN may be postulated

for HEALTH as

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the central memory and cognitive functions

of every person's nervous system that is formed

by the person's *uniquely-endowed* Human Capability

to become a viable Human Fetus and initiate the

quantum processing of their contextual consciousness and

its clusters of pattern-recognition knowledge

to achieve adequate resilience for the developing person's

innate temperament and baseline homeostasis as

a viable Human Fetus before birth, a Dependent Person after birth,

and an Independent Person with free will after adolescence.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

COMMENT Among the thirty-six concepts encompassed by this **Design Epistemology,** the *Human Quantum-Cognitive Brain* of each person is likely to be the most difficult to understand or accept. With the advent of quantum mechanics within the last 100+ years, we now encounter a need to use our imagination to understand this newly understood phenomenon. For most quantum dimensions, they cannot be measured by direct assessment. Thus, 'alternate statistical systems' are required to assess the presence of quantum phenomena. Devising an alternate statistical system using calculus requires the exploration of alternate statistical models and, thus, the need for intuitive imagination.

The terms paradigm paralysis and paradigm shift continue to appear with the use of new terms, concepts, and dimensions for which any current Glossary or Unified Lexicon may not be intellectually accessible. The best analysis of this paradigmatic phenomenon would be most widely recognized as described by the book entitled: "THE STRUCTURE OF SCIENTIFIC REVOLUTIONS." It was initially published by Thomas S. Kuhn in 1962 (Kuhn 2012). It is best complemented by the Eric Hoffer book entitled "THE TRUE BELIEVER" regarding the nature of mass movements (Hoffer 1951). In a sense, an enduring paradigm is maintained by its own true believers who tend to resist accepting new forms of knowledge. — 19 —

By understanding the historical evolution of scientific knowledge over time, we now recognize the central role of the Human Quantum-Cognitive Brain and its Cultural Social-Cognition as the basis to understand each resident person's substantially unique survival among all the other biological species. After birth, each person eventually achieves self-sufficient survival, *viz.*, freedom or agency, by the continuous acquisition of adaptive skills that eventually include a cultural array of intuitive social interactions, moral reasoning, and an adaptive personality. To understand the origins of this ecological and cultural array of attributes, I refer to the career-long research commitment of Michael Tomasello, Ph.D. He has defined each person's Childhood Development and its subsequent trajectory during their lifelong development. The breadth of this commitment should inform everyone's knowledge arena for understanding Population Health. Among multiple books and research reports by Professor Tomasello, his keystone book is entitled: "BECOMING HUMAN – A THEORY OF ONTOGENY (Tomasello 2019a)."

For the analysis of the various "quantum" attributes that would account for human consciousness, consider the article entitled: "Holographic Brain Theory: Super-Radiance, Memory Capacity, and Control Theory (Nishiyama, *et al.*, 2024). For a recent biological review that is Internet open-accessible, consider "Quantum Neurobiology" by Melanie Swan.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

Her review represents a "common-sense" introduction to the quantum dimensions of brain signaling and consciousness (Swan 2022). And finally, Takaaki Musha has recently explained another view of our human holographic memory (Musha 2022).

Finally, I cite three articles for those readers familiar with the Quantum boundaries of knowledge regarding consciousness: **by** Eric Bond – "Coherence Field Theory: Quantum Coherence as the Basis for a Model of Brain Function (Bond 2022);" **by** Charles D. Laughlin – "Consciousness as an intelligent complex adaptive system: A neuroanthropological perspective (Laughlin 2023);" and **by** – Dirk Meijer "Concept of Integral Holographic Consciousness: Relation with Predictive Coding, Phi-Harmonic EEG Coherence as Perturbed Mental Disorders (Meijer 2023)."

HUMAN MEMORY ESTIMATE

On December 10, 2024, I used my internet access to the GOOGLE CHROME search tool to find a "layman-related" review for *Human Brain Memory.* I cite the first item, identified as an "AI Overview," which simply states the following: "The human brain's memory capacity is estimated to be 2.5 petabytes, which is **roughly equivalent to:** 1024 terabytes, a million gigabytes, OR 2.5 million gigabytes of memory for the average adult, equivalent to 300 years worth of continuous TV. My cursory use of the GOOGLE SCHOLAR extension using the same three-word phrase confirmed the 2.5 million gigabytes estimate cited in several scientific reports. Remember that the human brain captures the affect and/or dissonance associated with lifelong human quantum-cognition survival to inform the immediacy patterns of our consciousness.

INTELLIGENCE & UNIVERSAL CONSCIOUSNESS

This HEADING implies that a philosophical conundrum underlies their definition. I highly recommend an article by Franco Ivaldi, Nicola Smigliani, and Sabato Scala (Ivaldi, *et al.,* 2024). It can be easily downloaded from 'Google Scholar.'

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Here is a large collaborative study involving 12 separate experts associated with 4 medical centers, each within either Alabama, Illinois, Minnesota, or California. 5115 participants were enrolled for a separate CARDIA study during 1985-1986, aged 18-30 years. A standard protocol caled for doing cardiac tests every 3-4 years until 2015-2016. During 2000, a follow-up study involved a questionnaire evaluation among the cohort regarding each participant's personal history, if any, of one or more ACEs. A standardized questionnaire was used. During the study, they also evaluated several types of DNA, methylation-based measurements known to be associated with increased risks from Coronary Artery Disease (Kim, *et al.,* 2023).

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

From the report, I cite the CONCLUSIONS AND RELEVANCE Section of its **ABSTRACT:** "In this cohort study, ACEs were associated with EAA (epigenetic age acceleration) among middle-aged adults after controlling for demographics, behaviors, and socioeconomic status. These findings of an association between early life experience and the biological aging process in midlife may contribute to *adverse* (pjn *edit)* health promotion for a life course perspective (Kim, *et al.,* 2023)." This study will likely receive a follow-up analysis within 5-10 years. — 21 —

A **COMPLEX ADAPTIVE SYSTEM** may be postulated for
a nation's POPULATION HEALTH & its PRIMARY HEALTHCARE

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as the minimally nested community Cluster
of a nation's micro-, meso-, & macro-person networks
within a *Human Dignity* scenario that becomes
established and sustained by the collaborative application
of collective action to define, monitor, and periodically revise
their respective community's **Survival** COMMONS
that is implemented to function generationally
near the edge of chaos to achieve a national Goal as informed
by a nationally chartered **DESIGN EPISTEMOLOGY.**

COMMENT To newly establish 810 contiguous Community Districts, each originating with @400,000 citizens, for a national Complex Adaptive System (CAS) of institutions after the COVID pandemic may seem totally unrealistic. Neighborhood by Neighborhood, the CAS would intentionally rebuild our nation's Social Cohesion by a self-governed, decentralized span-of-control institution involving @2,000 Associates. The Associates would represent the staff of NATIONAL HEALTH and the 900 Members of the 10 Governance Committees for the CAS. Even with a chaotic onset, a broadly shared commitment to assemble a very large set of fully engaged, nationally collaborative social networks would ultimately be required. Left unrecognized, nearly 8,000 members of every local Community's HEALTH Forum's governance would also need to be locally promoted. Further analysis and exploration of this concept could begin with six journal articles: [Next Page]

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

- **1.** Simon A. Levin. "ECOSYSTEMS AND THE BIOSPHERE AS COMPLEX ADAPTIVE SYSTEMS (Levin 1998);"
- **2.** Kevin J. Dooley. "A COMPLEX ADAPTIVE SYSTEMS MODEL OF ORGANIZATION CHANGE (Dooley 1997);"
- **3.** Ted Carmichael and Mirsad Hadzikadic. "THE FUNDAMENTALS OF COMPLEX ADAPTIVE SYSTEMS (Carmichael & Hadzikadic, 2019);"
- **4.** Michel D. McGinnis and Elinor Ostrom. "SOCIAL-ECOLOGICAL SYSTEM FRAMEWORK: INITIAL CHANGES AND CONTINUING CHALLENGES (McGinnis 2014);"
- **5.** My M. Sellburg, Allyson Quinlan, Rika Preiser, Katja Malmborg, and Gurry D. Peterson, "ENGAGING WITH COMPLEXITY IN RESILIENCE PRACTICE (Sellburg, *et al.*, 2021);" and
- **6.** Charles D. Laughlin. "CONSCIOUSNESS AS AN INTELLIGENT COMPLEX ADAPTIVE SYSTEM: A NEURO-ANTHROPOLOGICAL PERSPECTIVE. (Laughlin 2023)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

The importance of a "complex adaptive system" for governance now becomes sacrosanct because of its provision for supporting community autonomy to design their own **SURVIVAL** Commons. As an introduction to its paradigm shift, I cite the ABSTRACT of an article that projects the complexity associated with a community's prevention, mitigation, and amelioration of **ACEs** (Guevara 2024).

"... In the United States, communities that have been historically marginalized, including racial and ethnic minorities, are disproportionately impacted by ACEs due to systemic inequities and historical injustices, leading to persistent sociodemographic health and social disparities. Recent advances in the ACEs framework argue that the traditional ACEs model inadequately addresses the broader socio-structural, political, and economic contexts that influence adversity, including living in under-resourced communities, ongoing community violence, and poor access to service systems. As a result, child and family service systems may fail to consider how socio-structural factors, may potentially reinforce disparities in services access, delivery, and outcomes. [...] By shifting toward this holistic perspective, researchers and practitioners alike can better understand the interplay of systemic inequalities and socio-structural conditions in shaping ACEs exposure, and, therefore, inform more effective practices, and services that can address both the immediate impact and root causes of adversity (Guevara, 2024)."

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EPIGENETICS **CULTURAL** **SOCIAL-COGNITION**

HUMAN CAPABILITY **HUMAN FETUS**

PERSON **BIRTHING PERSON**

EPIGENETICS may be postulated for HEALTH as

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"... the interactions of genes with their environment,

by which genotype gives rise to phenotype and brings

the phenotype into being ... (cited by Lester, *et al.*, 2012)."

Conrad H. Waddington (1905 – 1975)

COMMENT The Waddington quotation cited above originates from within the Lester essay that identified Conrad Waddington as having been the first to use the concept of "Epigenetics" in his book entitled ORGANIZERS AND GENES (Waddington 1940a). Specifically, we are considering what occurs to the maternal RNA and as well as DNA fertilized ova as they biologically develop during conception within their *Birthing Person* to nurture the origins of a fetal person's phenotype.

Epigenetics influences the expression of a person's Genes and does **not** change or alter a person's originating DNA (without certain very unusual circumstances). Most importantly, Epigenetics should be recognized for its potential effects on the maternal gestational environment. In effect, prenatal epigenetic factors can alter the pre-viable fetal formation of its

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

uniquely endowed Human Capability. The epigenetically informed, developmental process then continues after birth, especially during the first 1-3 years of growth and development. Remember, the male sperm and its semen are necessary to modulate the ova fertilization process and its subsequent endometrial implantation. Sperm do not contribute any cytoplasm to a fertilized ovum, just DNA. Apparently, the mitochondria associated with each sperm can influence the conception process as well.

"Evidence for the multigenerational and transgenerational impact of the environment is described and the chapter explores the unique routes through which mothers and fathers mediate this generational transmission. We differentiate between germline and experience-dependent epigenetic inheritance and discuss the role of these mechanisms of inheritance in adaptation and plasticity (Curley, *et al.,* 2023)." I cited the last two sentences from the article's Summary of the review article entitled "Transgenerational Epigenetics" that represented Chapter 24 in the Handbook of Epigenetics (Third edition) published by ScienceDirect in 2023. This Chapter OF JUST 9 pages augments the related information introduced in the Definition for Birthing Persons at the end of this PERSON THEME (Curley, *et* al., 2023).

As our knowledge about Epigenetics and its inheritability has become defined, a report (Jones, *et al.,* 2019) from the Tulane Brain Institute described their analysis of 67 births. They found epigenetic evidence that several newborns had inherited the attributes during the gestation of their mother's prior experience of one or more **ACEs**. Their analysis focused on "placental aging" and "infant autonomic system reactivity." I cite the last sentence of the **Conclusions** section of the report's **Abstract** — "These data are the first, to our knowledge, to report that changes in placental TL (telomere length) influence the transgenerational impact of maternal early life adversity on the development of her offspring's autonomic nervous system." (Jones, *et al.,* 2019)

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Within the last 10 years, the processes that cause "environmental and social" effects on the expression of a person's Human Dignity have become progressively studied. For this Epigenetic definition, I cite a recent study. (Triplett, et al, 2022). The research identified 280 infants whose mothers had endured substantial social disadvantage (poverty) with psychological stress before and during their child's prenatal gestation. The research identified substantially <u>reduced</u> brain volume after birth among many of the study's infants. The study represented their initial findings as the basis for a continuing follow-up study to further define the prenatal epigenetic effects of poverty on an infant's nervous system when exposed to **ACEs.**

This study established the occurrence of a Childhood Adverse Event by using DNA methylation as a marker for an intervening occurrence of an

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

ACE. Three separate blood or urine sampling schedules, along with concurrent family/social history monitoring, occurred for 14,451 children from birth to age 15 years. The study included 19 collaborative participants from 5 separate institutions located in Ireland, the United Kingdom, the USA, and Australia. I cite its published title: "The timing of childhood adversity associates with epigenetic patterns across childhood and adolescence: results from a prospective, longitudinal study (Lussier, *et al.*, 2023)." I strongly recommend this study as the basis for grasping the DNA methylation concept. Be prepared to increasingly encounter this concept!

CULTURAL SOCIAL – COGNITION may be postulated as

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a unique <u>cluster</u> of cognitive attributes *encompassing* each person's Shared Intentionality, Tribal Social Learning, and Symbolic Learning that is nurtured during each person's early childhood development by their Family, its **Family Culture,** Extended Family, their Home's close neighborhood, and the **Survival** Commons of their family's community to prepare each person's prosocial contribution to the generational survival of the *Homo Sapiens* species.

COMMENT A detailed analysis by Professor Tomasello of the historical progress of the Homo Sapiens species indicated an evolutionarily sudden transition 150,000 years ago that included an expanded set of attributes definable as Shared Intentionality, Tribal Social Learning, and Symbolic Learning. These skills promoted our species' worldwide migration and its eventual tribal agrarian survival. The eventual transition to larger community-based survival began 12,000 years ago (Tomasello & Call, 1997; Tomasello 2019a; and Tomasello 2019b). The transition began at the end of the last global ice age, the holocene.

Shared Intentionality represents "...the ability to participate with others in collaborative activities and shared goals..." (O'Madagan & Tomasello, 2021). In comparison to empathy and its mutual awareness of emotional states of mind, Shared Intentionality implies a natural predisposition to

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

cooperatively contribute to mutually beneficial, social interactions. It becomes developmentally observable by 12 months of age.

Tribal Social Learning may best be viewed as occurring among a cluster of 153 persons, aka, a social network. This number is recognized as the mean number, aka the Dunbar Number, of persons within a natural social network (Dunbar 2020). This social network, alias tribe or close neighborhood (including "dependents"), then becomes the essential origin from which daily routines involving social interactions are acquired, learned, and generationally revised within a neighborhood's "social network" and secondarily by its surrounding community. The learning micro-events of this process are delightfully described by a somewhat sardonic, 'easy-to-read' essay by Erving Goffman: "THE NATURE OF DEFERENCE AND DEMEANOR" (Goffman 1956).

Symbolic Learning refers to the capability of communicating from within a complex cluster of knowledge systems, such as music, language, geography, flowers, and mathematics. These structures of knowledge then mediate how a given tribal unit's cultural traditions and knowledge are generationally accrued, memorized, and shared, or not, with other Tribes.

To further inform the structures of knowledge, I introduce Andras Angyal, M.D., Ph.D., who was the Resident Director of Research at the Wooster State Hospital, Wooster, Massachusetts, from 1937 to 1945. Born in Hungary, he obtained a Ph.D. in psychology (1927), and an M.D. along with his Psychiatry residency (1932) in Austria, He emigrated to the USA at the end of 1932. His first book, published in 1941, carries this title: "Foundations for a Science of Personality" (Angyal 1941a). On Page 111 of this book, we encounter the following two sentences: "Physiological psychology takes into consideration some of the physiological functions, namely, the sensory processes. In modern quantum physics, the role of the subject, the observer, is considered a rather important factor."

To view this analysis with perspective, Dr. Angyal's theory of personality is about how a person acquires and refines the social scenario memories for building the intuitional character of their personality. Given the required memory dimensions, we can only imagine the recall capabilities required for each person's **Human Quantum-Cognitive Brain.** I suggest that Doctor Angyal may have been the first to understand the memory processing requirements for a person's intuitive participation during the diversely discordant, social interactions encountered daily, lifelong.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

From an article written by Andrea L. Roberts and 6 associates, I cite a background statement in the article's first paragraph: "US national surveys report high lifetime occurrence of childhood physical abuse (18.1%), emotional abuse (23.9%), and sexual abuse (26.6% for females,

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

5.1% for males). (Roberts, *et al.*, 2022)" The Nurses Health Study II was the focus of the Study. It included 116,429 female U.S. nurses in 1989 who participated in a biennial questionnaire for data acquisition. A violence questionnaire occurred in 2001. This Study represented a follow-up analysis of the 2001 survey respondents, numbering 14,151.

I cite the last sentence of this article's **Abstract:** "Childhood abuse should be investigated as a potential risk factor for cognitive decline and dementia in old age (Roberts, *et al.*, 2022)." For a very thorough analysis, it announces a certain degree of deep resignation given its prevalence among our nation's resident persons. We must do better! — 27 —

HUMAN CAPABILITY may be postulated for HEALTH as

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each person's epigenetically & genetically, *uniquely-endowed*

HUMAN QUANTUM-COGNITIVE BRAIN that

emerges during its initial Human Embryo, Preparatory Phase;

begins to promote harmony between their innate temperament and

its baseline homeostasis to become a pre-viable Human Fetus;

configures their Cultural Social-cognition to become

a pre-birth viable *Human Fetus* for initiating the person's

eventual pursuit of 'his or her' *Human Dignity*;

initiates their consciousness at birth; AND

promotes their adaptive skills during

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i. the person's sequentially nested, cognitive development throughout

early childhood when nurtured by the caring relationships originating

before birth from within the person's Family, its Family Culture,

its Extended Family, and their Home's close-neighborhood AND

ii. the person's situationally socialized, cognitive development

throughout their childhood, adolescence, and early adulthood

to achieve Free Will after adolescence when

the person's Cultural-Social cognition begins to merge the fluency

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

of their personality, moral reasoning, and self-esteem while acquiring the intuitive spontaneity to apply prosocial norms for resolving the human-dignity-related, discordant social interactions they encounter within the civic life of their Family's community, especially when these discordant social interactions also receive "timely mentoring" by the caring relationships originating from within their Family, its **Family Culture,** their Extended Family, and their Home's close neighborhood.

COMMENT The original conceptual exploration of "Human Capabilities" is primarily attributable to Martha Nussbaum and Amartya Sen (Nussbaum & Sen, 1993). They had proposed a set of lifetime capabilities and their respective aspirational functionings for each person. These "Human Capabilities" then formed the social justice requirements for a social-choice-based democracy. This expanding philosophical exploration has now been somewhat codified by its designation as "the human capability approach" (Robeyns 2005).

In contrast, the future of a **NATIONAL HEALTH** tradition begins with defining each person's *uniquely-endowed* Human Capability as forming the developmental origin for their Quantum Signaling Brain. It is also recognized as a Social Brain that humanity has acquired to become socially self-sufficient among the *Homo Sapiens* species as substantially separate from all the other biological species (Dunbar 1992, 1998, 2003, 2007, 2009, 2016, 2020a, 2020b & 2024). "Thus, human reproduction is defined by high failure rates *(viz.,* periodic ovulation) but also good cumulative success rates, reflecting against low-fitness offspring (Brosens 2022)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

I propose that the analysis reported in 1997 by two faculty members at the University of British Columbia in Canada has a special honor for shepherding the socio-ecologic Human Dignity arena now recognized as **ACEs** (Power & Hertzman, 1997). Here is its title: "Social and biologic pathways linking early life and *adult* disease." Beginning in 1974, Canada reorganized its healthcare into a Federally managed system. As a result, they encountered the phenomenon now recognized as Population Health, especially the health of children. As a Pediatrician, Professor Hertzeman was prominently active in this public health arena until he died in 2013.

Here is the last sentence of the 1997 report's **ABSTRACT:** "Thus, it is argued that adult disease will be more fully understood when account is

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

taken of the combined effects of social and biological risk occurring at different life stages (Power & Hertzman, 1997)."

HUMAN FETUS may be postulated for HEALTH as

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identified by the occurrence of a fertilized ovum
of the *Homo Sapiens* species through its initial gestational survival
during an initial 8-week Stage involving conception,
uterine implantation, germination, and embryonic phases
to finish a 20-week, pre-viable Human Fetus stage that incorporates
its generational genetic and epigenetically molded origins
for endowing its *individually unique* Human Capability
to become a post-birth, viable Human Fetus as enhanced
by the resilience of its mother's pre-gestational Health and
a perinatally co-occurring Birthing Convoy originating
from within its gestational parents' Families, their Extended Family,
their Family Culture, and their Home's close neighborhood.

COMMENT: Each resident person of every community should have a regular "nudge" that this phase of every person's future survival hinges on the unique juxtaposition of multiple generational cultures that coalesce for every Human Fetus. A sustained Birthing Convoy is beneficial for nurturing the Birthing Person's prenatal "gestational" survival with **anticipatory** courage and enduring hope, despite the physical and emotional risks that are <u>not</u> ultimately manageable by any "medical model." This Human Fetal stage begins a quest to gradually acquire a new beginning for its Family and their commensality needs. — 29 —

During conception, the fertilized ovum becomes implanted within its gestational endometrial surface to form an embryo. The ultimate paradox of feto-maternal, immunological tolerance then begins. I cite the PERSPECTIVE article by Gabrielle Rizzuto and Adrian Erlebacher for a baseline description (Rizzuto, *et al.* 2022). The profound complexity of this immune paradox begins during implantation. Its most important transition occurs 16-20 weeks after contraception when post-birth viability develops. As of 2022, there are no physiologic resiliency tests

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

that will reliably identify when the onset of birth viability by a Human Fetus has already occurred, or when it will eventually occur.

The Human Fetal stage ends at birth after the onset of the rapidly evolving and complicated, reversal of the maternal, immune-tolerant gestational status has occurred to induce the onset of labor. At birth, the infant is suddenly exposed to a very cold environment that initiates a crying response (driven by evaporating amniotic fluids) that is necessary to open the respiratory passages for obtaining oxygen. In addition, the infant's uterine birthing sequence may have initiated a "splitting" headache as well as their innate rooting reflex.

Simultaneously, the person's mucosal surfaces are being colonized with their own bacterial "biome" to modulate their initial immune system (Panthee 2022). And just as suddenly, their Quantum Signaling Brain awakens its consciousness with the flood of newly encountered sensory and homeostatic signaling information.

As a result, each newborn dependent person begins to interact with their new environment to achieve many changes that are most obviously marked by a doubling of their weight and a 27% increase in length during the next five months. If you started today at 150 pounds, a similar weight gain would represent a weight of 300 pounds, five months later. Remember also, that within 5 months, each newborn will be able to quickly recognize their parents and smile when viewing their faces, maybe with a bit of cooing as well. Unfortunately, maintaining an awareness of this child's daily developmental needs as a prelude to their character differentiation as a 16-year-old adolescent becomes steadily, more difficult to anticipate.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

In 2021, Andre Bussieres and 12 colleagues reported the results of their analysis of ACEs during childhood and the occurrence of chronic pain as an adult (Bussieres, *et al.,* 2021). Their research accessed data from 70 observational studies involving 826,452 persons, each person living in either Canada, Australia, Denmark, Hong Kong, or the USA. From the **ABSTRACT** of the report, I cite its Background statement – "Adverse childhood experiences (ACEs) have been shown to negatively affect health in adulthood. Estimates of associations between ACEs and chronic painful conditions are lacking." and from its Objectives statement – "This systematic review and meta-analysis aimed to evaluate associations between ACEs and chronic pain and pain-related disability in adults. (Bussieres, *et al.,* 2021)"

For the study's results, I cite the **ABSTRACT's Conclusions:** "Single and cumulative ACEs are significantly associated with adult reporting of chronic pain and pain-related disability (Bussieres, *et al.,* 2021)."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

PERSON may be postulated for a NATION as representing

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a Human Fetus that has achieved birth viability and survival after birth to

*) become a Dependent Person within 'his or her' Family;

*) become a person with Free Will after adolescence,

unless interrupted by an identifiable interval of Dependency

according to the *Human Dignity* proportionality of their Nation;

*) maintain their own, Family-initiated, Personal **Survival** Plan;

*) sustain their survival as supported

by their community's **Survival** Commons;

*) support their community's *Community HEALTH Forum* and its

Survival Commons to sustain their community's Social Cohesion; **AND**

*) promote their nation's equitably available, ecologically &

culturally accessible, justly efficient, and dependably effective

participation in the international marketplace arenas of its worldwide

Resources, Knowledge, and *Human Dignity.*

COMMENT As anyone might observe, this collection of concepts is developmentally defined and may be viewed as overly convoluted. In response, the concept of cognitive dissonance needs further recognition. If we are all mutually committed to improving each community's Social Cohesion to reduce its prevalence of poverty, then we will ALL need to understand how human development occurs. Otherwise, it would be very difficult to prevent, mitigate, and ameliorate each person's developmental encounters with modest as well as substantially discordant, social interactions and the resultant moral fatigue. The resultant occurrence of entrenched poverty explains why it becomes generationally sustained as a result of its social, economic, and epigenetic perpetuation. — 31 —

Within the intellectual arena that focuses on a "Person," I found a collection of essays for a book written by Andras Angyal, M.D., Ph.D., as most engaging, *viz.*, its title: FOUNDATIONS FOR A SCIENCE OF PERSONALITY (Angyal, 1941a). To advance this diverse heuristic, it is important to distinguish an 'independent person' from a 'dependent person.' For daily discourse, the single-word "person" is usually understood as an independent person. This level of complexity is further clouded by each State's legislation and any National legislation for defining these terms. And finally, it becomes even more complicated as

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

each community attempts to manage the free will of its resident persons who are affected by a debilitating mental illness.

Eventually, the issue of Free Will, *viz.*, agency, and its associated moral reasoning becomes important to consider when evaluating the effects of certain addictions that can degrade any person's willfully authentic choices. As additionally identifiable in conjunction with Dr. Angyal, I recommend a sentinel essay written by Professor Harry G. Frankfurt, which appeared in The Journal Of Philosophy: "FREEDOM OF THE WILL AND THE CONCEPT OF PERSON" (Frankfurt 1971). This essay analyses the issue of a person's Free Will when they are under the influence of mood-altering substances.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

From (Zarei, *et al.,* 2021), here is a report with the following title: "*Adverse Childhood Experiences Predict Common Neurodevelopmental and Behavioral Health Conditions among U.S. Children.*" I quote from its **Abstract,** "Objective: Adverse childhood experiences (ACEs) can have a significant but variable effect on childhood neurodevelopment. The purpose of this study was to quantify and compare the associations between "household challenge" ACEs and common childhood neurodevelopmental and behavioral health conditions, using nationally representative data." ... "Results: Down Syndrome, Tourette Syndrome and cerebral palsy were not associated with household challenge ACEs, whereas behavior/conduct problems, depression, and substance abuse were strongly associated ... " "Other neurodevelopmental conditions not traditionally associated with childhood adversity showed moderate yet robust associations with ACEs including autism..., learning disability..., and attention deficit hyperactivity disorder...," "Conclusion: We found significant dose-dependent or cumulative associations between ACEs and multiple neurodevelopmental and behavioral conditions (Zarei, *et al.,* 2021)." The report also confirmed the widespread population-related incidence of ACEs.

BIRTHING PERSON may be postulated for HEALTH as

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a biologically-capable, independent person who

<u>revises</u> her own 'Personal **Survival** Plan' to

<u>form</u> a *Birthing Convoy* while planning and anticipating

the occurrence of conception to form a Human Embryo;

<u>completes</u> the gestational conception of this Human Embryo

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

to achieve its post-birth viability as a Human Fetus;

nurtures their Human Fetus to secure its post-birth viability; AND

endures the miraculous birth of this Human Infant who

survives as a Dependent Person with *Human Dignity*.

COMMENT Our contemporary customs may prefer to use the term Birthing People and its connection to their biologic gender identity. This **Design Epistemology** prefers a basic commitment to support a uniform definition and heuristic for the use of the word **PERSON.** As conception eventually develops one, or more than one, Human Embryo, each *Birthing Person* then accepts the privilege of contributing to the evolution of Human Survival, especially by their contribution of a Human Fetus who has achieved 'his or her' post-birth viability. As such, the intentional termination of any post-birth viable Human Fetus then becomes a Population Health issue. From an ethical morality standpoint, any such intentional termination also becomes a national socio-political "Social Choice" issue. Incest, rape, maternal Well-Being, and congenital anomalies, such as anencephaly, can also become involved.

As a contribution to social cohesion, a biologically precise ability to identify the fetal transition to post-birth birth survivability would promote the evolution of a broadly accepted accommodation of abortion and its ethical morality. Putting aside the ultimate issues of fertility, the Well-Being Survival of each Birthing Person within the 21st Century has become the most disgraceful attribute within our global saga of Human Survival. It is second only to the continuing level of civilizational genocide and climate-related starvation.

Within the USA, the frequency of women who die in association with a pregnancy has worsened annually since @1975 (Singh 2021). Furthermore, the maternal mortality rate has especially worsened since 2020, and no one seems to know why! By comparison, we would need to reduce our nation's maternal mortality rate by 60-70% to achieve maternal survivability at the level of 'the Scandinavian nations' and by 40-50% to achieve the maternal mortality incidence of 'the 5 other English-speaking developed nations'. This problem represents the *Keystone* issue for our nation's POPULATION HEALTH. Reducing maternal mortality would likely resolve many of the other quality of Health and cost problems of our nation's POPULATION HEALTH, including our nation's exorbitant annual health spending.

ALLOSTATIC LOAD

The worsening incidence of our nation's maternal mortality is likely explained by the allostatic load that each birthing person experiences before and during a pregnancy. The inclusion of a *Birthing Convoy*

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

represents a recognition of the uniquely worsening, allostatic load that occurs for a birthing person before and during a pregnancy. "Allostatic load refers to wear and tear on the body due to repeated activation of the stress response and, thus, may be an early subclinical indicator of future disease and mortality risk (Richardson, *et al.,* 2021)."

The definition cited above represents the first sentence of the **ABSTRACT** from an article with the following title: "Social status differences in allostatic load among young adults in the United States (Richardson, *et al.,* 2021)." There are many attributes of this article that bear a connection with this **Design Epistemology.** For Birthing Persons, I cite this sentence from the article's **ABSTRACT**: "We found that Black women had significantly higher load scores than White women and Black men, net of educational attainment and other covaries." Ethnic Latina, Birthing Persons have a US maternal mortality incidence that is actually lower than for US White women. To understand this social dilemma and its socio-ecological implications, it may be that a nationally sanctioned and locally governed improvement of each community's **Survival** COMMONS will be generationally required, neighborhood by neighborhood, to significantly reduce the Allostatic Load for **ALL** gestational birthing persons.

"GRANDMOTHERS MATTER"

"Biomarkers of pre-pregnancy allostatic load and subsequent adverse birth outcomes" represents the title of a report by Megan C. Barry (Barry, *et al.,* 2022). It used a unique survey-based, initial teenage population (1994-5: 20,745) with four subsequent follow-ups for 23,000 ending in 2016-18. I cite the last two sentences of its **5. Conclusion:** "Despite the study's holistic approach and design strengths, we did not identify consistent patterns that could be used as key markers for prevention purposes. Additional work is needed to expand on the content and lived experiences that affect women's health and birth outcomes (Barry, *et al.,* 2022*)."* The underlying Human Dignity of this author's report no doubt reflects her character as well as her University of North Carolina colleagues, especially her Co-Authors.

"Grandmothers Matter: How Grandmothers Promote Maternal Perinatal Mental Health and Child Development (Riem & van der Straaten, 2024)" represents the title of a report from the Netherlands. Given the uniquely anthropologic role of a maternal grandmother, 'her role' may even have contributed to humanity's evolution. With the seemingly tragic dissolution of sustainable families during our Anthropocene Era, we may need only to view the Scandinavian nations' very low maternal mortality incidence to understand the basic function of her *Birthing Convoy.*

From the report's closing **Discussion** section, the authors state: "Although there is a lack of attention to the role of grandparents in perinatal research, studies conducted so far suggest that grandparents can

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

directly promote better child development in the case of maternal mental illness, by offering love and support to the child, or indirectly, through reduced maternal prenatal and postnatal caregiving stress. In particular, support from the maternal grandmother is a protective factor against the development of perinatal depression, and associated parenting difficulties and risks for the developing child (Riem & van der Straaten, 2024)."

EXCLUSIVE BREASTFEEDING

The definition of a *Birthing Person* includes a reference to a *Birthing Convoy.* For nearly 30 years (Antonucci 2019), Toni C. Antonucci has pursued the value of a Personal CONVOY, *viz.* Personal BOD (board of directors). Sociologically, we might view a *Birthing Convoy* as a cluster of Caring Relationships that form for a person with the purpose of preventing, mitigating, and ameliorating the personal isolation and fear that is especially associated with a *Birthing Person's* first, term pregnancy.

This becomes especially important as a basis to support Exclusive Breastfeeding for at least 3-9 months (Soegaard, *et al.,* 2024). The Denmark study involved a total of 309,473 children who were followed between 1 year and 14 years of age from 2005 through 2018. A total of 322 children had either a blood or a solid organ cancer. **37%** of these children had a blood cancer. I cite from the **RESULTS** section of its **ABSTRACT:** "...exclusive breastfeeding for 3 months or more was associated with the infantile risk of developing a certain cancer, which were largely attributable to a decreased risk of BCP-ALL..." BCP-ALL means B-Cell Precursor-Acute Lymphoblastic Leukemia. The incidence of all the other childhood cancers was NOT affected. — 35 —

Given this "Headlines Suitable" report, another study underlies the importance of a Birthing Convoy (Isiguzo, *et al.,* 2022). Here is the study's title: "Stress, Social Support, and Racial Differences: Dominant Drivers of Exclusive Breastfeeding." And, here are the last four sentences of their report's **Abstract**: "...Perceived social support moderated the relationship between perceived stress and exclusive breastfeeding. However, breastfeeding support directly increased the likelihood of exclusive breastfeeding for 6 months. Perceived stress is negatively associated with exclusive breastfeeding. Birthing people who intend to breastfeed may benefit from perinatal support programs that include components to buffer their stress."

Another attribute associated with breastfeeding may be the most important. I refer to the brain-to-brain synchrony that occurs as shown by their mother and child electroencephalograms, *viz.,* their inter-connected brain wave attributes. This theme is best understood by a research report from Yaara Endevelt-Shapira and her three associates (Endevelt-Shapira, *et al.,* 2012). I cite from the seventh page of the report as follows:

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

"We show that maternal presence experienced only through her smell increased the infants' visual attention to social skills, augmented positive arousal, improved safety during interaction with a stranger, enhancing inter-brain synchrony in this specific connectivity. Infants require their mother's presence for growth, soothing, and survival, but the two must be present at the same place and time for this presence to be felt. The unique properties of olfaction, which preserves the maternal presence in her absence, can assist infants in transitioning to social groups, exploring new environments, and communicating with unfamiliar partners, augmenting their social repertoire toward greater survival and thriving (Endevelt-Shapira, *et al.*, 2021)."

GENDER BIAS

"A feminine advantage in the domain of harm: a review and path forward" is the title of a BIOLOGIC LETTER from 'THE ROYAL SOCIETY journal (Graso & Reynolds, 2024). I cite the last three sentences of its **Abstract:** " ...Our view aims to complement the existing literature on gender biases by presenting a balanced view that acknowledges men and women face unique challenges. By understanding these biases, we hope to foster a more equitable discourse on gender and harm, encouraging empathy and validation of suffering irrespective of gender. This holistic approach aims to de-escalate gender-based conflicts and promote effective interventions for both men and women (Graso & Reyholds, 2024)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

A collaborative research-group had noted the adverse gestational effects of abnormally low as well as excessive, maternal weight during a pregnancy. This research commitment included 5 participants from Norway and 2 from the USA who reported their results in 1993 — "Adverse childhood experiences and pre-pregnancy body mass index in the HUNT study: A population-based cohort (Sandsaeter, *et al.*, 2023)." They linked pre-pregnancy data from 6679 gestational women participating in the Trondelag Health Study (HUNT) and the Medical Birth Registry. The HUNT population was considered as representative of Norway. They reported no maternal deaths.

A similar study was published the same year by the California Maternal Quality Care Collaborative and its key stakeholders (Johnson, *et al.*, 2023) entitled: "Addressing Adverse Childhood and Adult Experiences During Prenatal Care." The report describes the implementation of a prenatal endeavor to explore the maternal previous occurrences of '**ACEs**' and the current attributes of maternal adversity or mental trauma, *viz.*, Allostatic Load. This broad review includes care-planning options before and after parturition. As of a May 2025 Google Scholar review, this report represented the only article of its kind.

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SALUTARY GREETING **SOCIAL INTERACTION**

CARING RELATIONSHIP **FAMILY CULTURE**

EXTENDED FAMILY **FAMILY**

— 37 —

SALUTARY GREETING may be postulated for HEALTH as

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a person's steadily renewed 'adaptive skill' for offering
a brief gesture of Kindness and Respect to any person
who is safely encountered while participating
in their community's daily civic life, **especially** if this person
*) is recognizably parenting an infant or toddler
who may also share eye contact with a brief smile,
*) is disabled or possibly homeless, or *) lives within the
close neighborhood of the person's Family home.

COMMENT Encountering another person can begin with a communicative display of briefly combined combinations of eye contact, facial contortions, hand gestures, verbal phrases, or just a nod. Oh – yes, and here is a reference (Caruana, *et al.*, 2021) involving authors who originate from Australia. Here is its title: "Gaze facilitates responsivity during hand-coordinated joint attention." And, here is the last sentence of its **Abstract**: "These results indicate that humans attend to and process

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gaze information to facilitate joint attention responsivity, even in contexts where gaze information is implicit to the task and joint attention is explicitly cued by more spatially precise and visually salient pointing gestures (Caruana, *et al.,* 2021)." I practice these skills as often as possible, especially during visits to my neighborhood's chain-managed, grocery store. Remember that "joint intention" skills begin to develop for each person at 9 months of age (Tomasello 1999).

When expressed frequently within your Family, Extended Family, and your Home's close neighborhood, the persistent sharing of Kindness and Respect with their neighborhood's resident persons promotes their community's mutually recognizable trust and its associated social cohesion. Improving a community's social cohesion then promotes every person's healthy survival, *viz.,* self-reported health, during the bad times as well as the good times (Giordano & Lindström, 2016). Importantly, every person needs to steadily revise their adaptive skills while encountering the municipal life of their own, increasingly-complex, civic society. *Social stigmata* must never be allowed to disturb our mutually shared expressions of Kindness and Respect for each other. Now, you will understand why a serious commitment is necessary to steadily improve the spontaneity of every person's 'Salutary Greeting' skills while participating in their close-neighborhood's municipal life. A final reminder, a person's adaptive skills should include regularly adequate sleep. See the article by Professor Simon (Simon, *et al.,* 2022). Its **Abstract** about sleep could be described as startling.

Remember that close neighborhoods become possible for every family when 'Kindness and Respect' are mutually shared <u>daily</u> with and among each other's neighbors, ALL TOGETHER. To inform this priority, an unusual form of research regarding 'mindful awareness' applies. I will cite a portion of a study with the following title: "TRAIT-MINDFUL AWARENESS PREDICTS INTER-BRAIN COUPLING BUT NOT INDIVIDUAL BRAIN RESPONSES DURING NATURALISTIC FACE-TO-FACE INTERACTIONS (Chen, *et al.* 2022)."

- Here is a portion of its **Abstract:** "In recent years, the possible benefits of mindfulness meditation have sparked much public and academic interest. Mindfulness emphasizes cultivating awareness of our immediate experience and has been associated with compassion, empathy, and various other social traits. However, neurological evidence pertaining to the prosocial benefits of mindfulness in social settings is sparse. In this study, we investigate neural correlates of trait-mindful awareness during naturalistic dyadic interactions, using both intra-brain and inter-brain interactions [...] with a portable electroencephalogram (EEG) device ..."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

- And, here is the end of its **Abstract:** these "...findings underscore the importance of conducting social research in ecological settings to enrich our understanding of how (multi-brain) correlates of social traits, such as mindful awareness, manifest during social interactions ... (Chen, *et al.,* 2022)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

ACE phenomena have been codified under variously defined, epidemiologic criteria. A report by 6 co-authors (Surtees, *et al.,* 2003) cites @80 ACE's reports since the (Felitti, *et al,* 1998) sentinel article. It may be the best systematic review of research reports published using the ACE concept since 1998. Note, a Canadian Pediatrician published an **ACE**-related Population Health study before 1998 (Hertzman, 1994).

SOCIAL INTERACTION may be postulated as

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a single encounter, or a variously connected series of encounters involving two or more persons who recognize each other's 'shared intentionality' about the occurrence of a situational scenario, assemble for its purpose, and participate in this situational scenario based on each person's understanding of its likely purpose, rules, and time course.

COMMENT This definition represents a contemporary adaptation of the sociological concept originated by Erving Goffman (1922-1982), who initiated the field of study known as micro-sociology. Briefly considered, a Social Interaction refers to those actions within a social scenario that a person initiates with another person who responds in turn. Social Interactions apply to a very large array of human behavior (that may begin without an initial Salutary Greeting) and can be viewed as representing the cursory events occurring between two or three persons during their community's municipal life. The analysis of Social Interactions became a fixture within Sociology after the publication of Professor Goffman's book entitled: "THE PRESENTATION OF SELF" (Goffman 1959).

"Seeing social interactions" is the title of a scientific report with a focus on the cognition that occurs at the beginning of a Social Interaction (McMahon & Isek, 2023). Here is the first and last sentences of its **Abstract:** "Seeing the interactions between other people is a critical part

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

of our **everyday** visual experience, but recognizing the social interactions of others is often considered outside the scope of vision and often grouped with higher-level social cognition as in a theory of mind.[...]We propose a computational framework for how this process is carried out in the brain and offer directions for future interdisciplinary investigations of social cognition (McMahan & Isek, 2023)."

Within another humanitarian arena, Philosophy uses the term Social Relation instead of Social Interaction. Since the growing use of Social Interaction, it seems as if social relation usage has become overall less common. This may be rebalanced by the burgeoning use of Social Relations within the humanitarian arenas of social capital, social dilemma, and social cohesion as promoted by Professor Elinor Ostrom (E Ostrom 1990) and others for the analysis of Common Pool Resource management. (See Page 88 of the **Design Epistemology**)

SOCIAL INTERACTION FOR LEARNING NEW KNOWLEDGE

I cite a portion of the **Abstract** from an article by 4 colleagues from the United Kingdom (De Felice, *et al.,* 2022): "...The focus of past research on learning has been either exclusively on the learner or (less often) the teacher, with the primary aim of determining developmental trajectories and/or effective teaching techniques. In fact, social interaction has rarely been explicitly taken as a variable of interest, despite being the medium through which learning occurs, especially in development, but also in adulthood. Here, we review behavioural and neuroimaging research on social learning, especially focusing on cognitive models of how we acquire knowledge from and with others, and include both developmental as well as adult work. We then identify potential cognitive mechanisms that support social learning, and their neural correlates. The aim is to outline new directions for experiments investigating how knowledge is acquired in its ecological niche, i.e. socially, within the framework of the neuroscience approach."

From the LAST PARAGRAPH of the same Article (De Felice, *et al.,* 2022), I cite from its final summary: "In conclusion, we presented studies to show the role of social interaction in the first years of life for optimal cognitive and brain development, and demonstrate that social interaction boosts learning in adulthood too.[...]Taken together, these suggest that learning via solitary action may not be enough, while learning during an *interaction with* others may be a key factor supporting the acquisition of new knowledge in the real world." [Note: italics by its author]

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Here is a study about the **ACEs** that occur during the childhood of birthing persons who then become an actively gestational, birthing person. Apparently, the maternal neurological ACE residual is epidemiologically passed to this child, who passes it on to her own

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

children. Its principal author is Andrea L. Roberts (Roberts, *et al.*, 2015). I cite the last sentence of the study: "**Conclusions:** As offspring exposure to abuse and maternal mental health accounted for more than 50% of the elevated risk of high depressive symptoms among the offspring of women who experienced abuse, improving maternal mental health and parenting practices may reduce offspring risk for depressive symptoms in these families."

CARING RELATIONSHIP may be postulated for HEALTH as

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a dyadic social interaction occurring within a *Human Dignity* scenario,

that begins with kindness and respect for each person's autonomy,

thrives when each person steadily renews their adaptive skills, and

flourishes from a shared obligation to communicate *in harmony*

with warmth, non-critical acceptance, congruence, and empathy.

COMMENT Caring for, by, and about another person seems to be a psychological tradition that became initially denominated by Carl Rogers, Ph.D., after WWII. His research defined the interactional congruence necessary for therapeutic counseling to be effective. Eventually, Rogerian therapy became a recognized skill for which its interactional priorities reflected:

*) **warmth** *(viz.,* non-possessive positive regard);

*) **non-critical acceptance** *(viz.,* ecological and cultural dimensions);

*) **congruence** *(viz.,* coherent 'actions, thoughts, and feelings'); and

*) **empathy** *(viz.,* the most difficult to define) (Rogers 1995).

CARL E. ROGERS

Remarkably, the Editors of "The Personnel and Guidance Journal" eventually added a comment to its online version of an article they had published entitled *"The characteristics of the helping relationship* (Rogers 1958)." Here is the Editor's Comment:

"This article, written in 1958 by Carl Rogers, is his most quoted and reprinted article. It has been republished in sourcebooks, the Harvard Business Review, and many other publications. It helped introduce a profound change in the way people look at professional relationships.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

The Article's ripples still affect us today. It includes Roger's famous 10 'CAN I' questions."

STEADY RENEWAL

What may be new for our definition of a 'Caring Relationship' is its inclusion of the phrase *'in harmony'*. In effect, a Caring Relationship represents the continuing ability of two persons to interact with a spontaneously affirming acknowledgment of what the other person may be thinking, feeling, and needing, *viz.*, their shared intentionality. We all might recognize such an event as occurring within a close friendship or an immediate family relationship. Recently reported research has shown that your brain's electromagnetic energy patterns may become coupled with another person's electromagnetic wave patterns to mutually focus each other's intellectual and emotional cognition, *viz., in harmony.*

Importantly, every infant's brain requires it to develop normally after birth. Here is the evidence. I cite from Yaara Endevelt-Shapira & Ruth Feldman and their 2023 report regarding dual-electroencephalogram recordings: "*Mother-Infant Brain-to-Brain Synchrony Patterns Reflect Caregiving Profiles.*" Here is the last sentence of the report's **Abstract:** "Our results support the perspective that inter-brain synchrony is a mechanism by which mature brains externally regulate immature brains to social living and suggest that one pathway by which sensitivity and intrusiveness exert their long-term effect may relate to the provision of coordinated inputs to the social brain during its sensitive period of maturation (Endevelt-Shapira & Feldman, 2023)."

"THE MORAL PSYCHOLOGY OF OBLIGATION"

By 3 years of age, every young child will demonstrate obligation with peers with a special force and social structure. Michael Tomasello compiled his own core article (Tomasello 2020) with 32 Commentary responses for an *'Open Peer Commentary'* article that included his own responses to the commentaries. The title for the Tomasello article represents the Header for this paragraph. As a result, the word 'obligation' has been added to the Caring Relationship definition.

At the instant of birth, each person's *Human Quantum-Cognitive Brain* initiates the person's consciousness and its lifelong learning process for informing their survival. Given a basic framework for acknowledging each person's prenatal *innate temperament* and *baseline homeostasis,* each person's consciousness steadily informs their intuition and social-cognition knowledge from experience, *viz.*, Lifelong Learning. With a focus on **Design Epistemology,** I surreptitiously encountered a book with the following title: "*Epistemologies and Ethics in Adult Education and Lifelong Learning* (R. G. Bagnall & S. Hodge, 2018a)." Its 7th Chapter is remarkably applicable to this **Design Epistemology.**

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

Here is its title: "*Design Epistemology and Ethics in Lifelong Learning* (R. G. Bagnall & S. Hodge, 2018b)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Remarkably, here is a complex **(ACEs)** related study, (Houtepen *et al.*, 2020), who analyzed their eventual connection with adolescent educational success and family socioeconomic attributes. Within the article's **ABSTRACT,** the authors end with a sub-section with the following header: "What do these findings mean?"

- "People who experience ACEs have, on average, lower educational attainment and higher risk of depression, drug use, and smoking; these factors were not fully explained by family and socioeconomic factors.
- "We did not find strong evidence of associations between ACEs and either obesity or alcohol use.
- "Our findings imply that interventions that focus solely on ACEs or solely on socioeconomic deprivation, while beneficial, would miss most cases of adverse educational and health outcomes, suggesting that the intervention strategies should target a wide spectrum of relevant factors, including ACEs, socioeconomic deprivation, parental substance abuse, and mental health. (Houtepen *et al.*, 2020)"

FAMILY CULTURE may be postulated for HEALTH as

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a cluster of adaptive skills that a Family

acquires to perpetuate their shared identity,

applies to the daily encounters involving

their caring relationships, and periodically

adjusts to enhance their generational traditions

of mentoring each other's Personal **Survival** Plan.

COMMENT Dolores Curran (1932-2022) found herself having been appointed to coordinate the Family Education program within a Catholic parish that her family had joined in Denver, Colorado. With her recent post-graduate education for an M.S. in Journalism, she began a research project to define what was known about how Families function to best prepare their children for becoming self-sufficient independent persons. As described in her book TRAITS OF A HEALTHY FAMILY, an

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

extended national survey analysis led to the list cited below (Curran 1983). Now, some 40+ years later, her list of TRAITS still represents the Gold Standard for defining a FAMILY CULTURE. Written with a warm-hearted hint of Irma Bombeck, it remains remarkably current. The TRAITS are:

"**1.** Communicate and listen;

2. Affirm and support one another;

3. Teach respect for others;

4. Develop a sense of trust;

5. Have a sense of play and humor;

6. Exhibit a sense of shared responsibility;

7. Teach a sense of right and wrong;

8. Has a strong sense of Family in which rituals and traditions abound;

9. Has a balance of interactions among its members;

10. Has a shared religious core;

11. Respect the privacy of one another;

12. Value service to others;

13. Foster family mealtimes and conversations;

14. Share leisure time together; and

15. Admit to and seek help for problems."

Dolores Curran (1932 – 2022)

When questioned about how many of the Traits are required for a Healthy Family, she refused to answer when asked and even refused to study such a goal. In essence, she did not want these Traits to become **socially observable currency.** She claimed that none of the traits were absolutely required and that no cluster of traits was possibly more important than any other cluster of traits. Importantly, the list of traits is rank-ordered based on how frequently they were cited during her survey research.

She also proposed that "Family Traditions may be defined historically for the members of a family as their treasured legends and characters, their gathering persons and places, their gathering rituals, their shared past as a link to the future, their positive regard for infants and elders, and their shared priority to actively attend and participate in their gatherings (Curran 1983)." Her view of Family Traditions, from my

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

perspective, has defined *Family Culture* with succinctly accurate precision. Her book continues to be published by her family.

A succinct analysis and literature review with a focus on "...Food Makes Family..." recently appeared. Mealtime gatherings are described in all their commensality complexity (Ee 2023).

MAPPING PLACES OF ENCOUNTER

"Meeting places are an important element of social integration and sense of place in both urban and rural areas. Generally speaking, face-to-face encounters can be considered a prerequisite for building local communities that constitute a "lubricant" for social contact and contribute to personal well-being and identity formation. Weak ties, such as with a greeting or making 'small talk' with neighbors, can reduce the social distance between social groups. This adaptive skill may occasionally be converted into "strong ties" depending on **1)** time spent together, **2)** emotional congruence, **3)** mutual trust, and **4)** certain types of reciprocal assistance (Spenger, *et al.*, 2023)." Meeting Places involve their survival needs, as in favorite locations for their grocery store (especially for produce), post office, gas station, bus stop, restaurants, bakery, and hardware supplies. The Spenger reference expands the character and integrated inclusion of favorite family places, for a family's sources of communal identity, including a church or synagogue for their spiritual traditions. Finally, a family will also include special locations for a work site, schools, health clinics (medical & dental), as well as community parks for exercise and blue-sky awareness.

For a family with 2 or more children, the daily routine can become very "chaotic." So, the location of their family home, mealtimes, and respective schedules become a daily challenge. Eventually, a balance of paternal and maternal Gatekeeping becomes a choreographic challenge. An article by Tina Miller (Miller 2018) describes the importance of mutually balancing their parental responsibilities. I cite the last sentence of her article's **Abstract:** "This paper urges a more critical examination of practices of maternal and paternal gatekeeping as parental choreographing of caring practices and responsibilities unfold (Miller 2018)."

MULTI-GENERATIONAL FAMILY COMMUNICATION

Given a Family of 3-4 persons, its Extended Family, its close neighborhood, and its social networks distributed within their community, we might encounter, on average, approximately 153 participatory resident persons. This number represents the Dunbar number (Dunbar 2020) for whom a family of 6-10 persons would have frequent contact, *viz.*, their social network. Importantly, this would likely involve three generations. I cite another investigation involving the analysis of interpersonal brain-coupling, *viz.*, tri-generational (Dikker 2024).

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

From this report, I cite its **Abstract:** "The simulations suggest that grandparent-child interactions may be paired with higher inter-brain coupling than parent-child interactions, raising the possibility that the former may be more advantageous under certain conditions. Critically, this enhancement of inter-brain coupling for grandparent-child interactions is more pronounced in tri-generational interactions that also include a parent, which may speak to findings that grandparent involvement in child-rearing is most beneficial if the parent is also an active household member. [...] We advocate for a community neuroscience approach in developmental social neuroscience to capture the diversity of child-caregiver relationships in real-world settings (Dikker 2024)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

A rapidly evolving, newly advanced conceptual strategy for the analysis of Human Survival eventually yields a wide variety of research traditions. You may have anticipated that, in due time, these studies would lead to reviews of reviews. Here are four examples:

- (Lorenc, *et al.*, 2020) Its five contributing authors originated from the United Kingdom. Here is its title: "Interventions to support people exposed to adverse childhood experiences: a systematic review of systematic reviews." Here are the last two sentences of <u>its</u> **ABSTRACT's Results:** "The strongest evidence is for cognitive-behavioral therapy for people exposed to abuse. We included reviews with a summary quality score (AMSTAR) of 5.5 or above."
- (Cibralic, *et al.*, 2022) Its eleven contributing authors originated from Australia. Here is its title: "Utility of screening for adverse childhood experiences (ACE) in children and young people attending clinical and healthcare settings: a systematic review." Here is the last sentence of <u>its</u> **ABSTRACT'S Conclusion:** "As the evidence stands, widespread ACE screening is <u>not</u> recommended for clinical use."
- (Tzouvara, *et al.*, 2023) Its six contributing authors originated from Northern Ireland. Here is its title: "Adverse Childhood Experiences, Mental Health, and Social <u>Functioning:</u> A Scoping Review of the Literature." Here is the last sentence of its **ABSTRACT'S Conclusions:** "Future research should implement robust methodologies to provide evidence that could be used for developing evidence-based interventions."
- (Gautschi & Latsch, 2024) Its two authors originate from Switzerland. Their article represents a broad review of its realm of knowledge. Here is its title: "The Effectiveness of Interventions to Prevent and Reduce Child Maltreatment in high-income Countries: An Umbrella Review." As such, here is the only sentence in its **ABSTRACT'S Conclusions:** "We suggest

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

several measures to improve the quality of research and call on practitioners to be persistent in developing more effective interventions."

EXTENDED FAMILY may be postulated for HEALTH as

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a cluster of persons assembled by a family,
commonly involving 3-4 persons per family member, for whom
each member of the cluster maintains a caring relationship
with at least one family member as a variably-close connection that
forms initially with the selection of close, biologically related persons
of their Family to enrich the ecological and ethnic
continuity of its generational Family Culture;
includes persons residing within the close neighborhood of their home
who share mutually reciprocating, helpful accessibility;
selects persons who offer situational, wisdom-guided mentoring
for the family members, such as Godparents;
evolves periodically from the replacement of certain persons
according to the family's needs for prosocial adaptive skills,
contact frequency, or nearby closeness; and
revises as the social network's membership changes with the occurrence
of sentinel events that substantially affect the Personal **Survival** Plan
of a specific Family member.

COMMENT Beginning many years ago, the concept of a personal micro-network as a support and mentoring source of caring relationships continues to be revisited by Toni Antonucci, Ph.D. Some 25 years after initially assessing the close Convoys of an investigational cohort, she again assessed the same cohort and their Convoys. She noted that their Convoys had remained largely intact (Antonucci, *et al.*, 2019). Presumably, this combined version of a Convoy for each parent would then prepare their children's adaptive skills for eventually maintaining their own personal Convoy, particularly with helpful persons. — 47 —

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

For this **Design Epistemology,** an amalgamated version of a Convoy might be useful. The inclusion of a mentoring contribution to each Family member's Personal **Survival** Plan recognizes the value of the Convoy tradition. Suffice it to say, the use of the **Extended Family** concept has had many models, historically as well as currently.

The occurrence of a large number of persons who are genetically related and live within a given neighborhood may have been common before the 20th century. But, it virtually disappeared during the first half of the 20th Century. I would 'venture to say' that it is currently an extremely rare occurrence within any of our nation's 810 District Communities.

The historical occurrence of Extended Families applies to the kindred early-adult children or grandparents who live with a classic Family of mom, dad, baby Jane, and toddler Joe. This was prominent during the final quarter of 1800-1899 in England (Ruggles 1987). And, the nuclear family seems to have been applied to a triadic Family of mom, dad, and toddler Jane. Finally, a complex family cluster applies to a mom and dad who each may have custodial responsibilities for children from a previous marriage as well as their own marriage, *viz.,* a blended family.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Chaotic Disruption may be acknowledged as the evolutionary forces that disturb the ecological and cultural attributes of a community's Population Health. As encountered by a community's **Survival** Commons, an underlying theme will involve the dimensions of Prevention, Mitigation, and Amelioration. Given the potential for a lifelong impact from **ACEs,** the complexity underlying their occurrence should prompt a focus on prevention. Ten contributing authors originating from the University of Manitoba in Canada have collaborated to offer a sentinel proposal (Afifi *et al.,* 2021). What follows is a supplement to the Afifi article and reminiscent of the book written by Doloris Curran: "Family Traits of Healthy Families."

Afifi Protective Factors For Adolescents

- "Individual-Level – a) Identifying with a culture or language, b) Becoming excited about the future, and c) Visualizing one's future;
- Family-Level – a) A trusted adult in the Family, b) Being hugged by a parent or guardian, c) Being told "I love you" by a parent or guardian, d) Eating regular meals with an adult family member, e) Supportive relationship with a mother or mother figure, and f) supportive relationship with a father or father figure;
- School-Level – a) A supportive relationship with a peer at school, b) a trusted adult at school, and c) A feeling of belonging at school;

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

- Community-Level – a) A trusted adult in their community, b) Volunteering in their community, c) Feeling involved within their community, and d) Feeling motivated to help and/or improve their community (Afifi *et al.* 2021)."

FAMILY may be postulated for HEALTH as

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a cluster of two or more persons that

I. Configures itself with a goal to encourage the broadest expression of each other's *uniquely-endowed* Human Capability and to sustain each other's survival by the daily immediacy of their communal caring relationships, especially when an 'originating' independent person is also a Birthing Person;

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II. Institutes itself with a social gathering to jointly affirm the expression of 'shared intentionality' by its 'originating' independent person or persons when

A. Two 'originating' independent persons express a lifelong commitment to their caring relationship as affirmed by a marriage certificate OR

B. One 'originating' independent person who is not married, has a sustainable caring relationship with a dependent person, and accepts custodial responsibility for this dependent person as an 'additional' dependent person;

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III. Engages their community by offering a Salutary Greeting to every person that each of their Family's persons safely encounter during the municipal life of the Family's community, irrespective of any *ecological* or *cultural stigmata* possibly represented by either a member of the person's Family or the other person (Goffman 1963);

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IV. Accepts an 'additional' dependent person into their Family, if at least one current 'originating' independent person of the Family has an established custodial responsibility for the 'additional' dependent person as defined:

A. Biologically through birth, biological child, or sibling OR

B. Legally through a divorce, adoption, guardianship, or foster care;

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Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

V. Assembles the traditions of their **Family Culture** to form the communal identity of the Family's persons and to guide the responsibilities of the 'originating' independent person or persons for their duties to:

A. Establish a household, *viz.*, a Home, for their Family within a neighborhood of their municipal or rural community for the purpose of promoting the resilience of each person's *uniquely-endowed* Human Capability;

B. Identify an evolving group of independent persons who would function as the household's **Extended Family** and respectfully nurture a caring relationship with at least one household person involving varying degrees of closeness that

1. initially forms by consolidating any pre-existing Extended Family of the cluster's 'originating' independent person or persons or custodially related dependent person or persons,

2. evolves over time as the persons of the Extended Family variously contribute to the family gatherings involving its **Family Culture** with an intent to enrich its cultural heritage of the family's communal identity, and

3. offers courageous mentorship when requested during a substantial Disruptive Process affecting the survival resilience of a household person, especially during and after adolescence;

C. Promote gatherings of the Family members within their Home:

1. for a weekly pattern of at least 3-5 Family Mealtimes to promote a communal responsibility for each other's biological, emotional, and spiritual nutrition to prevent, mitigate, and ameliorate their daily encounters with disruptive processes involving discordant, social interactions,

2. for the recurring events involving close persons of their Extended Family to enhance the ecological and cultural character of the household's **Family Culture,** especially in association with the sentinel transitions occurring throughout the household's generational cycle, and

3. for the episodic events involving persons from within their Extended Family who share mutually supportive attributes about the household's **Family Culture,** including those persons residing within the family's close neighborhood (Goffman 1963);

D. Define a Personal **Survival** Plan for each person of the Family to:

1. arrange for the daily residential needs of each person's Stable HEALTH, especially for their Restful SLEEP, Good FOOD, Dedicated EXERCISE, and Mentored COURAGE,

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

2. prevent, mitigate, or ameliorate, when possible, each person's encounter with a discordant or traumatic disruptive process that includes a dedicated connection with Primary Healthcare, and

3. adapt the residential capabilities of their Home, when required, for the Personal **Survival** Plan of each household person; AND

E. Accept an 'additional' independent person into their home, if either the 'additional' independent person becomes an 'originating' independent person through marriage with a sole 'originating' independent person of a family OR the 'additional' independent person

1. has the authentic consent of the current 'originating' independent person or persons that occurs 01 to 28 days before the first day of residence by the 'additional' independent person within their Home and

2. has an authentic Personal **Survival** Plan, or its next-of-kin approved equivalent, that includes:

a. provisions to manage the 'additional' independent person's HEALTH in the event that the 'additional' independent person becomes, or is possibly becoming, a 'dependent person' who would not qualify as an 'additional' dependent person within their Home and

b. a notarized Will, power of attorney, and medical power of attorney, including its provisions, for an advanced directive.

COMMENT If you find this definition somewhat inscrutable, I would respond by saying: "So do I." Intentionally, it describes the ecological and cultural requirements for promoting each resident person's lifelong Stable HEALTH. For continuing Human Survival, each Family will most commonly include a person who either will be, is now, or was previously a 'biologically capable' Birthing Person.

The traditions of each person's ecological and cultural 'civic-heritage' are now withering under a contemporary barrage of discordant social interactions. More than ever, we all need a very clear basis to reinvigorate the sustainable resiliency of every community's Safety Net, *viz.*, **Survival** Commons within our own community. Repeated multiple times, remember that POPULATION HEALTH is ultimately about each person's Family, their **Family Culture,** their Extended Family, and their Home's close neighborhood as sustained by their community's **Survival** Commons, *viz.*, its augmented Safety Net.

"Section **III.**" of the Family definition draws special attention to *stigmata* phenomena. It is very important to realize that a person may have an internalized sense of living as a stigmatized person. Even if not at all noticeable by anyone else, they are substantially affected by

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

someone becoming aware of its presence. A person who has well-controlled epilepsy might well apply. An essay by Lawrence H. Yang, along with 5 other authors representing public health, sociology, anthropology, and psychiatry, best amplifies the dimensions of Stigma Theory (L. H. Yang, *et al.*, 2007).

One wonders why there is **no** substantial arena of anthropological research for a clearly understood and recognizable ethnography about the functional dimensions of a Family. Even the occurrence of Extended Families involving adult children was only identifiable during a short sociologically discrete period of time in the United Kingdom by the census-analysis community (Ruggles, 1987).

HOME

To access an all-inclusive awareness of the importance of a person's home for their health, several realms of knowledge come to mind. Anthropology, human ecology, home economics, human adaptability, ethnography, and social epidemiology come to mind. After a sustained effort over several hours, serendipity won out with my eventual discovery of a concisely edited series of small handbooks published by the OXFORD University Press, Oxford, UK. The series is labeled as such: VERY SHORT INTRODUCTIONS. From the list of nearly 500 titles, there is one entitled simply 'HOME.'

It is written by Michael Allen Fox (2016), then on the faculty of the University of New England in Australia. It represents a collection of short essays. One of the essays was 'New to me,' not all languages have a word with a meaning similar to our Anglo use of the word 'HOME.' Here we go, the eight Chapters cover 122 pages, and the first paragraph begins "Homes have always been gathering places (Fox 2016)." The Chapter titles attest to the book's underlying dimensions. They are:

1st ***The many faces of home,***

2nd ***The importance of place,***

3rd ***Dwelling and* dwellings,**

4th ***Remembering, Imagining and other Mindwork,***

5th ***People, Objects, and identity,***

6th ***Home politics,***

7th ***Homelessness and uprootedness, &***

8th ***The future of the home.***

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Referring to (Hege 2020), this study of an initial cohort involving 13,500 adults in North Carolina from 2012 through 2014 who had experienced frequent **ACEs** during their own childhood. Another cohort was selected, and their children were screened for possible **ACE**-associated, long-term adverse health. With 'Population Health' related, cohort survey analysis, I cite the first three sentences of the report's **Abstract:** "Adverse

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

childhood experiences **(ACEs)** are a critical determinant and predictor of health across the lifespan. The Appalachian region of the United States, particularly the central and southern portions, experiences worsening health outcomes when compared to the rest of the nation. The current research sought to understand the cross-sectional relationships between **ACEs,** social determinants of health, and other health risk factors in one south-central Appalachian state (Hege 2020)."

Using a 'Population Health' study's analytic process, the initial study's cohort who had experienced 4 or more **ACEs** also experienced a significantly higher prevalence of smoking, heavy alcohol consumption, obesity, frequent mental distress, and food insecurity. The study's **Abstract** ends with the following sentence: "Developing programs and implementing policies aimed at reducing the impact of **ACEs** could improve social determinants of health, thereby helping to reduce health disparities (Hege 2020)."

In effect, there is no basis to assume that the generational effects of **ACEs** would respond to a medical-model strategy, *viz.*, 3.8 million USA births annually. Plainly, if a person has developed a Borderline Personality disorder from the incessant occurrence of near-daily childhood maltreatment, we need to accept the maddening reality of its intransigent social cognition deficits. In effect, our nation's Population Health has become paralyzed by the effects of an overwhelmingly dominant CAPABILITY TRAP (Landry & Sterman, 2017) that has developed neighborhood by neighborhood within every community.

As a Wicked Problem (Gamberini *et al.,* 2022), a complex-systems strategy will be required to promote the *natural* health of every newborn and their mother. Quoting Eleanor Roosevelt: "It's better for everybody when it gets better **for** everybody." With this prompt, it is likely that a nationally chartered and community-focused institution will be required. To prevent, mitigate, and ameliorate every community's socio-economically driven CAPABILITY TRAP (Landry & Sterman, 2017), a complex adaptive-system strategy must ensure the lifelong ascendancy of every resident person's **Human Dignity.** To focus on the prevalence and immediacy problems of our nation's CAPABILITY TRAPs, I recommend a 2022 report from the NATIONAL BUREAU OF ECONOMIC RESEARCH (Kennedy-Moulton *et al.,* 2022). — 53 —

"MORAL LEARNING and DECISION-MAKING ACROSS THE LIFESPAN"

The above heading is the title of an Annual Review of Psychology (Lockwood, *et al.,* 2025) published by **ANNUAL REVIEWS.** The article begins with a sentinel **Abstract** herein cited:

- "Moral learning and decision-making are crucial throughout our lives, from infancy to old age. Emerging evidence suggests that

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

there are important differences in learning and decision-making across the lifespan, and these are underpinned by co-occurring changes in the use of model-based values and theory of mind. Here, we review the decision neuroscience literature on moral choices and behavioral moral learning considering four key concepts. We show how in the earliest years, a sense of self/other distinction is foundational. Sensitivity to intention versus outcome is crucial for several moral concepts and is most similar in our earliest and oldest years. Across all ages, basic shifts in the influence of theory of mind and model-free and model-based learning support moral decision-making. Moving forward, a computational approach to key concepts of morality can help provide a mechanistic account and generate new hypotheses to test across the whole lifespan (Lockwood, *et al.,* 2025)."

Of the extensive list of references, my preference is the one by Michael Tomasello. The author team of the **Abstract** originates from Western Europe and has described the most current status of Moral Learning. This is the development setting that is so harmfully disturbed by the **ACEs** phenomenon, which is prominently cited in this **Design Epistemology.** Oddly connected, I cite a new sentinel article by Professor Tomasello entitled: **"An agency-based model of executive and metacognitive regulation** (Tomasello 2024)." Here is its **Abstract:**

"In the context of agentive decision making and action, both executive and metacognitive processes serve self-regulatory functions–just on different hierarchical tiers. In the agency-based model proposed here, executive processes monitor and control action and attention from an executive tier of operation, and metacognitive processes monitor and control those executive processes from a second-order tier of operation–both with the function of facilitating effective and efficient behavioral decisions. Each is best conceptualized as comprising three key components: (i) what is regulated, (ii) how, via what processes, is it regulated, and (iii) where, in what cognitive workspace is it regulated–either in individual or shared agencies. Developmentally, evidence is presented that executive processes for regulating both individual and joint agencies emerge only after 9-12 months of age, and metacognitive processes for regulating both individual and collective agencies emerge only after 3-4 years of age. Cognitive flexibility, as an important outcome, derives from the child's attempts to metacognitively regulate differing social perspectives within shared agencies (Tomasello 2024)."

Note: *Agency* and *Free Will* have the same meaning.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

PROSOCIALITY **NEIGHBORHOOD**

HEALTH **SOCIAL STIGMA**

POVERTY **POPULATION HEALTH**

PROSOCIALITY may be postulated for HEALTH as

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human behavior as characterized by

social interaction scenarios involving volunteerism and altruism

by one or more *persons* to improve the Human Dignity

of another *person* or *persons* as guided by:

*) certain Principles, e.g., Autonomy, Beneficence,

Non-maleficence, and Justice;

*) certain Interpersonal Rules, e.g., Veracity, Confidentiality,

Privacy, Fidelity, and Respect;

*) certain Action Ideals, e.g., Forgiveness, Generosity,

Immediacy, Compassion, or Kindness; AND

*) certain Social Norms for Collective Action, e.g.,

Trust, Reciprocity, Cooperation, and Idle Talk.

(adapted from Beauchamp & Childress 8th Edit 2019)

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

COMMENT During the transition from early to late childhood, each person normally begins to engage more closely with their home's close neighborhood and the municipal life of their community. As the encounters with discordant social interactions begin to acquire a widening array of deference and demeanor skills, each person's personality and moral reasoning begin to intuitively acquire the spontaneity for maintaining their self-sufficiency. A positive connection with a father helps their children manage their male social interactions. Similarly, the same occurs for the children with their mother and her female social interactions.

Beforehand, this **Design Epistemology** included a definition for an Extended Family and its role in promoting contact between adolescent family members and familiar adults to mentor their prosocial behavior (see above). Lost in all of this, there is no intentional strategy to encourage locally-specific, norms of deference and demeanor for a community's traditions of prosociality (Goffman 1956). Ultimately, High Schools, Vocational certification schools, and Colleges that grant Baccalaureate Degrees may be the best institutionally sponsored sources to guide or sponsor this priority within the civic affairs of their associated community.

Importantly, the social cognition underlying the human attribute of "Human Sociality" begins before the onset of late childhood (Tomasello 2020). I cite another article by Michael Tomasello, especially given his analysis of the current status for the social development of each person's Prosociality during early adulthood (Tomasello 2019b): "THE ROLE OF ROLES IN UNIQUELY HUMAN COGNITION AND SOCIALITY."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Karen Hughes and her Co-Authors reported an extensive analysis with an article entitled – "Health and Financial Costs of Adverse Childhood Experiences in 28 European Countries and North America: A Systematic Review and Meta-analysis (Hughes, *et al.,* 2021)."

I cite a sentence from its **Findings** — "Harmful alcohol use, smoking, and cancer had the highest ACE-attributable costs in most countries. The ACE-attributable costs ranged from $0.1 Billion (Montenegro) to $129.4 Billion (Germany) and were equivalent to between 1.1% (Sweden and Turkey) and $6.0% (Ukraine) of their nation's Gross Domestic Product (Hughes *et al.* 2021)."

And from the article's **Interpretation** — "Millions of adults across Europe and North America live with the legacy of ACEs. Our findings suggest that a 10% reduction in ACE prevalence would equate to an annual savings of 3 million DALYs or $105 Billion. Programs to prevent ACEs and moderate their effects are available. Rebalancing expenditure towards ensuring safe and nurturing neighborhoods would be

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

economically beneficial and relieve pressures on a nation's health-care systems (Hughes, *et al.*, 2021)."

NEIGHBORHOOD may be postulated for HEALTH as

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a cluster of resident persons within a community who

reside within a variously identifiable section of their community,

share certain cultural traditions within their social networks,

bond their caring relationships with close neighbors, and

initiate collective action, when necessary, to augment

the public symbols required by their section of the community.

COMMENT Like so many of the other concepts of the **Design Epistemology,** this definition is another concept characiterizable by the iconic rubric for **quality,** *viz.*, "I know it when I see it." As a result, I prefer to use the concept of a Cluster for defining a Neighborhood. A *cluster* (see page 14) may be defined as "two or more bounded components that combine to form a uniquely resilient and sustainable capability from the emergent interactions involving *synergy* among the components, *affinity* between certain components, and *salutary conditions* surrounding the components."

For a **Neighborhood,** there are TWO communitarian components for every neighborhood: the PUBLIC obligations and the PRIVATE obligations. Each community's municipal, county, & state PUBLIC obligations encompass roads, public transportation facilities, utilities, primary & secondary education, public & fire safety, parks & recreation, historical monuments, libraries, post office, public health & its Primary Healthcare, Safety Net resilience, disaster preparedness, community sustainability, and promotion of its Social Cohesion. These PUBLIC obligations should also include their respective Justice and Fiscal responsibilities.

The PRIVATE obligations then are generally related to the support of higher education opportunities, employment alternatives, household shopping accessibility, diverse fine arts & their performance/exhibition facilities, philanthropy, ecological & cultural heritage, and social capital. For a common-sense reference, the MODELS OF NEIGHBORHOOD

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

CHANGE essay by Kent P. Schwirian still retains its stalwart level of sensibility (Schwirian 1983).

Of interest for this concept, most research focuses on a neighborhood's adaptability to endure ecological and cultural change. Gentrification, racial & ethnic evolution, climate change, longevity & homicide, social isolation, and poverty are among the most prevalent arenas of knowledge warranting continuing sociological research. For a neighborhood, its sustainable attributes are then associated with its geographic location, especially as it becomes affected by its surrounding historically associated ecological and cultural identity.

Recently, a new arena of research has focused on neighborhood social networks with data from internet social networks. For one example of this research arena, I cite Dounia Mulders: "INFERENCE OF NODE ATTRIBUTES FROM SOCIAL NETWORK ASSORTATIVITY (Mulders 2020)." For an institutional tradition of research, I cite Robert J. Chaskin and his summary about the Chapin Hall Center for Children at the University of Chicago: "LESSONS LEARNED FROM THE IMPLEMENTATION OF THE NEIGHBORHOOD AND FAMILY INITIATIVE: A SUMMARY OF FINDINGS" (Chaskin 2000).

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

We are now increasingly aware of the perinatal epigenetic factors that affect early childhood, neurological development. Here is a report on the use of a maternal Mediterranean-style diet (MSD) to prevent the occurrence of autism or hyperactivity during childhood (NDD). It represents a study by 7 University-associated, Co-Authors originating from either Maryland, Massachusetts, or Illinois (Che *et al.* 2023). The results identified a reduction in the incidence of NDD by **26%**, especially for women who were overweight with and without diabetes.

HEALTH may be postulated for a nation's **COMMON GOOD** as the experience of **Well-Being** that occurs for each of its resident persons when their lifelong survival has been

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A. Endowed initially by a <u>Family</u> <u>Culture</u> that originates before 'his or her' birth to promote a communal identity among the caring relationships involving their Family, Extended Family, and Close Neighborhood to sustain

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

the synergy between the person's *innate temperament* and

baseline homeostasis for building resiliency

during the fetal person's survival immediately after birth and

for 'his' or 'her' stable vitality thereafter from their parent-originated,

Personal **Survival** Plan to become a happy 'Dependent Person;'

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B. Nurtured by the person's caring relationships that originate

from within the person's Family, their Extended Family, and

their home's Close Neighborhood 1) during Early Childhood

with a goal to enrich the person's search for the broadest

portrayal of their *uniquely-endowed* Human Capability to

become a happy 'Dependendent person' AND 2) during

Late Childhood and early Adolescence with a goal to mentor

the person's cultural and social-cognition for the broadest portrayal

of their *uniquely-endowed* Human Capability for becoming

a courageous and sustainably self-sufficient 'Independent person'

within their Home's community after Adolescence;

^

C. Challenged by the person's encounter with *Chaotic Disruption*

involving discordant social interactions that begin before birth,

occur daily as interacting combinations and patterns, and cause

variably-reversible, beneficent and maleficent changes to the

adaptive resilience of the person's *Human Quantum-Cognitive Brain*

as variously prevented, mitigated, and ameliorated lifelong

by the person's Family Culture, **by** the courageous

caring relationships originating from within 'his' or 'her' i) Family,

ii) Extended Family, and iii) Home's close neighborhood as well as

by their Personal **Survival** Plan, and

by the **Survival** Commons of their Home's community;

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D. Matured by the person's encounter with *Chaotic Disruption*

involving diversely complex, traumatic events that begin before birth,

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

occur episodically as interacting combinations and patterns, and cause variably-irreversible, maleficent changes to the adaptive resilience of the person's uniquely-endowed Human Capability including its innate temperament and baseline homeostasis as prevented, mitigated, and ameliorated lifelong **by** their Family Culture, **by** the courageous caring relationships originating from within 'his or her' i) Family, ii) Extended Family, and iii) Home's Close Neighborhood as well as **by** their Personal **Survival** Plan, and **by** the **Survival** Commons of their Home's community; AND

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E. Sustained ***by*** the person's Family Culture,
by the hopeful caring relationships originating from
'his or her' i) Family, ii) Extended Family, and iii) Home's
Close Neighborhood as well as
by their Personal **Survival** Plan and
by the **Survival** Commona of their Home's community
until the entropy-ladened, resilience of the person's
uniquely-endowed Human Capability is no longer sufficient
to maintain 'his or her' survival as a result of their lifelong
encounter with *Chaotic Disruption.*

COMMENT Milliman is a nationally recognized consulting company with periodic business connections involving the actuarial consultation needs of various health insurance companies. They have publically reported their analysis of the basic causes of Unstable Health. They are: Social Determinants – 40%; Behavioral – 30%; Healthcare Quality – 20%; and Genetics – 10%.

Given the Milliman findings, it is unlikely that the character of our nation's Population Health will improve with the strategy that is currently focused on improving our healthcare. Remember that our nation's maternal mortality incidence has worsened nearly every year since 1975. Every year, there are nearly 300 Birthing Persons who likely die in association with pregnancy just because they were not living in a 'Scandinavian' nation at the time of conception.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

In 2021, the **JAMA Pediatrics|Review** published a report by Lucinda R. Grummit and 5 associates. The Co-Authors variously originated from Australia as well as from New York and Massachusetts. Here is its title: "ASSOCIATION of CHILDHOOD ADVERSITY WITH MORBIDITY IN US ADULTS a Systemic Review (Grummitt *et al.* 2021)." Here is the last sentence from its "CONCLUSIONS AND RELEVANCE. The prevention of Childhood Adversity and Disruptive **ACEs** that link these experiences to elevated disease risk must be considered a critical public health priority (Grummitt *et al.,* 2021)." I would add: nationally, community by community.

SOCIAL STIGMA may be postulated for a PERSON as

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a isolated social interaction involving 2 or more persons that
occurs unexpectantly for a variable interval of time,
involves a 'loss of *Human Dignity'* scenario, and
eventually *excludes* one or more of the participating persons
based on the perception of "Spoiled Identity"
by one or more of the other participating persons.

COMMENT This concept has many dimensions that inform the *Chaotic Disruption* concept underlying a person's Well-Being during their lifetime. Most importantly, Erving Goffman, Ph.D. laid the groundwork for recognizing Stigma phenomena (Goffman 1963). Obviously, I cited his last book entitled "STIGMA Notes On The Management Of Spoiled Identity." The definition given above uses the template of SOCIAL INTERACTION as developed by Professor Goffman and included within this **Design Epistemology.** Human Dignity is also defined herein by Kai Moller, Ph.D. Eventually, this COMMENT will lead to citations that reflect current dimensions for understanding Stigma and its effect on a community's level of prosociality.

"CONCEPTUALIZING STIGMA"

We begin by citing an article, so named, from an Annual Review of Sociology (Link & Phelan, 2001). '15,571' Times since 2001, it has been cited by another article as of July 1, 2025. From its **Abstract,** I cite its first and last two sentences: "Social Science research on stigma has grown

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

dramatically over the last two decades, particularly in social psychology where researchers have elucidated the ways in which people construct categories to stereotyped beliefs. [...] Finally, because there are so many stigmatized circumstances and because stigmatizing processes can affect multiple domains of people's lives, stigmatization probably has a dramatic bearing on the distribution of life chances in such areas as earnings, criminal involvement, health, and life itself. It follows that social scientists who are interested in understanding the distribution of such life chances should also be interested in stigma (Link & Phelan, 2001).

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

"The Neighborhood as a Unit of Change for Health: Early Findings from the East Harlem Action Center" represents the title of a report by 17 co-authors (Dannefer *et al.*, 2020). I cite from its **Abstract:** "Interviewees felt that collaboration, being responsive to community needs, and being community-based were essential elements of the Action Center. Interviewees recognized the complex dynamic of a large city agency serving as the host for the Action Center while simultaneously aiming to establish more equitable relationships with partners. Governance Council members' expectations and hopes for the East Harlem Action Center were consistent with the overall vision for the Action Centers, which may facilitate implementation. (Dannefer *et al.* 2020)"

POVERTY may be postulated for a Community as

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the *cognitive fatigue* of a person's Human Quantum-Cognitive Brain
that occurs from the incessant *Chaotic Disruption* associated with
the hypervigilant expression 'his or her' adaptive skills
during the discordant Social Interactions occurring while
the person encounters their community's **Survival** COMMONS
for obtaining its survival-related, Benefits and Obligations AND
during the discordant Caring Relationships encountered
while marginally maintaining their close neighborhood's home
to sustain their own Personal **Survival** Plan and, if any,
the additional resident persons of 'his or her' Family.

COMMENT A person and their Family including its Family Culture, Extended Family, and their close neighborhood, *viz.* tribal unit, thus

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

becomes the anthropologically fundamental unit for evolutionary human survival. The increasingly rapid worldwide population growth since 1800 has encountered a steady increase in the cultural and social complexity occurring within the civic life of every large city and its densely populated neighborhoods.

Each of these communities struggles with the complexities of housing needs, food insecurity, neighborhood safety, educational needs at a variety of levels, and the resultant complexities of their Population Health. Increasingly, Families need both parents to work for their Family's survival. Even so, poverty afflicts too many families, especially their parental responsibilities. With 'lap time' by a Birthing Person for her children contributes substantially to prevent their cognitive fatigue. Fred Rogers and this aphorism are cited within the article by Louisa Davidson (Davidson 2015).

"The roots of a child's ability to cope and thrive,

regardless of their circumstances,

lie in that child's having had at least a small, safe place

(an apartment? a room? a *lap?*) in which,

in the companionship of a loving person, that the child could discover

that he or she was lovable and capable of loving in return."

Fred Rogers, Ph.D. (1928 – 2003)

Considering the effects of cognitive fatigue on parents who are coping with poverty, it is likely that 30-40% of all children may have missed the developmental process described above by Fred Rogers, Ph.D. That is, learning how to be lovable is the basis for acquiring the skills necessary to love others. Importantly, the intuitive character of these skills then underly the caring relationships that are required within every Family. These adaptive skills then ameliorate the occurrence of cognitive fatigue for anyone.

Importantly, cognitive fatigue is known to degrade a person's moral reasoning processes while also responding to complex social interactions involving multiple alternatives for deciding what is best to do. This concept is more thoughtfully explored by Shane Timmons and Ruth MJ Byrne (Timmons & Byrne, 2018). Ultimately, the complexity of POVERTY is immense.

Remember now, the potential benefit of frequent mealtimes is to manage the stress related to a family's Poverty endurance (Ee 2023). I cite the last sentence of the **ABSTRACT** from Ashley Teoh Synn Ee's report:

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

"This study offers an extension to the current literature by examining the role food plays in family culture development (Ee 2023)."

TAXPAYER RELIEF ACT OF 1997 Expanded Child Tax Credit Act 1997 ("CTC")

"Since 1997, the original CTC benefit had been decreased prior to the COVID-19 pandemic spread to the USA (Robert Hovey 2024, p.590). "In response to the COVID-19 pandemic and the economic downturn that followed, the federal government passed the American Rescue Plan Act ("ARPA") of 2021. Under ARPA, the government used the tax code to provide benefits to struggling families with children by temporarily expanding the Child Tax Credit (Robert Hovey 2024, p.590). Here is the title of the Robert Hovey citation: "A Road to Recovery: Why the Expansion of the Child Tax Credit Should Be Permanent."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Research reports that evaluated the occurrence of **ACEs** on lifelong mental health began to occur around 30 years ago, *viz.,* 1997. A Reference published in a 2008 review listed the prior research articles regarding this problem (Afifi *et al.,* 2008). As of January 2024, it had been cited 701 times. Here is the Abstract of the Afifi report: "***Conclusions:*** **The estimated proportion of poor mental health outcomes attributable to adversity were medium to large for men and women. Prevention efforts that reduce exposure to adverse childhood events could substantially reduce the prevalence of psychopathology and suicidal behavior in the population."** The American Journal of Public Health published the report. Since 2019, a similar population analysis involving **ACEs** and diverse lifelong outcomes has been published on multiple occasions. I have cited **two:**

Danielsdottir, Hilda B. (2024 *et al*). Its title is: "*Adverse Childhood Experiences and Adult Mental Health Outcomes.*" This study focused on 25,252 adult twin pairs aged 18-47 years with a birth year between 1959 and 1998. The data was analyzed from April 2022 to November 2023. The occurrence of **ACEs** was subsequently associated with family violence, emotional abuse & neglect, physical abuse, sexual abuse, rape, hate crime, and correlated with the occurrence of depression & anxiety, alcohol or drug misuse, or stress-related disorders. The analysis took full advantage of its twin-pair (identical & fraternal) study group.

Harter, Cynthia L. & John F. R. Harter (2022). Its title is: "*The Link Between Adverse Childhood Experiences and Financial Security in Adulthood.*" A financial well-being study framework had been established by the Consumer Financial Protection Bureau. In addition, data was used from within a survey begun in 1984 by the Centers for Disease Control, *viz.,* its Behavioral Risk Factor Survey Alliance System (BRFSS). With 400,000 interviews annually, it represents the largest health survey system

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

in the world. The initial sentence of the **Conclusion** states: "Having experienced more ACEs is correlated with having more financial stress in adulthood as measured by food security and housing security."

POPULATION HEALTH may be postulated **for** a NATION as

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a community's neighborhood-related

patterns of Unstable HEALTH that occur

among the community's resident persons as a result

of their community's neighborhood-related encounters with

emergent *Chaotic Disruptions,* which variously disturb the *resilience*

of each resident person's Stable HEALTH and may require a collaborative

obligation by their community's **Survival** Commons

to prevent, mitigate, and ameliorate the harmful effects caused

by these diverse *Chaotic Disruptions* and thereby minimizing their

disturbance to the continuing *resilience* of each neighborhood person's

innate temperament and baseline homeostasis for Stable HEALTH.

COMMENT Prior to the above definition, there has been a fitful effort for 20+ years to define POPULATION HEALTH as an independent phenomenon. As yet, there seems to be minimal progress toward achieving any converging consensus. An initial surge of multiple proposals by pre-eminent scholars occurred 15-20 years ago to explore a robust conception. These eminent scholars included Barbara Starfield (Starfield 2001), Sandro Galea (Galea *et al.* 2005), David Kindig (Kindig 2003 & 2007), and A DICTIONARY OF EPIDEMIOLOGY by Miquel Porta (Porta *et al.* 2014).

During 2021-22, another effort by several scholars suggested an even wider consideration for defining Population Health. I recognize the contributions from C.J. Peek (Peek *et al.*. 2021), Mark Fineberg (Fineberg *et al.,* 2022), David Kindig (Kindig 2022), and Craig McEwen (McEwen 2022) The definitions proposed herein attempted to encompass the Cosmological, Biological, and Human Dignity dimensions of every community's resident persons within their nation.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

Most succinctly, an article appeared in the 2023 edition of The Milbank Quarterly (Lantz *et al.,* 2023). Using a medicalization theme for understanding the perils underlying the pervasive cost and "health equity" problems afflicting our nation's Human Dignity (Lantz *et al.,* 2023). It summarizes the paradigm paralysis underlying the institutional preoccupation with market share priorities within every community, especially our Nation's maternal mortality rate.

SURVIVAL COMMONS **AND CHILDHOOD DEVELOPMENT**

The POPULATION HEALTH definition, cited above, refers to a **Survival** Commons. Its full definition is on pages 62-64. The **Survival** Commons concept represents a definition that proposes to formally establish each community's responsibility to assess and refine the resiliency of its own Safety Net. Since the generational heritage of each community is unique, its own **Survival** Commons would identify the uniquely evolving occurrence of individual and family needs, especially with a focus on early childhood development. — 65 —

ADOLESCENT DEVELOPMENT

The complexity of this definition for "Population Health" may be most fully appreciated by a citation that refers to the lifelong career findings of Murray Bowen, M.D. (1913-1990). Some will remember his development of a Family Systems Theory. I have chosen a citation from a book written by his associate C. Margaret Hall, Ph.D. (Hall 1991) entitled BOWEN FAMILY SYSTEMS AND ITS USES. Here is the citation from pages 36-37 of the book:

"One of the most important premises of Bowen's theory is that a family is the most tightly bonded emotional system an individual participates in for an extended period of time. Not only do family relationships, for most people, largely define a person's life situation at birth and in the years of early socialization, but they also strongly affect an individual's behavior at all stages of life. Even though family members may be widely dispersed geographically or separated through institutionalization or death, some degree of emotional "bondedness" persists, especially in relation to their family of origin.

The emotional intensity of a family system increases during its relationship crises such as birth, abortion, loss, sickness, marriage, divorce, separation, institutionalization, or delinquency. According to Bowen's theory, it is more difficult to be a self in a family than to be a self in comparatively transient groups, which make fewer and less persistent demands. A related hypothesis is that self can be differentiated more effectively in an individual's family, as other social contexts do not provide a sufficiently challenging, lasting, and reactive arena for this difficult sequence of behavior.

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Effective differentiation of self generally creates a crisis in the emotional relationships of the differentiating person's family. Differentiation of self may also consist of planned responsible behavior in major crisis, such as death of a significant family member. Some preconditions appear necessary for successful differentiation. Only if relationship issues are dealt with in an emotionally reactive system that will not easily disband, can an individual respond fully to the feedback needed for long-term emotional maturation or differentiation. Only in a family network, can *solid self* most meaningfully encounter and deal with ingrained patterns of behavior which were and continue to be intimately related to self (Hall 1991)."

NOTE: As an aside to the above, I recommend a 'scoping review' article that focused on the current Bowen 'Family Systems' Theory (Calatrava M *et al.* 2022). It also has a focus on the 'Differentiation of Self' developmental transition.

COMMUNITY BY COMMUNITY

As a model for substantial change, the 63rd Congress passed the Smith-Lever Act in 1915 to establish the Cooperative Extension Service in connection with each State's federally supported College of Agriculture. "Extension" developed an intentional connection between the College of Agriculture and its state's farmer-operated food production. Thus, the "Ag Colleges became more familiar with their unresolved problems, and the farmers learned more precisely about newly evolving farming methods. As a result, our nation's farming industry represented approximately 60% of national total employment during 1930. By 2020, it was 1%. No other worldwide nation even approaches that level of efficiency. Argentina is the only nation that comes close at around 50% as efficient compared to the USA.

The same 63rd Congress also passed legislation to authorize the formation of the Federal Reserve. It functions as a semi-autonomous Federal institution with the responsibility to stabilize the value of the dollar within the international exchange of monetary assets. As a result, the stability of the US Dollar remains the essential basis for the international transfer of economic assets.

Obviously, we should not want for possible models to improve our nation's Population Health. Noteworthy, our nation's maternal mortality incidence has worsened steadily since 1975, especially since 2019. There is a very large commitment to improve the "quality" of maternal healthcare. However, there is essentially no pervasive evidence that it has or will ever be substantially successful. An "antibiotic model" for identifying a positivist, reductionist model to reduce maternal mortality is unlikely to succeed, especially for certain ethnic Birthing Persons. This result has not occurred because of a lack of focus, commitment, or

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

urgency from within our nation's healthcare industry regarding this devastating loss of Human Dignity. A nationally sanctioned, Complex Adaptive System will be required to apply a Population Health strategy with a generational, neighborhood by neighborhood focus.

To add a strategy for selecting a measurement typology for maintaining a population science analysis regarding stress measurement, I recommend pages 163 and 164 of the 2018 report by Elissa S. Epel and her 7 associates (Epel 2018). Any effort to implement a Complex Adaptive System to guide the justly efficient and predictably effective attributes of our Nation's Stable HEALTH will require, presumably, 810 District Communities. Each will establish, regionally publish, and regularly refurbish their own **Survival** Commons and its monitoring progress.

Given the early-century, paralysis afflicting our nation's Federally centralized and autocratic government, we will eventually need to consider a State-by-State strategic process. Ultimately, the State-by-State strategy must begin simultaneously within a 3-year "starting gate" by each of 810 contiguously connected, Community Districts. These Districts would, on average, encompass 400,000 resident persons. Each Community District would promote the formation of a Community HEALTH Forum to reduce the incidence of neighborhood-related Poverty and its Population Health associated deficits.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Historically, Canada was the first nation to be faced with online access to Population Health data for its citizens, soon after 1975. This occurred after their healthcare system was financially nationalized in 1973. As a result, the Canadian Minister of National Health and Welfare initiated an analysis that was released in 1974. *viz.*, the Marc Lalonde Report: "**A NEW PERSPECTIVE ON THE HEALTH OF CANADIANS a working document"** (Lalonde 1974).

Subsequently, three reports focused on the occurrence of **ACEs.** First, I cite Clyde Hertzman who may be the initial pioneer for recognizing the critical developmental transitions that can be damaged by co-occurring events. With several related articles, I cite the most important: "The Lifelong Impact of Childhood Experiences: A Population Health Perspective" (Hertzman 1994). Second, I cite an article that may represent the first evidence to verify the relationship between low birth-weight at birth and maternal socioeconomic disadvantage (Bartley 1994). Here is the article's title: "Birth weight and later socioeconomic disadvantage: evidence from the 1958 British cohort study" (Bartley 1994). And finally, here is a report from an economist at the University of Toronto, Daniel Trefler: "Looking Backward: How Childhood Experiences Impact a Nation's Wealth (Trefler 2004)."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

SOCIAL DILEMMA INSTITUTION

COLLECTIVE ACTION COMMUNITY

SOCIAL CAPITAL SURVIVAL COMMONS

SOCIAL DILEMMA may be postulated as

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a social interaction involving two or more persons,
who assemble for a 'collective action' scenario
involving the distribution of a public good
within a definable time dimension,
for which one or more persons may choose
to acquire a short-term benefit for themselves rather
than expressing the prosocial norms that are necessary
for all the persons to receive the most equitable benefit.

COMMENT: Imagine an event involving four cars that arrive at a four-way, stop-sign-regulated intersection at about the same time. The first arrival, not fully stopping, goes first. One of the remaining three cars suddenly goes next, followed sequentially by the other two cars. The cars following the first and second cars are susceptible to an accident amidst this suddenly evolving "Social Dilemma." This represents a classic, public goods event in which there was a conflict between the individual

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

and collective interests involving the requisite expressions of trust, cooperation, and reciprocity among the participants.

Collective action situations have been studied extensively. The results generally indicate that some participants are more likely than others to intuitively apply trustworthy, cooperative, and reciprocal 'prosocial norms' for resolving a Social Dilemma encountered within a research study. They do the same while participating in the municipal life of their own community. Increasing each community's expression of 'prosocial norms', then becomes the basis for enhancing the resilience of the **Survival** COMMONS for the community's POPULATION HEALTH. As defined earlier, 'prosocial norms' are considered the basis for each community's level of Social Capital, *viz.*, page 64.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Here is a review by a collaborative 'cluster' of 11 persons representing diverse academic pursuits within Australia (Mehta 2023) and its title – **Child Maltreatment and Long-Term Physical and Health Outcomes: An Exploration of Biopsychosocial Determinants and Implications for Prevention**. From the review's **Abstract,** I cite the following: "The review takes a systems approach to child maltreatment outcomes through its focus on the overall burden of disease, gene-environment interactions, neurobiological mechanisms and social ecologies linking maltreatment to mental ill-health (Mehta 2023)." This may well represent one of those sentinel articles about mid-life mental health that will continue to be cited after 2034.

From the January edition of HEALTH AFFAIRS in 2025, a group of representative scholars from the Census Bureau, Centers for Disease Control (CDC), and the University of Michigan contributed a collaborative article entitled: "Adverse Childhood Experiences: Increased Likelihood of Socioeconomic Disadvantages for Young Adults (Ratcliff *et al.* 2025). Here are the 2nd, 3rd, and 4th sentences of the article's – **ABSTRACT** – "For this study of 930,000 children born during the period 1999-2003, we used linked administrative, survey, and criminal justice data to measure the association between ACEs (parental death; separation; incarceration; or criminal charge for intimate partner violence, substance use disorder, or child sexual or nonsexual abuse) and socioeconomic disadvantages at ages 18-22 during 2017-2021. After childhood socioeconomic status was controlled for, young adults with ACEs were more likely to have been charged with felonies, have become teenage parents, live in a household with poverty or housing assistance, be enrolled in Medicaid and not be employed, and were less likely to be enrolled in an educational institution. These outcomes were most likely among young adults with multiple ACEs or lower childhood socioeconomic status (Ratcliff *et al.*, 2025)."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

Within the text of the article, two prominent by-lines appeared: "**Analysis of cumulative ACEs supported previous studies documenting a dose-response relationship between ACEs and harmful long-term outcomes.** AND **Evidence on the long-term socioeconomic burden of childhood adversity is essential to increase understanding of the value of investments in prevention studies** (Ratcliff *et al.*, 2025)." — 71 —

"Broadly defined, **INSTITUTIONS**

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are the prescriptions that humans use to organize all forms of repetitive and structured interactions including those within families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments at all scales. Individuals interacting within rule-associated situations face choices regarding the actions and strategies they may take, leading to consequences for themselves and for others. The opportunities and constraints individuals face in any particular situation, the information they obtain, the benefits they obtain or are excluded from, and how they reason about the situation are all affected by the rules or the absence of rules that structure the situation. Further, the rules affecting one situation are themselves crafted by individuals interacting in deeper level situations. For example, the rules we use when driving to work every day were themselves crafted by officials acting within the collective-choice rules used to structure their deliberations and decisions. If the individuals who are crafting and modifying rules do not understand how particular rules affect actions and outcomes in a particular ecological and cultural environment, rule changes may produce unexpected, and at times, disastrous results (E. Ostrom, 2005)."

COMMENT The definition above can be found within the first paragraph, page 3 of the book entitled: "UNDERSTANDING INSTITUTIONAL DIVERSITY (E. Ostrom 2005)." This book probably

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

represents the most important accomplishment, among many, of Elinor Ostrom. I cite her reasoning for the purpose of this book from page 29: "Without the capacity to undertake systematic, comparative institutional assessments, recommendations of reform would be based on naive ideas about which kinds of institutions are "good" or "bad" and not based on an analysis of performance." This book laid out a comprehensive structure, the **IAD Framework,** as the basis for analyzing complex socio-ecological problems. Here is a commonly cited reference by Professor Ostrom for an application of the **IAD Framework** (Ostrom 2007). I quote the last sentence of its **Abstract**: "The framework is intended to be a step toward building a strong interdisciplinary science of complex, multilevel systems that will enable future diagnosticians to match governance arrangements to specific problems embedded in a social-ecological context."

Historically, she had cited a reference to Douglas C. North (North 1990) and his view of the distinction between an institution and an organization. The Ostrom definition cited above for an institution ends with a curious admonition. It ends with a sentiment that was also voiced by Thomas Jefferson regarding our nation's governance. As voiced by an unknown author, "If you do what you've always done, you will get what you've always gotten." See the website "Quote Investigator" for its analysis of the "unknown author."

As defined by Douglas C. North, "Organizations include political parties (Political Parties, the Senate, a City Council, a regulatory agency), economic bodies (firms, trade unions, family farms, cooperatives), social bodies (churches, clubs, athletic associations), educational bodies (schools, universities, vocational training centers). They are groups of individuals bound by some common purpose to achieve their objectives. Modeling organizations is analyzing governance structures, skills, and how learning by doing will determine the organization's success over time (North 1990, p. 5)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Herein, I cite another study from the Federal government's Agency for Healthcare Research and Quality involving its long-standing and nationally representative, MEPS study group of @10,000 households (Decker 2024). page 4, I cite the first sentence under the **Discussion** paragraph header: "Using nationally representative data, we found that in 2021 42.8 percent of US children lived in a household with an adult who had experienced four more **ACEs.**[...]Fewer than one-fifth of children lived in families whose Adult or Adults had not experienced any ACEs (Decker 2024)." This study added further analysis to the **ACEs** socio-ecologic, dose-response character.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

COLLECTIVE ACTION may be postulated as

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a social interaction involving an initial cluster of three or more persons who collaborate with diverse combinations of ecological and cultural congruence and their attributes of prosociality to achieve a Goal for improving their status or the status of another cluster by:

1. formalizing a visioning statement to achieve the initial cluster's Goal, especially when acting on behalf of one, or more than one, social network;

2. preparing an action plan for achieving the initial cluster's visioning statement, especially when this visioning statement requires a set of tasks for managing a Common Pool Resource; and

3. delegating the action plan responsibilities to one, or more than one, of the following three options: a. the initial cluster itself, b. another cluster of persons, or c. an incorporated private or public institution selected by the initial cluster.

COMMENT Mancur Olson, Ph.D. wrote the sentinel reference for collective action, *viz.,* its title: "THE LOGIC OF COLLECTIVE ACTION Public Goods and the Theory of Groups (Olson 1965)." Importantly, the definition for Collective Action given above describes the importance of a defined Visioning Statement (viz., Vision, Mission, Principles) and Action Plan (viz., Strategic Development Plan). It also alludes to alternate types of collective action, as in the collective impact model.

The steady development of collaborative processes, community by community, to manage their own **Survival** Commons in association with their contiguously adjacent communities is likely to represent a highly diverse occurrence of 'fits and starts.' At least 810 Community HEALTH Forums would be contiguously formed nationally with population clusters involving @400,000 resident persons. Each Forum would manage the sustainable resiliency of their own community's **Survival** Commons in association with their contiguously adjacent communities within each State.

This **Design Epistemology** includes a definition for each community's **Survival** Commons (See page 76). Locally initiated and supported, each Community HEALTH Forum could then become eligible for nationally instituted certification to receive technical support from **NATIONAL HEALTH.** Grappling with adverse, locally entrenched ecological and cultural traditions will require a substantial effort within every

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

community. It is likely to represent the lynch-pin strategy for ultimately improving our nation's social cohesion for its Population Health.

As a reminder, collective action by itself does not automatically achieve a positive goal that promotes caring relationships and Social Capital. Only one question would accurately measure the Collective Action occurring within a community that augments its **Survival** Commons: "To what extent does each of a community's neighborhoods share their own resident persons with each other's Extended Family?"

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Three collaborating authors applied evidence from a population birth cohort study that focused on child abuse, presumably well within the realm of **ACEs** as we currently acknowledge them (Pereira *et al.* 2021). Importantly, the self-report of abuse after age 16 years that had occurred during earlier childhood was evaluated. I cite the study's **Conclusions:** "In a population cohort, adult retrospective report of child abuse was associated with several harms, prospectively measured from childhood to adolescence, providing support for the validity of retrospective report-based research. Findings suggest retrospectively reported child abuse is not biased by depression in adulthood (Pereira *et al.* 2021)."

COMMUNITY may be postulated for POPULATION HEALTH as

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a cluster of persons, most commonly recognizable as the persons residing
within a municipality's geographic border AND characterizable
by the unique history of its ecological and cultural heritage,
who participate in more than one social network of the cluster
to obtain certain prosocial benefits from each network's
intuitive spontaneity and to acquire a valued awareness
about the identity of these social networks that is borne out
of their *social interactions* occurring within these social networks and
each person's cumulative association of these *social interactions*
with the memories of their own ecological and cultural traditions.

COMMENT This definition originated from A COMMENTARY essay written by David M. Chavis and Kien Lee for the Stanford SOCIAL

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

INNOVATION Review (Chavis & Lee 2015). It has been augmented to account for the large variety of social networks occurring within most communities. The prosocial evolution of these social networks then augments their community's social capital and its annual contribution to offset the entropy-laden depreciation of their nation's Social Cohesion.

For this **Design Epistemology,** each District Community, *viz.*, page 86, would represent, on average, 400,000 resident persons within the border of any State as primarily defined by each Community HEALTH Forum's, contiguously connected counties. Any District Community with a low-density population must be comprised of at least 100,000 resident persons. The community median for resident persons would evolve every 10 years based on the distribution of Community HEALTH Forums individually accounting for a number of resident persons above and below the median size.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Ultimately, every person's experience of sustainably resilient Well-Being is dependent on their housing stability. The occurrence of being evicted from a person's home was the subject of a classic book about homelessness by Matthew Desmond (Desmond 2016) entitled: "EVICTED Poverty and Profit in the American City." It represents a chronology of events that degrade the homelife that is critical for any person, especially if they are responsible for a family. To understand the effect of Housing Instability on children, I refer to a report from Katherine Marcal (Marcal 2018) entitled: "The Impact of Housing Instability on Child Maltreatment: An Investigation."

From the Marcal report's **Abstract,** I cite its last two sentences: "Families experiencing housing problems likely have a range of needs that require earlier, targeted intervention to mitigate consequences of poverty, domestic violence, and maternal depression. Child welfare services should invest resources in housing assistance programs in-house as well as through partnerships with local public housing authorities to stabilize families, reduce housing-related strain on caregivers, and promote family preservation (Marcal 2018)."

SOCIAL CAPITAL may be postulated for HEALTH as

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the intuitive immediacy to offer a Prosocial Greeting when encountering another person within their community's municipal life

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

that becomes increasingly prevalent among the community's resident persons

when multi-generational, caring relationships progressively populate

the community's micro-, meso-, and macro-social networks.

COMMENT This definition of Social Capital is uniquely phrased for this **Design Epistemology.** It reflects an emphasis on the character of the social networks within a community and how they do or do not maintain caring relationships among and between their micro-, meso-, and macro- social-networks. For a uniquely comprehensive bibliography and periodic analysis of Social Capital, Tristan Claridge, MS initiated, long ago, an online Institute for Social Capital (Claridge 2005). Notably, he lives in New Zealand.

Ultimately, the prevalence of each community's prosociality and its steady improvement over time contributes to their 'appreciation rather than depreciation' of their nation's Social Capital and its Social Cohesion. It is likely that our nation's locally prevalent social determinants of health will not be resolvable without a nationally sanctioned and locally driven strategy to refurbish every community's prosociality, neighborhood by neighborhood, and *viz.,* its related *Capability Trap* (Landry & Sterman 2017).

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

Assuming that a child's development encounters a steady exposure to ACEs while his or her family survives amidst pervasive poverty, what might be his or her lifelong disability? I cite the **ABSTRACT** of a collaborative report by 6 Co-Authors from New York, Michigan, and Texas (Perkins, *et al.,* 2024). Here are its **Abstract's** first and last sentences: "Childhood poverty is related to deficits in multiple cognitive domains including adult function. ... Childhood poverty disrupts language processing neural networks in adulthood, after controlling for phonological awareness, suggesting that poverty in childhood influences the neurological basis for language processing in adulthood. (Perkins, *et al.,* 2024)."

SURVIVAL COMMONS may be postulated

for POPULATION HEALTH as

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an evolving Cluster Of Functionings for a community (Sen 1994)

that are intended to prevent, mitigate, and ameliorate

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

the neighborhood-related Unstable Health occurring
among its resident persons from the occurrence
of *Chaotic Disruptions* for which the Cluster is:

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A. Assembled in accord with their nation's laws and regulations,
at all jurisdictionally nested scales applicable
to the public and private institutions within their community
to promote a **SAFETY NET** for its resident persons;

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B. Enhanced by the daily greetings of Kindness and Respect occurring
within the municipal life of their community's resident persons,
especially when each resident person safely offers
a salutary greeting to each person they encounter and
each of these persons responds with an appreciative gesture;

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C. Offered by each municipal community to its resident persons
who each may select from among their community's
Cluster Of Functionings, those Benefits and Obligations
most suitable for the needs of their own and, if any, the needs
of their family's Personal **Survival** Plan(s) which are offered
from within their community's ecological and cultural traditions;

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D. Improved by each municipal community's volunteer, resident persons
who become aware that their community's **SAFETY NET**
requires the resolution of certain discontinuities with an
equitably available, ecologically & culturally accessible,
justly efficient, and dependably effective *Vision and Action Plan;*

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E. Augmented by the collective action strategies originating from
within each community's private and public institutions as well as
its social networks to prevent, mitigate, and ameliorate any
'newly recognizable adversity' encountered by its resident persons

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

that is related to a locally prominent discontinuity among
the community's Cluster Of Functionings or
its associated Benefits and Obligations, especially
if the 'newly recognizable adversity' is associated with
a birthing person, homelessness, poverty, or ageism;

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F. Protected by the community's Master Disaster Planning Strategy
that is reviewed and revised annually to prevent, mitigate, and
ameliorate the *Chaotic Disruption* occurring from
certain locally occurring disasters which may variously affect
the neighborhoods of the community's resident persons and
their ability to maintain their own Personal **Survival** Plan, especially
for those residents person's afflicted by social isolation; AND

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G. Supported by the community's reciprocating collaboration
with their contiguously adjacent communities and
by their nation's expression of social cohesion when interacting
within the worldwide, marketplace arenas for every other nation's
Resources, Knowledge, and *Human Dignity.*

COMMENT Assuming that Congress will charter the formation of **NATIONAL HEALTH,** each of its nationally recognized District Communities would form a Community HEALTH Forum. Each Forum would pursue certain responsibilities as defined for this recognition, such as the community's support for a locally sustainable collaboration to maintain their District Community's **Survival** COMMONS. This phenomenon, *viz.*, an augmented safety net, has already been variably formed, community by community, to manage a variety of problems related to a family's socio-economic status (SES), especially its maternal mortality. Ironically, it is now 60+ years since President Lyndon Johnson initiated his "War on Poverty" in 1964.

National Health Spending continues to increase faster than our nation's economic growth, and our nation's annual maternal, mortality incidence continues to worsen, as it has since 1978. Both of these phenomena

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

represent the containing and unabated, upstream problems that occur within the neighborhoods of every community. Developing a **Survival** COMMONS within every District Community will be very important to resolve the CAPABILITY TRAP that underlies ACEs and their occurrence for children and adolescents.

Among many others, I cite a research article by Vahid Fafhihi, Amy Kin, and David Ford that was published in 2023. Here is its title: "Designing Sustainability Programs to Escape the Capability Trap (Fafhihi *et al.)*." Remarkably, this report by two engineers (Landry & Stermin, 2017) represents the best analysis of the 'Capability Trap' phenomenon. It is likely that a Congressionally Chartered, thinly nested, and regionally decentralized institution with a fixed budget will be required. Both citations are easily downloadable from Google Scholar.

Every community's SURVIVAL **COMMONS** specifically depends on the prevalence of its resident person's Volunteer commitment. Fostering this community attribute promotes its **SOCIAL COHESION** which directly boosts the prevalence of its Prosocial Norms within its community's Families. An article that appeared in 2024 attests to this phenomena (Davies *et als.,* 2024). Here is its title: "The Causal Relationship Between Volunteering and Social Cohesion: A Large Scale Analysis of Secondary Longitudinal Data."

FUNCTIONINGS

Amartya Sen apparently helped to originate this odd concept with his prescient analysis of poverty many years ago (Sen 1994). FUNCTIONINGS referred to the poverty-associated personal adaptive skills that were deficient for pursuing the Global Goals related to 'his or her' Well-Being capabilities and their Functionings related to survival. The capabilities terminology eventually received considerable attention from Martha Nussbaum and her connections with other philosophers. Their articles eventually became mutually associated with a "capabilities approach" genre. In effect, a community's **SURVIVAL** Commons would currently become a community's institution for arranging the local array of FUNCTIONINGS as the Benefits and Obligation applicable for every resident person's 'Safety Net.'

STRONG NEIGHBORHOODS

I propose that the ultimate key to achieving Well-Being for every resident person will NOT be possible without substantially resolving the existence of poverty, neighborhood by neighborhood in every community. During my continuing search for meaningful reports, I heartfully recommend the Special Report by Seth Kaplan at the MERCATUS CENTER, George Mason University, Arlington, Virginia. I cite the last two sentences of its ABSTRACT: "The role of institutions is key to reviving a neighborhood. The way these institutions structure — or fail to structure — relationships

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

at the neighborhood and inter-neighborhood level affects the vitality of each locale and the Well-Being of everyone living there (Kaplan 2022)."

Tara Mahoney and her associates have compiled a similar report. They hail from Simon Fraser University in Vancouver, British Columbia, Canada. I cite from their Introductory Page regarding its regional impetus: "Our aim is to act as an infrastructure for community-engaged research rooted in values of reciprocity, collaboration, equity, justice, and social transformation (Mahoney *et al.* 2021)." Their SFU Community-Engaged Research Institute CERi) retains the copyright.

FAMILY RESILIENCY

To begin, we might view biological survival as an innate cluster phenomenon that is initiated from within the Quantum Physics of matter, *viz.*, Max Planck's definition cited on Page 6.

And, to continue, a family tipping point might be best identified by a father's, steadily literal and salutary presence for his child's mother. I fully recommend the analysis of this family tipping point by 5 Co-Authors from the University of Rochester in New York (Alio *et al.*, 2013).

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

A uniquely formed research group {representing University de Montreal (Canada) and the University of Edinburgh (United Kingdom)} assembled to study the 'Growing Up in Scotland' birth cohort data and an annual assessment through 7-8 years of age (Blair 2019). The report's **Abstract** for their research began with its **"Objectives** – To assess what proportion of the association between low income and the incidence of adverse childhood experiences (ACEs) would be eliminated if all households had access to housing, transportation and childcare services, breastfeeding counseling, and parks (with a <10-minute proximity)." The initial cohort was N=5217 and ended with N=2816 and 7 total data sets.

I now cite from its: **"Results** – The protective effects of resources were heterogeneous. Only access to transportation was associated with lower ACE incidence in both low- and higher-income households. If all *households (my edit)* had access to transportation 21% (95% CI 3%, 41%) of the income-based inequality incidence of 3 or more ACEs could be eliminated." Finally, I cite its: **"Conclusions** – While second best to the elimination of child poverty, measures to improve families' access to community resources such as transportation may mitigate the effects of poverty on ACEs incidence (Blair 2019)."

NEXT, I just now this afternoon finished reading a report published in **HEALTH AFFAIRS** this month, August 17, 2024: (Thomas *et al* 2024). All four of its authors hold positions at the Agency for Healthcare Research (AHRQ) and Quality in Rockville, Maryland. Here is its title: "Adverse Childhood Experiences: Healthcare Utilization And

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

Expenditures In Adulthood". Its **ABSTRACT** begins as follows: "Adverse childhood experiences (**ACEs**) have been shown to be strong predictors of socioeconomic status, risky health behaviors, chronic health conditions, and adverse outcomes. However, less is known about their association with adult healthcare utilization and expenditures."

"We used new data from the 2021 Medical Expenditure Panel Survey (aka MEPS). Compared to demographically similar adults without ACEs, those with ACEs had substantially higher utilization and 26.3 percent higher health expenditures. The aggregate spending difference across the 157.6 million US adults with ACEs was $292 billion in 2021. We also found associations between ACEs and a range of adverse adult circumstances, also newly measured in the 2021 MEPS, including financial and housing problems, social network problems, little or no life satisfaction, stress, food insecurity, verbal abuse, physical harm, and discrimination (Land *et al,* 2024)."

As an aside, the AHRQ group has been in existence for many years. The MEPS study is a major research project at AHRQ that represents an annual survey of some 10,000 adults that are periodically, individually replaced to represent a nationally representative, non-institutionalized study group. The MEPS reports have been published annually for more than 20 years. This study is probably the best for an annual evaluation tool to monitor the status of our nation's socio-economic CAPABILITY TRAP (Landry & Sterman, 2017) that variably exists, neighborhood by neighborhood, in every community. — 81 —

HOMELESSNESS

It seems as though the lifelong outcome of a person's social interactions with *) Chaotic Disruption involving 'his' or 'her' *uniquely-endowed* Human Capability, *) the absence of an enduring Family, AND *) their community's lack of a sustainably resilient 'Safety Net' may interact to eventually cause a person's HOMELESSNESS. I cite the most recent Literature Review of Homelessness that is entitled: "Homelessness and nature across landscapes and disciplines: A literature review (Land & Derrien 2025)." Within a theory of philosophy, it might be described as a typology.

From a 5-Author collaboration originating from the Western and McMaster Universities in Canada (Plett, *et al.,* 2024), I cite its title: **"Belonging through meaningful activity in the transition from unhoused to housed."**

I cite its Summary **Abstract:**

- **"BACKGROUND** Belonging is closely associated with well-being, yet individuals with experiences of being unhoused are likely to experience social exclusion and challenges with

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

developing a sense of belonging. Engagement in meaningful activity has been linked to belonging; however, there are no focused studies exploring experiences of how engaging in meaningful activities influences belonging. Meaningful activities are things we do that bring value to our lives.

PURPOSE To explore how engaging in meaningful activities may influence experiences of belonging following homelessness through a secondary analysis of qualitative interviews.

METHOD Using interviews conducted in a community-based participatory action study exploring the transition to housing following homelessness (n = 19), we conducted a thematic analysis using the method described by Braun and Clarke. Participants were recruited through communication with local organizations supporting individuals with lived and living experiences of being unhoused as well as through presentations at drop-in organizations. An intentional effort was made to recruit diverse participants regarding housing status, age, and gender. Inductive analysis was used to conduct initial coding, focusing on belonging and engaging in meaningful activities. We then analyzed the codes abductively, using Bourdieu's Social Capital Theory to inform this analysis.

FINDINGS The overarching essence generated in our analysis was: "I don't feel like I belong...everything in the world is not for me...it's for people wirh...enough money to...enjoy those things." Within this overall essence, we generated three themes: 1) Human connection: "being where I am with people who care about me, I actually feel good"; 2) Social Exclusion: being a "regular member of society"; and 3) non-human connection: "my cats...are like my kids to me." Participants described numerous contextual factors that challenged them as they sought belonging following homelessness, including financial limitations and other societal factors.

CONCLUSION Our findings suggest that meaningful activity was an important pathway to belonging for the participants in this study (Plett *et al,* 2024)."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

HEALTH CARE PRIMARY HEALTHCARE

COMMUNITY DISTRICT MANAGING THE COMMONS

SOCIAL COHESION COMMON GOOD

HEALTH CARE may be postulated for HEALTH as

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the preservation of a person's Stable Health

by a specific health service that is:

recognized by its designation as a uniformly-identifiable unit of

health services for research, professional, or financial reimbursement;

provided during a social interaction involving

a caring relationship with a professionally licensed person; and

defined as HEALTHCARE, when it is characterized

by two or more interconnected HEALTH CARE encounters,

occurring over a variable period of time.

COMMENT Both 'Health Care' and 'Healthcare' usually involve unpredictable professional activities to improve the precision of Health Care for promoting a person's Stable Health. With frequent shifts between alternate, diagnostic hypotheses, their associated deductive and inductive reasoning processes require extended periods of study and

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experience, e.g., 8-10 years, for a physician to acquire the adaptive skills for managing the pattern recognition, scenarios required by their professional Cultural-Social cognition.

BASIC HEALTHCARE VS COMPLEX HEALTHCARE

It is best to differentiate Basic **Healthcare** Needs for Primary Healthcare as compared to Complex **Healthcare** Needs, as follows.

a. BASIC **HEALTHCARE** NEEDS may be postulated as the prosocial opportunity for mentoring a person's priorities for preserving their *uniquely-endowed* **Human Capability** and its supportive Complex Adaptive Systems, by offering the following:

i. the equitably available as well as ecologically and culturally accessible medical TRIAGE that is telephonically offered to a person continuously for the occurrence of any emergent, urgent, or expectant HEALTH Condition involving a potential requirement for Health Care, especially for a HEALTH Condition possibly requiring referral to a Specialist Physician;

ii. the diagnosis and treatment of *) an urgent or expectant HEALTH Condition possibly representing a disease for which its timely treatment would improve a person's Stable Health, *) any new or recurring HEALTH Condition possibly associated with a disease for which the person's Stable HEALTH would be more likely preserved by its situationally-timely diagnosis and treatment, and *) any unchanging or uncomplicated disease for which its regular reassessment would likely mitigate and ameliorate its effects on the person's Stable Health; and

iii. the periodic reassessment of a person's overall Stable HEALTH as the basis for determining the person's priorities for defining a Comprehensive Care Plan a) to sustain their Stable HEALTH, b) to coordinate this Care Plan with any co-occurring Complex Healthcare Needs, and c) to acquire the provisions for their Personal **Survival** Plan.

b. COMPLEX **HEALTHCARE** NEEDS may be postulated as

i. the diagnosis and treatment of emergent HEALTH Conditions &

ii. the diagnosis and treatment of any new or previously established HEALTH Condition requiring the skills of a specialist physician.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

An article (Austin, *et al.,* 2023) reported that "States in the US have the option to eliminate the asset test and/or increase the income limit for SNAP eligibility under a policy called broad-based categorical eligibility (BBCE). Given associations of economic hardships, including food insecurity, with child protective services (CPS) involvement, state adoption of these policies may be associated with changes of their CPS-investigational rates." From the article's **CONCLUSIONS AND**

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

RELEVANCE, here is its first sentence: "Results from this cross-sectional study suggest that state expansion of SNAP eligibility [...] may contribute to decreases in rates of CPS-investigational reports (Austin, *et al.*, 2023)."

PRIMARY HEALTHCARE may be postulated for a NATION as

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the HEALTH CARE for each of a community's resident-persons
that its municipal leaders and stakeholders promote to assure that
equitably **available,** ecologically & culturally **accessible,**
justly **efficient,** and dependably **effective** HEALTH CARE
exists for the 'Basic Healthcare Needs' of each resident person and
the coordination of these 'Needs' with any HEALTH CARE
required for a resident person's 'Complex Healthcare Needs.'

COMMENT This is a very compact definition for which several other definitions are required: PRIMARY HEALTHCARE TEAM, HEALTH Condition, medical TRIAGE and its subcategories, and PRIMARY PHYSICIAN. They are defined on the GLOSSARY For HEALTHCARE Sub-Page of the **APPENDIX** PAGE.

The first appearance of Primary Healthcare within a glossary or lexicon would most likely be attributable to a definition established by the World Health Organization in 1975 (WHO 1975). Cited below, it ascribes more clearly to an emphasis that Primary Healthcare is necessary for honoring a nation's social contract, *viz.*, its Common Good. — 85 —

- "Primary Health Care is essential health care made universally accessible to individuals and families in the community by means acceptable to them, through their full participation, and at a cost that the community can afford. It forms an integral part of both the country's health system, of which it is the nucleus, and of the overall social and economic development of the community."

As our nation continues to survive within the 21st century, the WHO definition for Primary Healthcare should persistently remind us that the **Population Health** of each community's resident persons evolves within the context of their Nation's Common Good. The need to improve the international prevalence of Social Cohesion will not occur for Stable HEALTH without the annual collaboration between each Nation and its

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

bordering associated nations that is focused primarily on Social-Ecological strategies to improve.

< ADVERSE CHILDHOOD EXPERIENCES >

I cite what is likely the first reported analysis of **ACE** phenomenon in 1994 by a Canadian pediatrician at the University of British Columbia (Hertzman, 1994). Here is its title: "The Lifelong Impact of Childhood Experiences: A Population Health Perspective." Canada had nationalized its healthcare system in 1974. Suddenly, the prospect of a very large accumulation of data represented an opportunity to assess broader phenomena. This led to the establishment of the Canadian Academy of Health Sciences Expert Panel's report: "EARLY CHILDHOOD DEVELOPMENT: ADVERSE EXPERIENCES and DEVELOPMENTAL HEALTH (Boivin & Hertzman, 2012). As a model for a Pediatric, Population Health **Plan,** it is outstanding.

COMMUNITY DISTRICT may be postulated for **HEALTH** as

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one of the 810 separate clusters of resident persons that respectively encompass, on average, 400,000 resident persons who contiguously reside within one, or more than one, county of a Region's State or States as the basis for establishing a nationally sanctioned Community HEALTH Forum.

COMMENT The Chartered provisions for the national governance of NATIONAL HEALTH form a triadic structure. The top level of Governance would reflect the formation of 9 Regions involving one, or more than one, state. Each Region would encompass a nearly equal number of National citizens. Since each State's population density varies considerably, the actual number of resident persons within a DISTRICT COMMUNITY may vary between 100,000 and 800,000. As sanctioned by their Region's governance, each DISTRICT COMMUNITY would form a locally supported Community HEALTH Forum in collaboration with the other 809 Community HEALTH Forums. Each of these FORUMs would establish a locally collaborative process to maintain their **Survival** COMMONS with a responsibility to especially augment their community's Safety Net, especially to prevent, mitigate, and ameliorate their own community's social determinants of Unstable Health.

The middle level of governance would be associated with each of the 9 Regions. The top level of governance would represent a Board of

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

Trustees involving 1 Member selected by each Region according to the Congressional Charter for NATIONAL HEALTH, and subsequently on a rotating schedule by each of the Regions, each encompassing approximately @37 million citizens. The Home office for each level of governance would be located near the population center of the Nation, a cluster of regional States, or cluster of District Community counties, each encompassing approximately 400,000 citizens. The nine regions can be identified as follows (including their 2020 regional population) for a grand total of 335,410,000:

- Region 1 **CENTRAL EAST** population 33.52 million – Pennsylvania, New Jersey, Maryland, Delaware, & District of Columbia with Protectorates;
- Region 2 **NORTH EAST** population 34.47 million – Massachusetts, New York, Connecticut, New Hampshire, Rhode Island, Vermont, & Maine;
- Region 3 **SOUTH EAST** population 36.69 million – Georgia, Virginia, South Carolina, North Carolina, & West Virginia;
- Region 4 **CENTRAL MIDDLE** population 36.16 million – Kentucky, Tennessee, Ohio, Indiana, & Missouri;
- Region 5 **SOUTH MIDDLE** population 37.19 million – Louisiana, Mississippi, Alabama, Arkansas, & Florida;
- Region 6 **NORTH MIDDLE** population 37.68 million – Illinois, Michigan, Iowa, Wisconsin, & Minnesota;
- Region 7 **CENTRAL WEST** population 39.54 million – California;
- Region 8 **SOUTH WEST** population 42.37 million – Texas, Oklahoma, New Mexico, & Arizona; AND
- Region 9 **NORTH WEST** population 36.95 million – Oregon, Kansas, Nevada, Nebraska, Colorado, Montana, North Dakota, South Dakota, Washington, Wyoming, Idaho, Utah, Alaska, Hawaii, & Protectorates.

The initial governance for NATIONAL HEALTH would begin with the selection of its Board of Trustees. Presumably, each of the 9 regions would be given a unique selection procedure by the Congressional Charter: the overall process would select three (3) Primary Healthcare physicians, Two (2) physician Specialists, and Four (4) non-physicians, each with a certain professional skill-set — such as: mental health; public health; anthropology; and socio-ecological economics.

Conceiving our nation's annual health spending as becoming defined as a portion of our nation's overall economy, *viz.*, Gross Domestic Product (GDP). This may strike most people as representing a strategy involving rationing by a centralized bureaucracy. The research of Professor Ostrom (E Ostrom 1990) establishes a cooperative process among payers, providers, and recipients of healthcare for it to become equitably

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

available, culturally & ecologically accessible, justly efficient, and dependably effective.

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

The next report may represent the broadest impact for informing our Family Culture anthropology (Helle *et al.,* 2024). A cluster of six colleagues who diversely collaborated from universities located in Finland, Australia, New Zealand, and Canada. Here is the Article's Title: "Investment by maternal grandmother buffers children against the impacts of adverse early life experiences." Yes, they use (AELEs) rather than (ACEs). I cite the last three sentences of the article's abstract: "When children had faced multiple AELEs, the investment of maternal grandmothers reduced, but could not fully erase, their emotional and behavioral problems. No such result was observed in the case of the investment of other grandparent types. These findings indicate that in adverse environmental conditions, the investment of maternal grandmothers can improve child wellbeing (Helle *et al.,* 2024)."

MANAGING THE COMMONS may be postulated

for **POPULATION HEALTH** as

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the application of the Design Principles associated with

successful management of a Common Pool Resource represents

a guide for the formation of a national Primary Healthcare Efficacy Plan

for achieving a budgeted portion of a nation's Gross Domestic Product

that is annually allocated to its health spending that originats

from within HEALTH SECURITY certified Primary Healthcare

offered within every Community District. (E. Ostrom 2009)

COMMENT Professor Elinor Ostrom, Ph.D. compiled her 2009 acceptance presentation upon receiving her Nobel Prize for Economics (E. Ostrom 2010): "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." The overall presentation best describes her research for the validation of the Design Principles, listed below, associated with the successful management of a Common Pool Resource (CPR). A video URL for the presentation is internet youtube accessible. It may represent the best introduction to this far-ranging concept. Notably, she was the first woman to be awarded a Nobel Prize in economics. I recommend an article by Michael Cox for an in-depth

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

review of the Design Principles (Cox *et al.*, 2010) entitled: "A Review of Design Principles for Community-based Natural Resources Management." This article describes the Design Principles as understood at the time of Professor Ostrom's death in 2010.

As a basis for understanding the dimensions applied to managing a Common Pool Resource, I cite the 1-8 numerated **Design Principles** associated with a successful Common Pool Resource (Cox *et al.*, 2010):

1. Clearly Defined Boundaries
2. Proportional equivalence between benefits and cost
3. Collective-choice arrangements
4. Monitoring
5. Graduated Sanctions
6. Conflict resolution mechanisms
7. Minimal recognition of rights to organize
8. Appropriate coordination among relevant groups

Conceiving our nation's health spending as limited to a certain portion of our nation's overall economic activity, its Gross National Product, may strike most people as representing a strategy that involves rationing by a highly centralized, Federal bureaucracy. The research of Professor Ostrom establishes a cooperative process among the payers, providers, and recipients of healthcare for it to become equitably **available,** culturally & ecologically **accessible,** justly **efficient,** and dependably **effective.**

SOCIAL COHESION may be postulated for a NATION as

^

the expectation among the resident persons within each
of its municipal communities that all of the resident persons
within the other municipal communities are trustworthy and
that the continuing prevalence of these trustworthy persons will be
sustainably enhanced **when** each municipal community
continuously collaborates with their adjacent communities
to annually enhance each other's **Survival** Commons
by their reciprocating investments of Social Capital.

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

COMMENT Fundamentally, it is possible to construe an analysis that our nation has endured a decline in our social cohesion since the Civil War and especially since WWII. This trend represents the fundamental cause of the stress that each resident person encounters daily within their community's municipal life. The definition above would not be recognizable by most Population Health experts. Of many thoughtful efforts to define Social Cohesion, I prefer the essay by David Schiefer and Jolanda van der Noll: *The Essentials of Social Cohesion: A Literature Review* (Schiefer & van der Noll, 2017).

No matter how it is construed, this **Design Epistemology** for improving Population Health as well as its Primary Healthcare would likely fail without a strategy to intentionally engage the close neighborhood of every resident person's home. A nationally sanctioned, locally self-sustained, and nationally committed strategy will be required to rebuild our nation's social cohesion, every community, neighborhood by neighborhood.

To substantiate the promotion of Social Cohesion, I refer to a recent study from Sweden by Professor Giordano and his associates who are known for his career-long studies of trust and self-reported health as an attribute of a nation's Population Health. Here is the study's title: *Trust and all-cause mortality: a multi-level study of US General Social Survey Data* 1978-2010 (Giordano 2019). Here is its **ABSTRACT's** Conclusion:

- "High levels of individual and contextual generalized trust protect against mortality, even after considering numerous individual and socioeconomic conditions. Its robustness among both conditions hints at the importance of psychosocial mechanisms, as well as a trustworthy environment. Declining trust levels across the USA should be of concern; decision-makers should consider direct and indirect effects of policy on trust with the view to halting this decline (Giordano 2019)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs)

Here is a study that directly evaluated, what likely represented, the largest number of participants among the ACEs related research studies. Cynthia Harter and John Harter published the results of their study in 2022 with this title (Harter & Harter, 2022): "The Link Between Adverse Childhood Experiences and Financial Security in Adulthood." A financial well-being study framework had been established by the Consumer Financial Protection Bureau in 1984. The authors also retrieved correlational data from the Centers for Disease Control (CDC) and its Behavioral Risk Factor Survey Alliance System (BRFSS). With 400,000

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interviews annually, it represents the largest health survey system in the world.

From the study report's CONCLUSION, I cite its initial sentence, "Having experienced more ACEs is correlated with having more financial stress in adulthood as measured by food security and housing security (Harter & Harter, 2022)."

COMMON GOOD may be postulated for a NATION as

^

the cooperative obligation of every Nation

to sustain their own prosocial, institutional responsibilities

for promoting the broadest expression of each resident person's

uniquely-endowed Human Capability and also

to sustain the annually reciprocating exchange of social capital

with their contiguously adjacent nations to improve

the occurrence of Stable HEALTH

for every worldwide community's resident persons.

COMMENT Following WWII, Eleanor Roosevelt Chaired the United Nations Commission on Human Rights. Renne Cassin, from France, is recognized as its originating author. Since then, no individual person has been recognized as the principal author of the UNITED NATIONS' Universal Declaration of Human Rights, eventually adopted on December 10, 1948. Worth noting, the UNITED NATIONS has adopted several other related Declarations, e.g., the Rights of a Child (UN 2022). In 2016, the Declaration of Human Rights became a United Nations Declaration. In effect, the change represented a process to exercise Treaty provisions for UN member nations. Given the options for this process, there were initially 196 signature nations for partial or full participation (UN, 2016).

The international law community of attorneys has maintained a continuing commitment to define **Human Dignity** as the basis for preparing certain international treaties. See page 12 of this **Design Epistemology** for details.

The "Universal Declaration for the Common Good of Humanity Project" may represent the most concise, comprehensive statement, viz., constitution, for achieving a worldwide GOAL of the COMMON

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

GOOD, nation by nation (Linder 2012). Its origin can be traced to a proposal initiated by the 2012 World Forum for Alternatives in Rio de Janeiro and presented to the 2013 World Social Forum in Tunis, Tunisia. I cite a retrospective analysis of this international scenario as attended by a participant from Germany (Schroder 2025).

"Health and inequality" (Currie 2024)

For 22 years, Janet Currie has focused on the dynamics of early childhood development. I cite the **"ABSTRACT"** from her most recently reported study:

"Poorer people tend to have worse health and shorter lives than richer ones, which raises the question of whether the relationship is causal. Does bad health lead to economic inequality or vice versa? And is increasing inequality responsible for widening socio-economic disparities in health status? What policies can break these links? This commentary assumes the positive relationship between health and income as a given and explores what is known about these questions. I conclude that bad health causes economic inequality, but whether economic inequality harms health depends on the policy environment. There is much that governments can do and have done to improve the health of the poor and flatten the relationship between income, income inequality, and health (Currie 2024)."

< ADVERSE CHILDHOOD EXPERIENCES (ACEs) >

A Canadian economist, Daniel Trefler, wrote a pivotal article published in 2004 with the following title: "Looking Backward: How Childhood Experiences Impact a Nation's Wealth (Trefler 2004)." I cite the last two paragraphs of its Final Comment:

"Many polemicists have argued that no successful strategy can reconcile the business and social agendas that have polarized Canadians. They are wrong. Canada can have both, but to do so, we must clearly articulate this as a goal and we must set about identifying the policies that will take us there. We need a pragmatic business strategy that promotes both beauty and brains, as well as caring and prosperity."

"The question is *not* about sacrificing our social programs on the altar of competitiveness and prosperity. Rather, it is whether a strategic use of our social programs, especially programs that invest in children, is the best, most cost-effective way to promote productivity growth and prosperity. The answer to this question is a clear and unequivocal – Yes (Trefler 2004, pg. 27)."

Docusign Envelope ID: 3543CAEF-FBFA-41A0-8882-090170900D81

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