

Cognitive decline, dementia, and Parkinson's disease: Environmental contributors and potential pathways to prevention

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(Comments do not represent state of California)

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COGNITIVE DECLINE Sam's Story

Finally, Sam admits he hasn't been getting out much since his wife died, as she was always the one who organized the social activities.

They talk more and Lisa mentions Sam's yearly physical at the VA in a couple of weeks. Lisa asks if she could go with him so they could ask some questions together and she could be his "health advocate."

+ Definition: health advocate

Sam reluctantly agrees. He already dislikes going to the doctor, much less having someone with him.

+ Importance of social interaction on cognitive health

More Information:
Determine a "walkability score"

[AARP's Livable Communities: An Evaluation Guide](#)

[National Institute on Aging: Social Interaction and Health](#)



[Watch: Environmental Drivers of Chronic Disease and Cognitive Decline](#)



Social Interaction and Health

National Institute on Aging

- Social relationships are consistently associated with biomarkers of health
- Positive indicators of social well being associated with lower levels of interleukin-6, an inflammatory marker associated with Alzheimer's disease, cardiovascular, and other disorders
- Social isolation constitutes a major risk factor for morbidity and mortality, especially in older adults
- Loneliness is a unique risk factor for depression
 - Loneliness and depression have a synergistic adverse effect on well being in middle aged and older adults

Livable Communities:

An Evaluation Guide



AARP® Public Policy
Institute

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COGNITIVE DECLINE Sam's Story

Dr. Gomez also asks Sam if he is feeling lonely, down or depressed.

When Sam replies that he has been depressed since his wife died, Dr. Gomez asks him if he is drinking more than usual or using other kinds of drugs.

Sam says he has been drinking more than he used to, several beers a day.

When his exam is over Dr. Gomez invites Sam into his office for further discussion. Sam says he'd like his daughter-in-law Lisa to be there.

- + Alcohol and dementia risk
- + Psychosocial and Socioeconomic Stressors
- 🔑 Key Concept: Allostatic Load



Psychosocial and Socioeconomic Stressors

Studies support:

- Early life or earlier onset depression increases risk of cognitive impairment and dementia
- Major depression may increase risk for dementia but also may be a reaction to cognitive decline
- Chronic and perceived stress associated with faster decline in healthy and those with mild cognitive impairment (MCI)
- Lower SES associated with increased risk for memory decline and dementia

COGNITIVE DECLINE Sam's Story

Workplace risk factors: Effects of lead on cognitive function

While lead's role as a neurodevelopmental toxicant and a danger to infants' and children's health has been well known, more recent evidence shows that lead is a neurotoxicant across the lifespan.

Higher cumulative lifetime lead exposures, as estimated by bone lead levels, are associated with higher risk of impaired cognitive function (Shih, 2007; Bandeen-Roche, 2009; Weuve, 2009) as well as Parkinson's disease (Coon, 2006; Weisskopf, 2010; Weuve, 2013). The impacts on various measures of cognitive function are particularly pronounced in studies of older people whose bone lead levels are elevated, regardless of current blood lead levels. These findings are supported by experimental data (Wu, 2008; Basha, 2005).

Lead in the workplace

Lead is still used in some industrial processes and fuels. Some people are more highly exposed because of recycling practices, occupation, or environmental contamination. OSHA estimates that approximately 804,000 workers in general industry and an additional 838,000 workers in construction are potentially exposed to lead. Organic lead compounds continue to be used in high octane fuel in the aviation industry for piston engine aircraft.



INTERACTIVE EFFECTS OF LEAD AND STRESS ON ELDER COGNITION

It's well established that childhood lead exposure harms cognitive development in childhood. More recent evidence shows that cumulative lead exposure harms cognitive function later in life as well. Chronic stress can exacerbate the adverse impacts of lead on cognitive function.



For clinicians: Neurotoxic effects of solvents



Carbon monoxide (CO) and parkinsonism

Where is the Lead?

- Formerly used in house paint, gasoline, water-pipes, solder in food cans.
- Currently found in car batteries, building material, imported pottery, some cosmetics, some traditional (indigenous or folk) medicine, older water pipes, older house paint, some types of industrial paint, aviation fuel, fishing and wheel weights, ammunition. Used as a stabilizer in some plastics.
- Most common sources of exposures: older paint, dust, and water pipes.

Note: See unanticipated benefits of removing lead from paint and gasoline, page 10.



Watch: Lead and Neurodegeneration

Samuel M. Goldman MD, MPH, University of California, San Francisco, Division of Occupational and Environmental Medicine and Department of Neurology, Co-Director PEHSU Region 9



Key Concept: Aging begins at conception

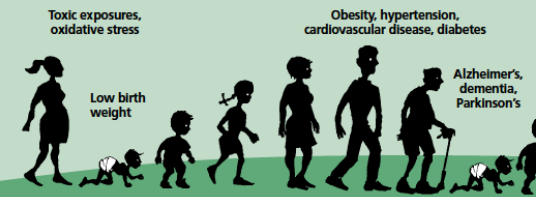


Early life exposure to lead, later life disease

Watch: Lead and Neurodegeneration
Samuel M. Goldman MD, MPH, University of California, San Francisco, Division of Occupational and Environmental Medicine and Department of Neurology, Co-Director PEHSU Region 9



Early life experiences can influence later-life health, disease.



Aging begins at conception.

Early Life Lead Exposure and Later Life Dementia

- Monkeys given lead from birth to one year
 - Levels 19-25 mcg/dl, similar to some children
- At 23 years
 - Increased expression of AD related genes including amyloid precursor protein APP
 - Altered levels and distribution of plaques in frontal cortex
- Epigenetic changes supported as mechanism of early life lead exposure resulting in AD related changes later in life

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+ Air pollution and the brain



Watch: USC Leonard Davis School of Gerontology: Air pollution and dementia in older women



Watch: Dr. Perry Hystad, Oregon Environmental Council: Diesel exhaust exposure and dementia

Air pollution and the brain

Air pollution is a complex mixture of: particles, gases, ozone, carbon monoxide, and nitrogen and sulfur oxides; metals such as lead and manganese; volatile organic compounds; and lipopolysaccharide (LPS), among other constituents. Particulate air pollution is comprised of complex, variable mixtures of soot, metals, and chemicals from industrial and natural sources. The major human source of air pollution in the modern world is fossil fuel combustion in motor vehicles and industry.

Respiratory and cardiovascular effects of ambient air pollution are well established. Growing evidence shows that it also harms the brain.

Autopsy studies comparing the brains of even relatively young people who had died accidental deaths living in highly polluted cities compared with those living in clean-air cities found numerous inflammatory markers, accumulation of amyloid-beta, inflammatory activation of endothelial cells lining blood vessels; and oxidative stress.

Extremely small pollution-related nanoparticles were identified in neurons, glia, choroid plexus and neurovascular units and associated with pathology in mitochondria, endoplasmic reticulum, axons, and dendrites (Gonzalez-Maciel, 2017).

A large population-based prospective study in Canada found a four percent increased risk of dementia with

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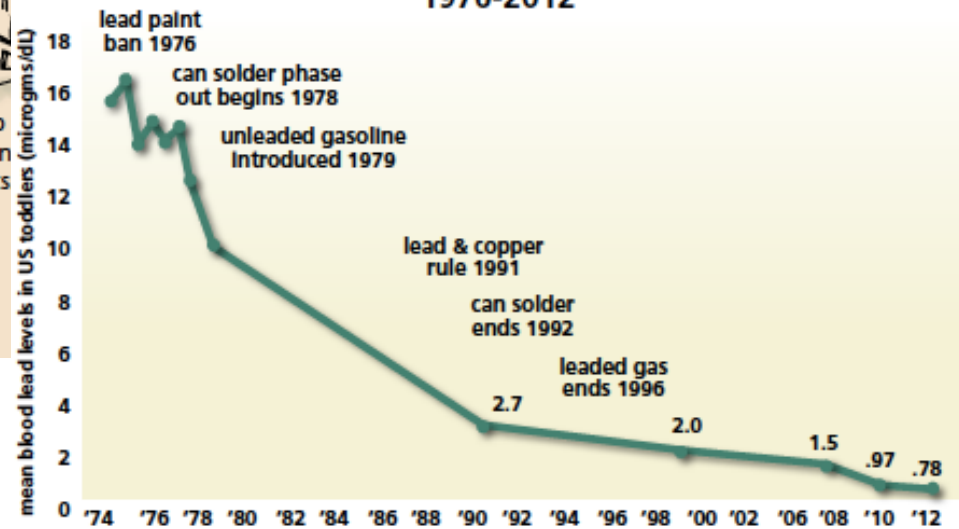
Public Policies Make a Difference

Recommendations at the public policy level:

PUBLIC POLICY LEVEL



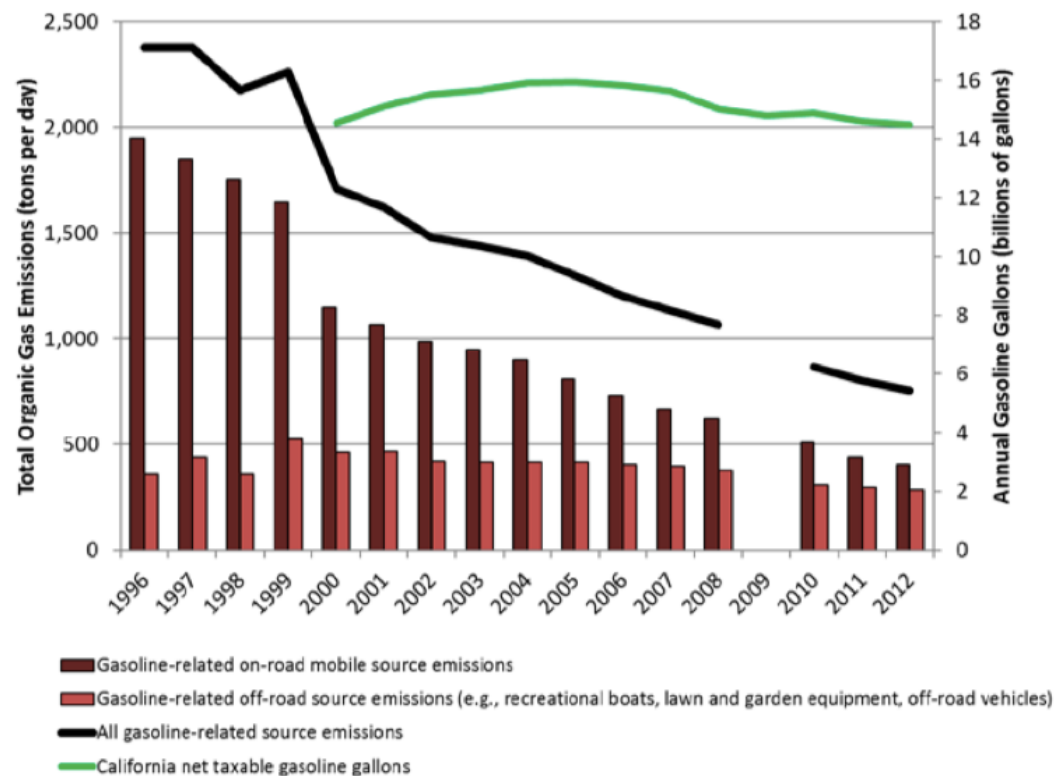
PUBLIC POLICIES THAT MAKE A DIFFERENCE
Mean blood lead levels in toddlers in the US population 1976-2012



California gasoline related emissions drop 70% from 1996

- Same amount of gas used
- 95 of top 100 VOCs Decreased
- Attributable largely to regulation and gas reformulation

Gas Related Air Pollutants in California
Trends in Exposure and Health Risk OEHHA
<https://oehha.ca.gov/air/report/gasoline-related-air-pollutants-california-trends-exposure-and-health-risk-1996-2014>



Data from CARB Emission Inventory and State Board of Equalization. Mobile source emissions estimates not available for 2009.