A Challenge: **Lead is Less Toxic than Thought.**

Or: Is The Establishment Science Exaggerated?

Author: Geoffrey H Sherrington, scientist.

**Preamble.**

*Section summary: Bodies I name “The Establishment” have assumed some control of science and social attitudes that requires resistance because of errors and problems from capture and control of the topic. Lead poisoning is here chosen as an example of capture by The Establishment and its serious implications.*

In my daily reading, the last few years has seen a marked increase of articles claiming that petulant governments are doing what governments want, not what voters want.

For an Australian example, see the “Voice” Referendum of October 2023, where the vote was about 60% “No” against the government preference for special Constitutional treatment of aborigines. Australian voters were harangued by a version of the topic by The Establishment, in this example with a strong Federal government input.

For a global example of The Establishment, see the global warming/climate change topic that has led to expensive and uncertain policy changes such as “net zero carbon by 2025” pledges. The have consequences like changes to electricity supplies in many countries without significant voter input.

Generally, these preferences of governments are enabled and managed and funded by groups of people whom I label here “The Establishment”. These are aggregates of mainly political, bureaucratic, academic, activist and non-governmental Organisations (NGOs), commonly with involvement of international bodies like the Intergovernmental Panel on Climate Change (IPCC) and United Nations groups like the World Meteorological Organization (WMO) and the World Health Organization (WHO).

The Establishment has existed for long enough to reveal a pattern of how it usually acts. I have written of this pattern before, on the [blog “Watts Up With That” of July 2023](https://wattsupwiththat.com/2023/07/18/corruption-of-science-by-money-and-power/), using the specific and important example of the corruption of science behind the dose/harm relationship of toxins like radioactive isotopes, particularly the questionable Linear No-Threshold relation.

As I study this influence of The Establishment and government over-ride, I find topic after topic where there is adequate evidence of misleading conduct to require investigation. Increasingly, I am using the crude phrase “making stuff up” which is an evolving part of the methods of The Establishment, together with a reluctance of The Establishment to debate plus a willingness to ignore and even stifle counter views.

There is also evidence of corruption, not only of the wishes of others, but also of the science behind the topic. Because I wish to show alleged distortions, I have selected here a substance that everyone has long known is harmful and dangerous and is now a part of conventional wisdom.

I refer to the poisoning of people by the metal Lead, Pb, of which the World Health Organisation alleged in 2023 –

“[*There is no level of exposure to lead*](https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health) *that is known to be without harmful effects.*”

Let us dig into the Lead story and the evolution of this astounding allegation now used widely by authors of the toxicology of Lead. Is Lead actually as toxic as we are being led to believe?

**A Lead Story from Before “The Establishment” was Formed.**

*Section summary: Scientific and medical understanding of Lead poisoning has changed from high Lead concentrations with simple explanations of yesteryear to low Lead concentrations with complex, perhaps partly fabricated explanations. This is my short version of the high Lead story.*

My article here is not written recently, as are many other articles these days. It was written in episodes with hands-on experience over the course of 30 years, which is rare. Here is a brief history.

In the early 1990s my employer North Limited incidentally acquired land in Ardeer, Melbourne, Australia, formerly used for a Lead acid battery recycle factory. This land had been levelled and subdivided. It was being sold for home building because we did not want the land. Pieces of Lead metal were visible at the surface and remediation was needed.

The newish State government [body Environment Protection Authority Victoria](https://www.epa.vic.gov.au/) issued us with clean-up orders. These were so stringent that we contested them and won with costs in the Supreme Court of Victoria. (We did not ask EPA Victoria to pay our $250,000 costs). I took charge of this matter and engaged two consultants.

Dr Allen Cristophers was then a senior medical doctor in the Victorian health administration. His 40 years of study of Lead toxicity had made him a global go-to expert, with scientist partner Pamela de Silva. There are several large Lead mines in Australia, including Mt Isa (from 1923) and Broken Hill (from 1883) with associated smelters and refineries mainly at Port Pirie, Newcastle and Townsville.

The timing of their research, say 1960-2000, is “old”, but important now, because Australian Lead mines caused many medical studies, some with special cases such as [pica for Lead](https://pubmed.ncbi.nlm.nih.gov/30868957/).

*“Pica refers to the persistent, compulsive craving for and the ingestion of substances usually considered inedible …. The condition is more common among children in lower socioeconomic classes and those who are mentally handicapped or emotionally deprived. Pica is a significant cause of anaemia and lead poisoning.”*

Today, sources of Lead for ingestion are less abundant and less concentrated, with mainly dilute sources such as remnants from earlier years of leaded gasoline.

Christophers and de Silva authored the 12-page paper with 29 references that is essential reading here, “[Lead Exposure and Children’s Intelligence](https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1440-1754.1997.tb00984.x). Do low levels of lead in blood cause mental deficit?” The topic of reverse causation is introduced. Simply, rather than Lead causing IQ changes, by reverse causation those youngsters with lesser IQ are more prone to ingest Leaded materials.

*“Abstract. It is claimed by some researchers that low levels of lead cause mental deficit in young children. This causal inference is based on claimed time precedence of the lead exposure and on biological plausibility. This paper reviews the evidence for the claimed causal relationship and concludes that, although there is an inverse relationship between lead level and IQ, it is the mental deficit which causes the raised blood lead level, not the raised blood lead level which causes the mental deficit.”*

That paper is presented here as a neutral summary of research and knowledge of Lead poisoning as at year 2000 or so. Research after the year 2000, to be comprehensive and correct, would reasonably be expected to either agree with Dr Christopher’s summary or to provide data showing Christophers to be wrong.

As of mid-2024, we have the social structure of The Establishment available to test and report on the reverse causation alternative. It has failed to do this. Papers by Christophers and reverse causation are now rarely mentioned.

(Note: My version of this Christophers paper was printed at the time it was delivered in the 1990s. It is different to the linked version, but not materially so.)

I continued discussions for some years after meeting Christophers and de Silva. One meeting was about the quantity of soil ingested by youngsters, said to be the main path for Lead to enter the young body. We found that average daily ingested soil weight varied by author by more than 2 orders of magnitude, making it difficult to use such numerical weights scientifically. But they were used, unscientifically.

By 2000, considerable effort was (correctly) being expended, particularly by several US scientists, to clarify biochemical pathways of Lead that caused human illness. The stories being promoted by The Establishment did not always align with independent research.

My studies proceeded to the main scientific publications from The Establishment. It was evident that they were telling their preferred “Lead is deadly” story while repressing or ignoring objections to that theme. The Establishment had decided to tell a story of harm, when it had an option of looking for good.

 I did not know why this choice was made, apart from the journalistic saying that “If it bleeds, it leads”.

**About “The Establishment”.**

*The social structure that is causing harm to science is loosely described and named “The Establishment” for each example of perversion.*

Here are some examples of topics affected by the voluntary participation of The Establishment. Although there might be some cross-membership, generally a new version of The Establishment happens for each new topic.

The Covid-19 pandemic starting in late 2019 demonstrated aspects of The Establishment at work in most countries. It became clear that the Pharmaceutical Industry had become part of The Establishment that formed in response to the start of the pandemic.

The Pharmaceutical Industry infiltrated authorising bodies in many countries. See the Therapeutic Goods Administration in Australia. Decisions were made by bodies heavily weighted by industry personnel who among other things allowed previous and prudent careful Government plans for handling future pandemics to be rejected apparently without much discussion – certainly without the knowledge of the public. The Establishment resorted to *ad hoc* inventions of combat the pandemic on the run.

The method of operation of The Establishment can be broken down into several parts.

First, there is recognition of an emerging issue of national or global significance that is of interest to the inner, existing global part The Establishment.

Second, there is a gathering together of those parties which initiate or invite others to become part of The Establishment group formed specifically for the issue.

Third, The Establishment then asserts control of the issue to some degree or other but certainly enough to allow its continued participation. This is the stage that I name the “capture”.

Fourth, working tries are made with mass media, with The Establishment helping to distribute standardised copies of press material to ensure uniformity of the messages.

Fifth, the silencing on contrary thought and opinion is enforced by means such as newly-formed or captured Fact Check bodies.

The capture of a topic by The Establishment is not an easy or peaceful process. It involves taking functions previously the conducted by governments in particular and sharing control.

Governments are not naturally disposed to the easy release of their power and control.

The Establishment is able to intrude because of money. The Establishment could not work without the participation of a number of wealthy people and bodies, who have gathered into groups such as the World Economic Forum, WEF, and the United Nations, UN, both having adequate wealth and some demonstrated ability to call the shots.

Lately, we have had Melissa Fleming, United Nations Under-Secretary General for Communications, in October 2022 **declaring “We own the Science”** of Climate Change (my bold). As a scientist with long experience and some success, I regard this as one of the worst, confronting set of words met for many years. Nobody “owns” science; it is not a concept that can be owned, possibly apart from the small exception of Patents; it is a transient and evolving set of thought processes ever questing for improvement, derived from observation, management, inference, deduction, replication and so on, as many studious texts affirm.

Melissa Fleming seems to want to redefine the role of science and scientists in the global social fabric. She is not qualified to do this. Her words should be binned under “examples of extreme hubris” and forgotten.

<https://www.youtube.com/watch?v=ez9jP29dljI>

4. Chapter Four.

**The Establishment Capture of the Mass Media – an Example.**

*Section summary. The Establishment has captured a large part of mass media since year 2000. This allows the public to be groomed to believe The Establishment stories. The media are failing proper responsibility towards truth.*

I now expand on the Fourth point of the previous section, about media activity.

 In researching this article, I sought a top paper that described both the science and the history of the present Climate Change story. One search gave the computer company IBM, founded in 1911 and progressing through accounting machines, software for large corporations, hardware like the Personal Computer of 1981 and latterly large computers and large software programmes for many uses.

“The history of climate change. Think 2024.” By journalist Alice Gomstyn.

[*https://www.ibm.com/blog/climate-change-history/*](https://www.ibm.com/blog/climate-change-history/)

*“In its sixth assessment report, issued in 2023, the IPCC predicted that significant and timely mitigation and adaptation efforts would reduce the adverse impacts of climate change on humans and ecosystems. The panel noted that since its fifth assessment report, issued in 2014, policies and laws on climate change mitigation have expanded.*

*Ongoing mitigation efforts, however, have not forestalled tangible signs of climate change, including changing weather patterns and extreme weather events. In recent years, an increase in droughts, heat waves, wildfires and intense precipitation have been attributed to climate change, as have sea level rises and declines in Arctic sea ice. Copernicus, Europe’s climate monitoring agency, declared 2023 to be the warmest year on record.”*

<https://www.ibm.com/blog/author/alice-gomstyn/>

*“Alice Gomstyn is a veteran business and technology editor and writer with a background in journalism. Her work has appeared in The Washington Post, Business Insider, ABCNews.com and NBCNews.com, among other outlets.”*

Alice Gomstyn is not a scientist, but a journalist. It shows. Her several 5-minute reads here are simple regurgitations of work by the Intergovernmental Panel on Climate Change, IPCC. Her words might be highly proficient in the eyes of other journalists, but to this scientist they are like the treacle that our parents in the 1940s fed us when nutrition was scarce.

The Establishment capture of this IBM outlet is thorough. There is a lesson. IBM. You must use scientists to represent IBM when the topic is scientific. Use journalism where science is not the topic. To be fair, IBM is only one of many current offender corporations, but a company of its history of success ought to be able to rise above the poor quality of this effort and show leadership.

One wonders what is in it for IBM. Cui bono?

Apart from this IBM example, there have been develop,ents in recent years that change the ways in which journalism data flow. One is by the creation od central bureaux who collect, coordinate,and distribute pre-cooked articles to paying journalism clients.

A dominant example is [The group Covering Climate Now](https://coveringclimatenow.org/partners/) (CCNow) that was co-founded in 2019 by Columbia Journalism Review and The Nation magazine, in association with the Guardian and WNYC as lead media partners. It has grown quickly to provide canned articles to lazy journalists who have lost respect for professionalism.

*“Covering Climate Now helps journalists and newsrooms improve the caliber and prominence of their reporting through training, networking, collaboration, and more. Over*[*500 journalism outlets*](https://coveringclimatenow.org/partners/partner-list/)*from around the world have joined CCNow, including some of the biggest names in journalism — the Guardian, TIME, The Times of India, Al Jazeera English, Reuters, Bloomberg, Agence France-Presse, NBC, ABC, CBS News, and more — along with scores of local and special interest publications.”*

[CCNow as seen by experienced journalist Tony Thomas](https://quadrant.org.au/opinion/doomed-planet/2023/08/how-science-is-done-these-days/) of Quadrant journal is unflattering.

5. Chapter Five. **A time line about lead poisoning events.**

The United States and Australia dominate the easily searchable literature.

1690s.

 In the German city of Ulm, during the late 1690’s, there was an severe outbreak of colic that a physician found the culprit to [be litharge, a white oxide of lead](https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf).

1763.

A physician at the English court of King George III discovered that [lead fittings used to press cider caused an outbreak of colic](https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf).

1763.

Benjamin Franklin wrote about the "dry gripes" (colic) and "dangles" (wrist drop) which [affected tinkers, painters, and typesetters](https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf).

1839.

[The first “modern'' clinical description of lead poisoning](https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=ff9b6174532a042f34df98a2aa50b1ebd387397c) was Tanquerel des Planches' famous “Traite des maladies de plomb ou saturnines,'' which appeared in 1839 and was based on over 1,200 cases.

1866.

[Charles Dickens](https://www.online-literature.com/dickens/uncommercial-traveller/35/) in episode 35 of “The Uncommercial Traveller” wrote “American inventiveness would seem to indicate that before very long white-lead may be made entirely by machinery.” … “ As to the rest, the philosophy of the matter of lead-poisoning and workpeople seems to me to have been pretty fairly summed up by the Irishwoman whom I quoted in my former paper: 'Some of them gets lead-pisoned soon, and some of them gets lead-pisoned later, and some, but not many, niver; and 'tis all according to the constitooshun, sur; and some constitooshuns is strong and some is weak.'

1890s.

John C Burnham wrote “1890s, physicians in [Queensland began reporting cases of lead poisoning](https://doi.org/10.1017/S0025727300065066) in children.

1892.

In “Brisbane, Australia, its (lead poisoning) very existence was disputed by elitist physicians in Sydney. A.J. Turner, a house officer at the [Brisbane Children’s Hospital, diagnosed several children with lead intoxication](https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf) who had been given a previous diagnosis of meningitis.”

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**6. Chapter Six. The Establishment Story – Main Themes & Directions on Lead.**

*Section summary: Part of The Establishment method is to demonise, to ignore and even to cancel alternative explanations of matters of social interest. This is bad because science has long advanced by consideration of alternatives.*

**Lead poison on the wall,**

**Kills little guys and little dolls,**

**It kills them big and it kills them small,**

**And the landlord does nothing to stop it at all,**

**That death on the wall.**

*-* [*lyrics from “Lead Poison on the Wall,”*](http://www.protestsonglyrics.net/Tenants_Housing_Homeless_Songs/Lead-Poison.phtml) *© Jimmy Collier*

The demonization of Lead has many examples, some so extreme that they are propaganda. When directed at children, this is particularly troublesome and plausibly against the wishes of some parents.

The propaganda is widespread and possibly coordinated. Here is the Australian Government paying money to an organization named Health Direct to push a line that I hope to show can be demolish in a later section. They claim “Healthdirect, Free Australian health advice you can count on.”

* *“Lead can enter your body through breathing in or swallowing materials contaminated with lead, such as old paint or petrol.*
* *“Lead is a poison, and there* [*is no safe level of lead exposure for anyone.*](https://www.healthdirect.gov.au/lead-poisoning)
* *“The risk of lead poisoning is highest for unborn babies, infants and children.*
* *“You should use ‘lead alert' practices if renovating or painting your home.”*

The Establishment story is mainly about the alleged medical effects of Lead in the bodies of babies and youngsters affecting their innate intelligence, mainly as linked to IQ testing and its correlation with the measurement of Lead in their blood, either at one time or as it might change over time.

Dr Herbert L Needleman authored many papers including a [1999 history of lead](https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf) and a [2011 paper on childhood cases](https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.88.12.1871). He is a major author of The Establishment story.

It is not dirty fighting to note that [Dr Needleman had an earlier scientific conduct examination reported in a 1996 summary](https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.86.1.112-a).

*The report concluded that "Dr. Needleman was deliberately misleading in the published accounts of the procedures used in the 1979 study." The board unanimously recommended that Dr Needleman submit corrective statements to the journals in which his original studies were published and that he make his complete data set available to any investigator.”*

Dr Bruce Lanphear is another prominent author is whose titles as primary author appear in an Internet search for “Lanphear lead poisoning” in order of their publication year and title given by the search.

* *2018 Low Level Lead Exposure and Mortality in US Adults*
* *2017* [*Still treating Lead poisoning after all these years*](https://publications.aap.org/pediatrics/article-abstract/140/2/e20171400/38718)
* *2005* [*Childhood Lead poisoning prevention: too little, too late*](https://jamanetwork.com/journals/jama/article-abstract/200846)
* *2003* [*Prevention of Lead toxicity in US children*](https://www.sciencedirect.com/science/article/pii/S1530156705602201)
* *2008* [*The Contamination of Scientific Advisory Committees: A Case Study of Industry Influence on the Prevention of Childhood Lead Poisoning*](https://journals.lww.com/epidem/FullText/2008/11001/The_Contamination_of_Scientific_Advisory.62.aspx)
* *2018* [*Low-level Lead exposure and mortality in US adults: a population-based cohort study*](https://www.thelancet.com/journals/lanonc/article/PIIS2468-2667%2818%2930025-2/fulltext)
* *2019* [*Low-level Lead exposure and mortality in US adults: a population-based cohort study*](https://www.thelancet.com/journals/lanonc/article/PIIS2468-2667%2818%2930025-2/fulltext)
* *1996* [*Lead-contaminated house dust and urban children's blood Lead levels.*](https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.86.10.1416)
* *1998* [*The contribution of Lead-contaminated house dust and residential soil to children's blood Lead levels: a pooled analysis of 12 epidemiologic studies*](https://www.sciencedirect.com/science/article/pii/S0013935198938592)

In this mixture, the social sciences versus hard sciences balance chosen by Dr Lanphear has increased since 2000, to the extent that many imagine that recommendations of social movements like Diversity, Equity, Inclusion (DEI) and Environmental, Social and Governance (ESG) should be [automatic inclusions in scientific publications](https://www.diversityaustralia.com.au/diversity-equity-inclusion-in-the-workplace-a-strategic-approach-for-business-success/). Thankfully, the first flush of approval of this silly trend has hit an early wall that sees some dominant investment funds who dipped a toe in the water finding it too hot to stay there.

Also prominent with publicity is the World Health Organization of the United Nations, which is often a player in The Establishment story for Lead. Most of the many WHO Lead articles that I have read stress catastrophe or predict harm. [One October 2021 example](https://iris.who.int/bitstream/handle/10665/346775/9789240037656-eng.pdf?sequence=1) has references to a dozen more WHO papers. I have not read all of them because they have non-scientific conclusions like the following.

*Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world. It is a cumulative toxicant that affects multiple body systems, including the neurological, haematological, gastrointestinal, cardiovascular, immune and renal systems. Children are especially vulnerable to the neurotoxic effects of lead, and even relatively low levels of exposure can cause serious and, in some cases, irreversible neurological damage.*

Objections to The Establishment Lead papers falls into three main groups that we shall now cover.

There are many papers that dispute this fundamental, alleged correlation, but they are not prominent in typical searches. A short sample follows. The interest is not in so much in the arguments that they promote, but more in the lack of response to the objections by those who promote “the black armband” treatment where a good crisis outweighs good news.

There are many papers that dispute the conventional wisdom about lead poisoning.

Alan S. Kaufman in May 2001 published “[How dangerous are Low (Not Moderate or High) Doses of Lead](https://doi.org/10.1016/S0887-6177%2800%2900090-1) for Children’s Intellectual Development?”. Many issues are raised in a combative style that expresses many concerns about the alleged correlation that are valid to address, such as a bias in choice of people to studied.

*“Ultimately, however, the case for the relationship of low blood lead to IQ loss seems to rest tenuously on data obtained from samples that included numerous subjects with moderate to severe levels of blood lead.”*

**7. Chapter Seven. Possible Origins of the Correlation, Lead Poisoning and IQ.**

*Section summary: The Establishment story about Ingestion of low concentrations of Lead started to involve children and their intelligence. Some reasons for this direction are proposed here.*

Year1979 saw two influential United States papers, their first authors being H. L. Needleman with “Deficits in Psychologic and Classroom Performance of Children with Elevated Dentine Lead Levels” and R. H. Bradley with “Home Observation for Measurement of the Environment: a Revision of the Preschool Scale.” They seem to have catalysed more intense research into the alleged correlation, though there could have been more catalysts elsewhere.

Did the authors give some reasons for their need for research? Yes, [Needleman et al noted a recent growing debate](https://d1wqtxts1xzle7.cloudfront.net/87171445/1979-needleman-libre.pdf?1654654136=&response-content-disposition=inline%3B+filename%3DDeficits_in_Psychologic_and_Classroom_Pe.pdf&Expires=1723115555&Signature=CfT~9mobIWW8u4~chFYe4z4qzjwvYu4PIrEqvcNqokdL0yOlr0KS9f5RG4MZZ7OkpmRKaicwCjOxV~1j1xxrukjr3TX~sV3sGE5RJshqdzJxvYmA9W50znmX2bk56t1tUvwMH-hH8VFxizgpvL2sO7OLmzwu8IiZsw~l89ts6lfmF07YmvpjWASmiVakJexFg49Gb~xdD6qe4uml4gk8~tKma-A1r3inxPEOrMXBFAxaDirFBctBgwtJD9UyXgtxlZTH7eOM9KG-k39rXDUtCXaG2Silbucw9TQnvl-F1o84CF7dAAgZ-Mvm9d3cFPOLkIjILclthpelxZxoT5Qt-A__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA) and wrote that

*“The neurotoxic properties of lead at high dose are well known and not a subject of general controversy. 1,****2.*** *A source of considerable debate, however, is whether or not blood lead levels below those associated with obvious symptoms have adverse effects on the brain. 3,4****.*** *Because the symptoms of milder lead intoxication are not dramatic, and may therefore evade precise identification, many efforts have been made to determine whether these lesser levels of lead are associated with undetected neuropsychologic impairment. 5,11.”*

[The clinical symptoms of this milder intoxication in children](https://www.mayoclinic.org/diseases-conditions/lead-poisoning/symptoms-causes/syc-20354717) are said to include:

* *Developmental delay*
* *Learning difficulties*
* *Irritability*
* *Loss of appetite*
* *Weight loss*
* *Sluggishness and fatigue*
* *Abdominal pain*
* *Vomiting*
* *Constipation*
* *Hearing loss*
* *Seizures*
* *Eating things, such as paint chips, that aren't food (pica)*

*Babies exposed to lead before birth might:*

* *Be born prematurely*
* *Have lower birth weight*
* *Have slowed growth*

The other main author, [Bradley at al went straight to statistical analysis](https://europepmc.org/article/med/93417) for no started reason of interest, setting a pattern that many others followed.

**8. Chapter Eight. The H. L. Needleman Final Paper.**

*One of the main pushers of Lead harm to the IQ of children was H Needleman. His last paper is analysed here because it summarised much of his earlier motivation.*

In recognition of his prominence in the global development of the blood Lead/intelligence relationship, we show some extracts from this July 2019 paper with 16 authors including Needleman, who died in July 2017.

Erratum: “Low-Level Environmental Lead Exposure and Children’s Intellectual Function: An International Pooled Analysis”. The paper has a useful 50 references. Here are some extracts, dealing mainly with harm to youngsters with the lower end of blood Lead concentrations, below 10 µg/dL or so, down to the lower limit of detection. Hitherto, this cluster was long considered to carry too little Lead to cause clinical effects.

*“Lead is a confirmed neurotoxin, but questions remain about lead-associated intellectual deficits at blood lead levels <10 μg/dL and whether lower exposures are, for a given change in exposure, associated with greater deficits. The objective of this study was to examine the association of intelligence test scores and blood lead concentration, especially for children who had maximal measured blood lead levels <10 μg/dL. We examined data collected from 1,333 children who participated in seven international population-based longitudinal cohort studies, followed from birth or infancy until 5–10 years of age. The full-scale IQ score was the primary outcome measure.”*

The summary key finding was:

“For a given increase in blood lead, the lead-associated intellectual decrement for children with a maximal blood lead level <7.5 μg/dL was significantly greater than that observed for those with a maximal blood lead level ≥7.5 μg/dL (𝑝=0.02). We conclude that environmental lead exposure in children who have maximal blood lead levels <7.5 μg/dL is associated with intellectual deficits.”

This type of finding allowed the sweeping allegation that there was no safe level of Lead in the blood. However, there ware some reservations emerging.

“There is emerging evidence that lead-associated intellectual deficits occur at blood lead levels <10 μg/dL. In the Rochester Longitudinal Study, there was an estimated reduction of 7.4 IQ points associated with an increase in lifetime mean blood lead from 1 to 10 μg/dL ([**Canfield et al. 2003**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c12)). In a re-analysis of a Boston, Massachusetts, cohort, a similar finding was observed among children whose maximal blood lead level was <10 μg/dL ([**Bellinger and Needleman 2003**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c7)). Questions about an effect of lead at blood lead levels <10 μg/dL persist, however, because of the relatively small numbers of children with maximal blood lead levels <10 μg/dL in the Rochester Longitudinal Study ([**Rogan and Ware 2003**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c40)). Other studies were limited because they involved children whose blood lead levels may have exceeded 10 μg/dL at some point in their lifetime or because important covariates, such as maternal IQ scores, were not always available ([**Fulton et al. 1987**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c22); [**Lanphear et al. 2000**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c25); [**Schwartz 1994**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c44), [**Schwartz and Otto 1991**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c45); [**Walkowiak et al. 1998**](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#core-c47)). Because of the policy implications of this research, it is critical to estimate with greater precision the exposure-response relationship at blood lead levels <10 μg/dL.”

In the next section of this article we see 4 objections to the clarity of the blood Lead/intelligence research. That effect shows in this graph from the final paper which is their Figure 2.



Figure One. Linear models for each cohort study in the pooled analysis, adjusted for maternal IQ, HOME score, maternal education, and birth weight. The figure represents the 5th to 95th percentile of the concurrent blood lead level at the time of IQ testing.

The various trends of the fitted linear regressions in Figure One from site to site demonstrate the difficulty faced when devising mechanisms and remediation for the blood Lead/ Intelligence relationship, plus the poor science shown by those claiming that the relationship is adequately understood for assisting health policy formulation.

Authors:

[BruceP. Lanphear](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con1), [Richard Hornung](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con2), [Jane Khoury](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con3), [Kimberly Yolton](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con4), [Peter Baghurst](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con5), [David C. Bellinger](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con6), [Richard L. Canfield](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con7), [Kim N. Dietrich](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con8), [Robert Bornschein](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con9), [Tom Greene](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con10), [Stephen J. Rothenberg](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con11), [Herbert L. Needleman](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con12), [Lourdes Schnaas](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con13), [Gail Wasserman](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con14), [Joseph Graziano](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con15), and [Russell Roberts](https://ehp.niehs.nih.gov/doi/full/10.1289/EHP5685#con16)

**9. Chapter Nine. Four Broad Objections to The Establishment Methodology.**

*The 4 broad objections are indirect measurements, large measurement uncertainty, difficult confounding factors and failure to combat reverse causation.*

1. Indirect measurement.

Pre-1990 papers dealt dominantly with high doses of Lead, including Lead encephalopathy that allegedly occurs with high whole-blood Lead levels over 80 to 100 μg/dL. Encephalopathy is a specific condition that is not seen with the low levels of blood Lead alleged to cause mental retardation in children. Observation of this encephalopathy should cause investigation of Lead poisoning. On the other hand, there appears to be no strong symptom that should cause investigation of low levels of Lead poisoning.

Lead encephalopathy is rare. For the United States, a paper from 1928 gave fatality rates per million population between [2.4 and 2.7 deaths per year over the 14 years 1910 to 1924.](https://www.govinfo.gov/content/pkg/SERIALSET-08791_00_00-002-0489-0000/pdf/SERIALSET-08791_00_00-002-0489-0000.pdf)

(Jumping the gun, in [a paper by Lanphear in April 2018](https://doi.org/10.1016/S2468-2667%2818%2930025-2) we read that -

*“Our findings suggest that, of 2.3 million deaths every year in the USA, about 400 000 are attributable to lead exposure, an estimate that is about ten times larger than the current one.”*

This equates to a rate of 1223 deaths per million people, compared to the 1920s rate of 2.5 or so deaths per million. It does not help that these 1223 alleged deaths per million each year do not appear on death certificates as the cause of death.)

Deaths from high doses of Lead, with diagnostic Lead encephalopathy is clinically different to alleged deaths from low doses, which have no or few clinical symptoms to prompt diagnosis by inspection. Instead, diagnosis is on the basis of the analysed levels of Lead in the blood of people being investigated for one purpose or another. In the US, the present threshold is given by many papers, this from [the US National Library of Medicine, 2015.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4961898/#:~:text=In%20cases%20of%20chronic%20exposure,is%20a%20cause%20for%20concern)

*“In cases of chronic exposure, lead often sequesters in the highest concentrations first in the bones then in the kidneys. According to the US Centres for Disease Control and Prevention and the World Health Organization, a blood lead level of 10 μg/dL or above is a cause for concern. However there is no threshold value below which lead exposure can be considered safe.”*

*CDC uses a*[*blood lead reference value*](https://www.cdc.gov/lead-prevention/php/data/blood-lead-surveillance.html)*(BLRV) of 3.5 micrograms per deciliter (µg/dL). This reference level helps identify children with BLLs higher than most children's levels. CDC estimates that approximately 500,000 children in the United States have BLLs at or above the BLRV. Healthcare providers can use CDC's*[*Recommended Actions Based on Blood Lead Level*](https://www.cdc.gov/lead-prevention/hcp/clinical-guidance/index.html)*to develop a plan of action for their patient. More information about sources of exposure, risk factors, testing and prevention is provided below.*

<https://www.cdc.gov/lead-prevention/about/index.html?CDC_AAref_Val=https://www.cdc.gov/nceh/lead/%2520publications/PrevLeadPoisoning.pdf>

[Centres for Disease Control US, Atlanta, Georgia](https://www.cdc.gov/lead-prevention/about/index.html?CDC_AAref_Val=https://www.cdc.gov/nceh/lead/%2520publications/PrevLeadPoisoning.pdf), undated.

1. Large measurement uncertainty.

The growing debate in 1979 would not have been strong without evidence of a link between blood Lead and IQ in general. For example, what was the range of correlation coefficients reported from these earlier studies? It turns out to be quite variable from one study to another, as expected when there are so many potentially confounding factors with various amounts of available measurement data to correct for them.

[Bradley et al gave some numbers.](https://europepmc.org/article/med/93417)

*“Information pertaining to a revision of the Caldwell HOME Inventory for use with families of children ages 3 to 6 was presented. Factor and item analyses were used as a basis for reducing the number of items from 80 to 55 …. Concurrent and predictive validity studies indicated that the HOME scales significantly correlated with IQ (as high as r = 0.58). Low to moderate correlations were obtained between HOME scores and SES measures, with significant correlations ranging from 0.30 to 0.65.”*

[Baghurst et al in the New England Journal of Medicine](https://www.nejm.org/doi/full/10.1056/NEJM199210293271805) published correlation coefficients in October 1992 from a study at Port Pirie, South Australia, where Lead smelting of Broken Hill ores occurred at large scale.

*“We measured IQ scores in 494 seven-year-old children …. In whom developmental deficits associated with elevated blood lead concentrations had already been reported at ages two and four years. … We found inverse relations between IQ at the age of seven years and both antenatal and postnatal blood lead concentrations. …. For an increase in blood lead concentration from 10 µg per decilitre (0.48 µmol per litre) to 30 µg per decilitre (1.45 µmol per litre) …. The estimated reduction in the IQ of the children was in the range of 4.4 points (95% confidence interval, 2.2 to 6.6) to 5.3 points (95% confidence interval, 2.8 to 7.8). This reduction represents an approximate deficit in IQ of 4 to 5 percent.”*

There was a [survey in New Zealand by Reuben at](https://pubmed.ncbi.nlm.nih.gov/28350927/) al reported in March 2017 of 1,037 participants born in 1972-3, blood sampled at age 11, with The IQ (primary outcome) assessed at age 38 years using the Wechsler Adult Intelligence Scale. After adjusting for confounders, each 5-µg/dL higher level of blood Lead in childhood was associated with a 1.79-unit lower score (95% CI, −3.17 to −0.40) in socioeconomic status.

There are many publications that seem to arrive at about this level of change, very roughly a 2 unit change for each 5-µg/dL higher level of blood Lead.

*“ Like all statistical quantities*[*, any particular estimate of IQ has an associated standard error*](https://en.wikipedia.org/wiki/Intelligence_quotient#:~:text=Like%20all%20statistical%20quantities%2C%20any,low%20as%20about%20three%20points.) *that measures uncertainty about the estimate. For modern tests, the confidence interval can be approximately 10 points and reported*[*standard error of measurement*](https://en.wikipedia.org/wiki/Standard_error_of_measurement)*can be as low as about three points.*[*[86]*](https://en.wikipedia.org/wiki/Intelligence_quotient#cite_note-86)*Reported standard error may be an underestimate, as it does not account for all sources of error.*[*[87]*](https://en.wikipedia.org/wiki/Intelligence_quotient#cite_note-87)*”*

Most researchers at their times have adopted this rule of thumb as a reason to continue with studies to hopefully find a cure for the condition. However, the statistics are such that a prime variable that has a large uncertainty, Intelligence Quota IQ, is being correlated with another prime factor that also has a large measurement uncertainty, both for one-off sampling and time series work. The two factors combine to create even greater uncertainty. In some fields of investigative science, correlation factors of 0.99 down to (say) 0.75 are suitable material for drawing positive conclusions, while correlation coefficients between (say) +0.4 and -0.4 indicate noise with little prospect of firm, positive conclusions. In this case of IQ and blood Lead, we are rather much in the wilderness, where errors from the identification and quantification of the confounding factors can dominate the analysis.

The alleged effect of Lead on IQ has far from a positive proof. Complications arise from measurement uncertainty being poorly defined, which in practical terms increases the frequency of misdiagnosis.

1. Difficult confounding factors.

It seems to be about this year of 1979 that authors more or less assumed that low levels of Lead caused the symptoms stated, while there were many confounding factors to be taken into account.

It is currently difficult to list the main confounding factors. Authors tend to use personal selections that need not match those of other authors. I did a quick survey of about 20 papers and found these confounding factors shown in the order of the search:

*Wilson and Wilson (*[*Citation2016*](https://www.tandfonline.com/doi/full/10.1080/10408444.2020.1842851)*) considered maternal IQ, HOME score, SES, parental education, birthweight, smoking, and race as characteristic variables which may have interaction effects with the blood lead variable.*

[*Landingham et al 2020*](https://www.tandfonline.com/doi/pdf/10.1080/10408444.2020.1842851) *- Birth order, Birth weight, Gestational age, HOME score, Mother’s age, Marital status at delivery, Maternal Maternal IQ, Ethnicity Categorical, Gender of child, Alcohol use during pregnancy, Tobacco use during pregnancy.*

[*NHMRC Australia 2015*](file:///C%3A%5CUsers%5CGeoff%5CDocuments%5CTODAY%20THINGS%5Cperson%E2%80%99s%20age%2C%20the%20amount%20of%20lead%2C%20whether%20the%20exposure%20is%20over%20a%20short-term%20or%20a%20longer%20period%2C%20and) *- person’s age, the amount of lead, whether the exposure is over a short-term or a longer period, and the presence of other health conditions.*

[*Tong & Lu, 2000*](https://www.sciencedirect.com/science/article/abs/pii/S1047279700001769) *- Four covariates (i.e., quality of home environment, socioeconomic status (SES), maternal intelligence, and parental smoking behaviour) met the conventional CE criterion (⩾10%), whereas 14 variables met the*[*ST*](https://www.sciencedirect.com/topics/mathematics/significance-test)*criterion (p ⩽ 0.25.*

[*Jia et al 2023*](https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2810983?utm_campaign=articlePDF&utm_medium=articlePDFlink&utm_source=articlePDF&utm_content=jamanetworkopen.2023.39108) *- The covariates for children: maternal age at delivery, prepregnancy body mass index, maternal education status, mode of delivery, gestational age at birth, paternal education status, annual family income, the top 10 genetic principal components, and blood Pb levels in children.*

[*Kuang et al 2023*](https://www.sciencedirect.com/science/article/pii/S0160412020320857) *- age, gender, parents’ education and parents’ occupation.*

Confounding variables are complicated because remedial action to reduce alleged Lead poisoning is itself might be a confounding factor. The average blood Lead concentration in children as been falling over the years in some countries in many surveys, an example being in Figure 1,

*“579 patients were included in the analysis. Blood leads of 25-29, 20-24, 15-19, and 10-14 microg/dL required 24.0, 20.9, 14.3, and 9.2 months, respectively, to decline to less than 10 microg/dL. For continuous data, a* [*linear relationship was described by the following equation*](https://pubmed.ncbi.nlm.nih.gov/11407501/)*: Time (# of months required to achieve a blood lead less than 10 microg/dL) = 0.845 x peak lead; p < 0.0001.”*

Remedial treatments and actions like the cessation of leaded gasoline for most classes of cars and trucks are themselves confounding factors. The average child blood Lead concentration has changed by year as shown in the following Figure One, Blood Levels US children aged 1 to 11 1976 to 2016.

[Egan, K et al, March 2021.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7969125/)



Figure Two. Blood Levels US children aged 1 to 11 1976 to 2016.

More complications arise because the Lead burden has changed with time. A major burden, from leaded gasoline, has changed in the US roughly thus:

1950s leaded gasoline common

1970s unleaded introduced to reduce alleged health problems

1996 leaded gasoline phased out completely for most motor vehicle uses.

This set a variable pattern of Lead able to form a burden for people, but the detailed pattern affecting a person at a place cannot be known precisely.

There is a large cost when Lead content of gasoline is reduced, because the octane rating is reduced and more gasoline is needed to perform the same work. This cost is a confounding factor because the timing of changes affected the Lead burden and so the pattern of blood Lead concentration changes in the population.

[The US EPA calculated this cost in 1985](https://nepis.epa.gov/Exe/ZyNET.exe/9100YK16.txt?ZyActionD=ZyDocument&Client=EPA&Index=1981%20Thru%201985&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C81THRU85%5CTXT%5C00000021%5C9100YK16.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=14). United States Environmental Protection Agency, Costs and Benefits of Reducing Lead in Gasoline: Final Regulatory Impact Analysis, 1985.

*“Our base case results suggest that the final rule will cost less than $100 million for the second half of 1985, when the 0.50 gplg limit will apply. For later years, when the 0.10 gplg limit will apply, the estimated costs range from $608 million in 1986 to $441 million in 1992”.*

Conversely, The Establishment has argued large dollar cost savings from the reduction of medical spending on reduced cases of Lead poisoning.

[Savings from ban on leaded gasoline globally](https://www.unep.org/news-and-stories/press-release/era-leaded-petrol-over-eliminating-major-threat-human-and-planetary)

*“Official end of use of leaded petrol will prevent more than 1.2 million premature deaths and save USD 2.45 trillion a year.“*

UN Environment programme, August 2021.

Some of the confounding factors have been analysed by correlation analysis, others by multivariate statistics. Some are true covariates, some are merely correlatives, some without stated mechanisms. In statistical studies, both correlation and multivariate statistics work better when the variables are constant in a time or at a place.

Large uncertainties can result when the main factors vary with time in ways that must be modelled in the absence of actual measurements. This impediment seems to be severe in the association of blood Lead with IQ, but in my view the uncertainty it causes is much larger than many authors consider.

1. Reverse Causation.

Finally, there is the under-addressed [topic of reverse causation](https://www.geoffstuff.com/leadex.docx) documented by de Silva and Christophers at the Second International Occupational Hygiene Association Conference in Hong Kong Co-Sponsored by the American Industrial Hygiene Association, date uncertain, soon after 1995*.* In short, reverse causation suggests that children of lower IQ are more likely to ingest Lead contamination, so giving the noted correlation of IQ with blood Lead levels.

*“Conclusion. The arguments which have been put forward in support of the view that low level Lead exposure causes mental deficit cannot be sustained and the reverse causation hypothesis is a much more plausible explanation of the facts.”*

**10. Chapter Ten. The Demolition.**

*Section summary: The Establishment alleges that there is no exposure to Lead without harm. This claim is ridiculed.*

This WHO catch phrase was mentioned earlier.

“[*There is no level of exposure to lead*](https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health) *that is known to be without harmful effects.*”

Therefore, all levels of Lead are said to be harmful. We shall examine all levels of lead, from 1 atom to pure metal, to test that WHO assertion.

To simulate real life, the adopted unit of concentration here starts with 1 millilitre of blood with various amounts of Lead expressed as the number of atoms of Lead in that millilitre (mL).

In Chemistry, Avogadro’s Number tells us that the gram atomic weight of an element contains 6.023 \* 10^23 atoms. The atomic weight of lead with its isotopes included is 207.2 gram, so 1 μg of Pb has 2.9 x 10^15 atoms.

In the medical papers that have been referenced here, the concentration of Lead in blood that has triggered past investigations is 10 micrograms of Lead per decilitre of blood, abbreviated to 10 μg/dL. There are 0.01 decilitres to a mL. A microgram is one millionth of a gram. Converting to conventional IUPAC units gives a starting point for 1 millilitre of blood of 0.1 μg/mL. This contains 2.9 x 10^14 atoms.

A lowest blood concentration would be 1 atom in this 1 mL sample. The trigger point is 2.9 x 10^14 atoms. Pure lead (which cannot be put into this 1 mL, except in concept) would be about 10^ 21 atoms in this hypothetical.

These can be graphed. From that graph, all levels below “Detection limit” cannot be measured, so are unable to reveal their properties. Yet, WHO claims they are harmful. There is no evidence to support this nonsense statement. Indeed, for numerous other substances[, there is an effect named “hormesis”](https://en.wikipedia.org/wiki/Hormesis) by which smaller and smaller quantities (down to some limit, perhaps) have been shown to benefit the human condition., not harm it.



Figure Three. Created for this article, a view of some parts of the harm/dose responses over a large range of Lead concentrations.

Google searches for hormesis by Lead did not return hits related to humans. There was one paper about plants growing in suburbia.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8514553/>

A related issue is about [analytical chemistry detection limits](https://iris.who.int/bitstream/handle/10665/77912/9789241502139_eng.pdf;jsessionid=FB4510C6D2D1681B4BCC9495E857FA6D?sequence=1). According to the WHO, these range from about 1 microgram per decilitre for graphite furnace atomic absorption spectrometry to 0.1 micrograms per decilitre for the more expensive inductively coupled plasma method. The detection limit is therefore not far below the concentrations of medical interest. It follows that it is difficult to impossible to analyse the properties of that 10 orders of magnitude about which the guesses are made. In rough graphical form, we see the large uncharted territory that the WHO says is dangerous, when it contains no data to enable any conclusion.

Scientists complicit in this chicanery should be struck off the list.

**11. Chapter Eleven. When Conventional Wisdom Morphs Into Absurd Pseudoscience.**

*Section summary: The Establishment with its poor standards of science has opened the door to more poor science. An example by B Lanphear is analysed.*

The ready acceptance and growth of The Establishment story relating Lead poisoning to altered childhood intelligence might have allowed some authors to adopt stretches of the imagination.

Such was my conclusion about this [publicised paper by Dr Bruce Lanphear et al, March 2018](file:///C%3A%5CUsers%5CGeoff%5CDocuments%5CTODAY%20THINGS%5CLow-level%20lead%20exposure%20and%20mortality%20in%20US%20adults%3A%20a%20population-based%20cohort%20study%20-%20The%20Lancet%20Public%20Health), in the highly regarded journal The Lancet Public Health.

Here is his opening salvo.

“Deaths from cardiovascular disease have declined strikingly in the USA over the past 50 years, but this disease is still the leading cause of death. In 2013, cardiovascular disease accounted for more than 800 000 deaths in the USA (about one in every three deaths), with total costs exceeding US$300 billion annually. Cardiovascular disease mortality is usually attributed to tobacco use, hypertension, diabetes, and lack of physical activity. Environmental lead exposure is an established risk factor for hypertension and a possible risk factor for cardiovascular disease mortality, but its contribution to deaths in the USA is poorly defined.

**“Our findings suggest that, of 2.3 million deaths every year in the USA, about 400,000 are attributable to lead exposure, an estimate that is about ten times larger than the current one**.” (My bold)

The authors thankfully explain the surge.

*The key reason for this difference is because the previous estimate assumed cardiovascular disease was only evident at concentrations of lead in blood as low as 5 μg/dL. Our findings show that concentrations of lead in blood lower than 5 μg/dL (<0·24 μmol/L) are associated with all-cause mortality, cardiovascular disease mortality, and ischaemic heart disease mortality. … These results suggest that low-level lead exposure is an important, largely overlooked, risk factor for death in the USA, particularly for cardiovascular disease deaths.*

Earlier in this article, we covered 4 reasons for concern about the relations between blood Lead and harm, summarised as indirect measurement, large measurement uncertainty, difficult confounding factors and reverse causation. The first three of these are at play in a large way for Lanphear’s astounding alleged mortality increase.

Recall that at first, Lead poisoning was about high Lead levels over 80 μg/decilitre and clinical symptoms like encephalopathy. Over time, interest attached to lower and lower concentrations of blood Lead, with trigger levels of around 10 μg/decilitre and vague symptoms that were often not evident unless diagnosis incidentally included blood Lead analysis. Then, the bar was lowered even more to suggest that any blood Lead concentration above the detection limit might indicate Lead poisoning, until reaching the ultimate abuse of the Linear No Threshold theory, that all levels of blood Lead are dangerous. (But see my Demolition).

Lanphear’s numbers do not work in the absence of authority to change trigger points in blood Lead concentrations. By authority, I mean the ability to select a personal preference for an effect to help the story along. Lanphear has essentially ordained that all levels of blood Lead can contribute to US mortality, but there is a formidable hurdle. There is no dissection into diffuse blood Lead levels (Lanphear’s choice) and blood Lead levels with associated clinical features and blood Lead levels with serious clinically diagnosed symptoms and blood Lead levels with fatal outcomes.

The actual deaths in the US each year that show Lead poisoning on the death certificate as the cause of death are tiny and hard to find. For the US, past years 1979-1998 are indicative of present levels. From a February 2003 paper, Deaths related to Lead Poisoning in the United States, 1979-1998, by [Rachel B Kaufmann](https://pubmed.ncbi.nlm.nih.gov/?term=Kaufmann+RB&cauthor_id=12584008)[1](https://pubmed.ncbi.nlm.nih.gov/12584008/#full-view-affiliation-1), [Catherine J Staes](https://pubmed.ncbi.nlm.nih.gov/?term=Staes+CJ&cauthor_id=12584008), [Thomas D Matte](https://pubmed.ncbi.nlm.nih.gov/?term=Matte+TD&cauthor_id=12584008)

  *“An estimated 200 lead poisoning-related deaths occurred from 1979 to 1998. Most were among males (74%), Blacks (67%), adults of age >/=45 years (76%), and Southerners (70%). “*

This amounts to an annual official inscription of about 20 cases per year for the whole USA. Most of these cases arose from drinking moonshine alcohol that was distilled in pipes with lead solder or walls.

The contrast of the official 20 deaths per year on certificates with 400,000 deaths per year by Lanphear’s method is too stark. Lanphear’s method is also inadequately specific. If a widespread extent of low-level body damage from low levels of Lead in the body can be used as the major factor for increased terminal cardiovascular disease, one has to first eliminate other causes that (imaginatively) might include Mercury poisoning, Cobalt poisoning,  *Escherichia coli*from worsening sewer system overflows, TB, Covid-19, Covid-19 vaccine damage and a host of other afflictions that could put pressure on the cardiovascular systems of many people each year and could provide a mechanism similar to that evoked by Lanphear for Lead.

Covid-19 happened after Lanphear’s paper, but it is being associated with a huge increase of excess mortality in most countries of the globe, by mechanisms still being investigated and not yet reported. But, imagine the volume and complexity of research required to separate Lanphear’s alleged 400,000 deaths each year from lead, from the similarly large number of excess deaths after Covid-19.

There will be such a paper and it will be interesting. If it uses proper, hard science and if it is not more of “making stuff up” then it will be valuable.

We then might avoid the stupidity of the current Google search that asks “how many US people die from lead poisoning each year” and returns as the first hit a quote from The Lancet –

*“Although we cannot exclude residual confounding, we estimate that about 400 000 deaths are attributable to lead exposure every year in the USA, of which 250 000 are from cardiovascular disease.12 Mar 2018”.*

I have shown a competing estimate of 20 deaths per year in the US whose cause of death on the certificates is Lead poisoning. The real figure probably sits between these two extremes, 400.000 and 20, but who knows where?

**Conclusion.**

A recreational, retired, non-specialist scientist author cannot expect to challenge The Establishment’s entrenched wisdom on a major topic – and win.

On the other hand, The Establishment can become so certain that its story is correct that it ceases investigations of criticisms of their story. My case is that the blood Lead/Intelligence story suffers this way. My suggestion is that the criticisms in the literature be taken more seriously. The stakes are high because of the large sums of money being spent on the topic. The past cost of banning leaded gasoline has been large and it has resulted in less efficient use of the energy in petroleum.

**12. Chapter Tewlve. Author’s notes and caveats:**

 Because “lead” has several meanings, I capitalise it to “Lead”, except where it is in a quote by others.

Also, I deal mainly with blood Lead concentrations, while many papers on dentine (teeth) material and some other body parts, too complicated to weave into this story.

I am a general scientist with emphasis on chemistry. Current literature on Lead poisoning often delves into highly specialised areas like medical biochemistry on which I am not qualified to comment apart from the obvious like breaches of logic.

It could happen that my whole article is invalid because it is contradicted by one or more conclusive specialist papers. If so, I apologise.

However, there is a large literature about Lead poisoning. I have not been able to study it all because it is too large. The best I can do is to avoid falling into one of the biased “camps” and so showing bias.

There is not only bias. There is a large difference between people and the ways that they think about other people. For example, my view is from the perspective of an elderly Australian citizen who has no idea of the ways that the 1.4 billion people in India live and think about daily life.

My language of English precludes written work in other languages.

In recent years, many authors have done research by literature searches as opposed to observation and measurement. Here, I have done this using Google. There have been comments about its political leanings and about how well it represents the “average” view. I have used the first hit of a Google search unless it fails badly to represent the point I wish to make. This all leads to a form of bias.

………………………………

**(end)**

**REFERENCES IN MORE DETAIL.**

**Preamble.**

G Sherrington WUWT blog article Corruption Rockefeller Foundation July 2023

*“Corruption is the act and effect of giving or receiving something of value so that someone will either do or not do something, sidestepping a formal or implicit rule about what that person should do, to the benefit of the person giving the object of value or of a third party”*

<https://wattsupwiththat.com/2023/07/18/corruption-of-science-by-money-and-power/>

…………………………………….

World Health Organization August 2023

“[*There is no level of exposure to lead*](https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health) *that is known to be without harmful effects.*”

<https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health>

…………………………………..

**A Lead story …**

[Environment Protection Authority Victoria](https://www.epa.vic.gov.au/).

“We're the state's independent environmental regulator.
“We protect the health of our community and environment from pollution and waste.”

<https://www.epa.vic.gov.au/>

…………………….

Covering Climate Now CCNow.

“Covering Climate Now helps journalists and newsrooms improve the caliber and prominence of their reporting through training, networking, collaboration, and more. Over [500 journalism outlets](https://coveringclimatenow.org/partners/partner-list/) from around the world have joined CCNow, including some of the biggest names in journalism — the Guardian, TIME, The Times of India, Al Jazeera English, Reuters, Bloomberg, Agence France-Presse, NBC, ABC, CBS News, and more — along with scores of local and special interest publications. CCNow collaborates with journalism support organizations such as Climate Central, the Society of Environmental Journalists, and Solutions Journalism Network to advance the quality, impact, and reach of climate journalism.”

…………………….

……………………

Pica for Lead.

Pica: A Common Condition that is Commonly Missed - An Update Review

[Alexander K C Leung](https://pubmed.ncbi.nlm.nih.gov/?term=Leung+AKC&cauthor_id=30868957)[1](https://pubmed.ncbi.nlm.nih.gov/30868957/#full-view-affiliation-1), [Kam Lun Hon](https://pubmed.ncbi.nlm.nih.gov/?term=Hon+KL&cauthor_id=30868957)[2](https://pubmed.ncbi.nlm.nih.gov/30868957/#full-view-affiliation-2)

*“Pica refers to the persistent, compulsive craving for and the ingestion of substances usually considered inedible …. The condition is more common among children in lower socioeconomic classes and those who are mentally handicapped or emotionally deprived. Pica is a significant cause of anaemia and lead poisoning.”*

<https://pubmed.ncbi.nlm.nih.gov/30868957/>

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de Silva, Christophers March 2008, reverse causation of Lead ailments.

*“It has come to be generally accepted that low levels of lead exposure may result in mental deficit. This causal inference is based on claimed time precedence of the lead exposure and on biological plausibility. The objective of this study is to argue that mental deficit causes pica which causes lead exposure (i.e. to support the theory of reverse causation).”*

<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1440-1754.1997.tb00984.x>

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**About “The Establishment”.**

An example of demonization of Lead. Song by Collier 1966.

**Lead poison on the wall,**

**Kills little guys and little dolls,**

**It kills them big and it kills them small,**

**And the landlord does nothing to stop it at all,**

**That death on the wall.**

<http://www.protestsonglyrics.net/Tenants_Housing_Homeless_Songs/Lead-Poison.phtml>

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Health Direct Australia govt funded

*“Key facts*

* *Lead can enter your body through breathing in or swallowing materials contaminated with lead, such as old paint or petrol.*
* *Lead is a poison, and there is no safe level of lead exposure for anyone.*
* *The risk of lead poisoning is highest for unborn babies, infants and children.*
* *You should use ‘lead alert' practices if renovating or painting your home.“*

<https://www.healthdirect.gov.au/lead-poisoning>

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Guardian Article March 2018, Brujce Lanphedar suggests huge death toll from lead poisoning.

Author Jessica Glenza

“Exposure to lead could contribute to as many as 412,000 premature deaths each year in the United States, a new study in the medical journal The Lancet found.

“That estimate of premature deaths is 10 times larger than in previous studies, and could put deaths from exposure to the heavy metal on a par with smoking.

“Lead is most widely recognized as a hazard to children, who can suffer intellectual damage from even minimal exposure. However, because lead can contribute to conditions such as high blood pressure and hardening of arteries, it is also believed to contribute to cardiovascular and heart disease.

 “What this study suggests is there’s no apparent safe level” for adults, said the principal author of the study, Bruce Lanphear of Simon Fraser University in Canada. Lanphear called the results both “troubling” and “hopeful”. “

<https://www.theguardian.com/us-news/2018/mar/12/lead-exposure-premature-deaths-us#:~:text=Exposure%20to%20lead%20could%20contribute,on%20a%20par%20with%20smoking>.

Jessica Glenza, Guardian reporter, Summary

Jessica Glenza, based in New York, New York, United States, is currently a Senior Health Reporter at Guardian News & Media. Jessica Glenza brings experience from previous roles at Guardian News & Media, Digital First Media, Journal Register Company and Backstage. Jessica Glenza holds a 2008 - 2011 Bachelor of Arts in Spanish, Journalism @ Purchase College, SUNY. With a robust skill set that includes Online Journalism, Journalism, Writing, Reporting, Research and more.

<https://rocketreach.co/jessica-glenza-email_9364122>

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HISTORY OF LEAD POISONING IN THE WORLD Dr. Herbert L. Needleman

*“It is clear that lead exposure during pregnancy is a behavioral teratogen.”*

<https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf>

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Childhood Lead Poisoning: The Promise and Abandonment of Primary Prevention Herbert L. Needleman, MD.

“Braced by abundant data on the damage done by lead at low doses, the Public Health Service in 1991 embarked on a visionary, indeed radical, adventure: it set out to permanently end lead exposure and toxicity. A combination of long-held prejudices, market forces, and bureaucratic timidity conspired to frustrate that enterprise. Opposition was expected, and was encountered, from the traditional enemies of lead control: the lead industry, realtors, and their insurers. What was surprising and disillusioning was the role of some paediatricians, their professional organization, 2 government agencies, and a public interest group.”

<https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.88.12.1871>

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History of climate change as told by IBM corporation.

“The history of climate change. Think 2024.” By journalist Alice Gomstyn.

*“In its sixth assessment report, issued in 2023, the IPCC predicted that significant and timely mitigation and adaptation efforts would reduce the adverse impacts of climate change on humans and ecosystems. The panel noted that since its fifth assessment report, issued in 2014, policies and laws on climate change mitigation have expanded.*

*Ongoing mitigation efforts, however, have not forestalled tangible signs of climate change, including changing weather patterns and extreme weather events. In recent years, an increase in droughts, heat waves, wildfires and intense precipitation have been attributed to climate change, as have sea level rises and declines in Arctic sea ice. Copernicus, Europe’s climate monitoring agency, declared 2023 to be the warmest year on record.”*

[*https://www.ibm.com/blog/climate-change-history/*](https://www.ibm.com/blog/climate-change-history/)

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Biography of Alice Gormston.

<https://www.ibm.com/blog/author/alice-gomstyn/>

*“Alice Gomstyn is a veteran business and technology editor and writer with a background in journalism. Her work has appeared in The Washington Post, Business Insider, ABCNews.com and NBCNews.com, among other outlets.”*

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(MORE) History of Lead Poisoning in the World H L Needleman 1999.

*“In the late 1970s, attention began to shift to the question of intrauterine exposure to lead. Scanlon measured umbilical-cord blood lead concentrations in newborns and showed that infants born to inner city mothers tended to have higher blood lead levels than those born to suburban mothers. The observation that lead crossed the placenta sparked studies of prenatal exposure on infant development. The first study examined a large cohort of births at the Boston Hospital for Women. Umbilical-cord bloods were obtained from almost 12,000 births over a 2-year period. Lead was found to be related to minor birth defects in a subsample of 5000 of these infants. A subsample of these subjects that was evenly divided among low exposure (< 3 ug/dl), medium exposure (6-7 ug/dl), and high exposure (> 10 ug/dl) was followed. Subjects were seen at 6, 12, 24, 57, and 120 months of age. Significant deficits in infant IQ scores were found in children in the high cord blood lead group as late as 24 months of age. At 57 and 120 months of age, the effect of umbilical-cord blood was no longer significant, but the effect of the 24-month blood lead level was statistically significant .”*

<https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf>

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About Childhood Lead Poisoning Prevention. [Centres for Disease Control US, Atlanta, Georgia](https://www.cdc.gov/lead-prevention/about/index.html?CDC_AAref_Val=https://www.cdc.gov/nceh/lead/%2520publications/PrevLeadPoisoning.pdf), undated.

*“Overview. Lead is a naturally occurring metal that can cause negative health effects. People are exposed to lead by eating lead paint chips, ingesting contaminated food or water, and/or by breathing in lead dust.*

*Children younger than 6 years are more likely to be exposed due to their hand-to-mouth behavior. Many children ingest lead dust by putting objects such as toys and dirt in their mouths.*

*Lead in blood*

*No safe blood lead level (BLL) in children has been identified. Even low levels of lead in blood are associated with developmental delays, difficulty learning, and behavioral issues. The*[*effects*](https://www.cdc.gov/lead-prevention/symptoms-complications/index.html)*of lead poisoning can be permanent and disabling.*

*There are steps that parents and healthcare providers can take to*[*protect children from lead exposure*](https://www.cdc.gov/lead-prevention/prevention/index.html)*. Healthcare providers can perform a blood lead test if a child was or may have been exposed to lead.*

*CDC uses a*[*blood lead reference value*](https://www.cdc.gov/lead-prevention/php/data/blood-lead-surveillance.html)*(BLRV) of 3.5 micrograms per deciliter (µg/dL). This reference level helps identify children with BLLs higher than most children's levels. CDC estimates that approximately 500,000 children in the United States have BLLs at or above the BLRV. Healthcare providers can use CDC's*[*Recommended Actions Based on Blood Lead Level*](https://www.cdc.gov/lead-prevention/hcp/clinical-guidance/index.html)*to develop a plan of action for their patient. More information about sources of exposure, risk factors, testing and prevention is provided below.”*

<https://www.cdc.gov/lead-prevention/about/index.html?CDC_AAref_Val=https://www.cdc.gov/nceh/lead/%2520publications/PrevLeadPoisoning.pdf>

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Scientific misconduct Needleman Lead industry note January 1996. Blood Lead Levels, Scientific Misconduct, and the Needleman Case 1. A Reply from the Lead Industry.

“*The report concluded that "Dr. Needleman was deliberately misleading in the published accounts of the procedures used in the 1979 study." The board unanimously recommended that Dr Needleman submit corrective statements to the journals in which his original studies were published and that he make his complete data set available to any investigator.”*

<https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.86.1.112-a>

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Diversity Australia undated.

*‘By understanding and embracing these principles, we can create*[*inclusion*](https://www.nejm.org/doi/full/10.1056/NEJMpv2022639)*, value*[*diversity*](https://www.nejm.org/doi/full/10.1056/NEJMpv2022639)*, and promote*[*equity*](https://www.nejm.org/doi/full/10.1056/NEJMpv2022639)*in the workplace. This helps us build an environment where everyone has equal opportunities, experiences fair treatment, and can flourish in their roles. It is important to continually assess our approach to DEI and adjust as necessary, ensuring that we promote a diverse, equitable, and inclusive work environment.’*

<https://www.diversityaustralia.com.au/diversity-equity-inclusion-in-the-workplace-a-strategic-approach-for-business-success/>

ALSO.

Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world. It is a cumulative toxicant that affects multiple body systems, including the neurological, haematological, gastrointestinal, cardiovascular, immune and renal systems. Children are especially vulnerable to the neurotoxic effects of lead, and even relatively low levels of exposure can cause serious and, in some cases, irreversible neurological damage.1,2 Lead exposure causes a significant burden of disease: the Institute for Health Metrics and Evaluation has estimated that in 2019, lead exposure accounted for 0.90 million deaths and 21.7 million disability-adjusted life years (DALYs\* ) due to long-term effects on health.4 Reductions in the use of lead in petrol (gasoline), paint, plumbing and solder have resulted in substantial reductions in blood lead concentrations globally.5 However, significant sources of exposure to lead still remain, particularly in developing countries and those in economic transition. Further efforts are required to continue to reduce the use and releases of lead, and to reduce environmental and occupational exposures, particularly for children and women of childbearing age.

<https://iris.who.int/bitstream/handle/10665/346775/9789240037656-eng.pdf?sequence=1>

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**A time line about lead poisoning events.**

1690s litharge colic link in wine.

HISTORY OF LEAD POISONING IN THE WORLD Dr. Herbert L. Needleman.

Centre for Biological Diversity. Date unstated.

<https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf>

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1763 English Court George III lead fittings for cider production caused colic.

HISTORY OF LEAD POISONING IN THE WORLD Dr. Herbert L. Needleman.

Centre for Biological Diversity. Date unstated.

<https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf>

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1763. Benjamin Franklin wrote about the "dry gripes" (colic) and "dangles" (wrist drop) which affected tinkers, painters, and typesetters.

HISTORY OF LEAD POISONING IN THE WORLD Dr. Herbert L. Needleman.

Centre for Biological Diversity. Date unstated.

<https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf>

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1839 [The first “modern'' clinical description of lead poisoning](https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=ff9b6174532a042f34df98a2aa50b1ebd387397c) was Tanquerel des Planches' famous ``Traite des maladies de plomb ou saturnines,'' which appeared in 1839 and was based on over 1,200 cases.

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 38:244±254 (2000) Lead Poisoning in a Historical Perspective Sven Hernberg, MD, PhD

<https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=ff9b6174532a042f34df98a2aa50b1ebd387397c>

1866. [Charles Dickens wrote](https://www.online-literature.com/dickens/uncommercial-traveller/35/) “American inventiveness would seem to indicate that before very long white-lead may be made entirely by machinery.” … ““ As to the rest, the philosophy of the matter of lead-poisoning and workpeople seems to me to have been pretty fairly summed up by the Irishwoman whom I quoted in my former paper: 'Some of them gets lead-pisoned soon, and some of them gets lead-pisoned later, and some, but not many, niver; and 'tis all according to the constitooshun, sur; and some constitooshuns is strong and some is weak.'

The Literature network.

<https://www.online-literature.com/dickens/uncommercial-traveller/35/>

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1890s. J Burnham wrote “**Biomedical communication and the reaction to the Queensland childhood lead poisoning cases elsewhere in the world** by John C Burnham 1999.

“Beginning in the1890s, physicians in Queensland began reporting cases of lead poisoning in children.”

[Medical History](https://www.cambridge.org/core/journals/medical-history), [Volume 43](https://www.cambridge.org/core/journals/medical-history/volume/93535659D2E2E0F7295C367F27BFAD3B), [Issue 2](https://www.cambridge.org/core/journals/medical-history/issue/4C27FB4319668D2A67CAD1D998D61D2E), April 1999 , pp. 155 - 172

<https://doi.org/10.1017/S0025727300065066>

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1892. In “Brisbane, Australia, its (lead poisoning) very existence was disputed by elitist physicians in Sydney. A.J. Turner, a house officer at the [Brisbane Children’s Hospital, diagnosed several children with lead intoxication](https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf) who had been given a previous diagnosis of meningitis.”

HISTORY OF LEAD POISONING IN THE WORLD Dr. Herbert L. Needleman.

Centre for Biological Diversity. Date unstated

<https://www.biologicaldiversity.org/campaigns/get_the_lead_out/pdfs/health/Needleman_1999.pdf>

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<https://whc.unesco.org/archive/1998/whc-98-conf203-inf18e.pdf>

Distribution limited WHC-98/CONF.203/INF. 18 Kyoto, 29 November 1998 Original: English UNITED NATIONS EDUCATIONAL SCIENTIFIC AND CULTURAL ORGANIZATION CONVENTION CONCERNING THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE WORLD HERITAGE COMMITTEE Twenty-second session Kyoto, Japan 30 November – 5 December 1998

Information Document: Report on the mission to Kakadu National Park, Australia, 26 October to 1 November 1998

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US Dept of Labor 1928 Deaths from Lead Poisoning statistics

<https://www.govinfo.gov/content/pkg/SERIALSET-08791_00_00-002-0489-0000/pdf/SERIALSET-08791_00_00-002-0489-0000.pdf>

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Wani et al June 2015

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4961898/#:~:text=In%20cases%20of%20chronic%20exposure,is%20a%20cause%20for%20concern>

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clinical symptoms low level Pb Kathuria et al Jan 2020

<https://emedicine.medscape.com/article/1174752-clinical?form=fpf>

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Needleman et al March 1979

<https://d1wqtxts1xzle7.cloudfront.net/87171445/1979-needleman-libre.pdf?1654654136=&response-content-disposition=inline%3B+filename%3DDeficits_in_Psychologic_and_Classroom_Pe.pdf&Expires=1723115555&Signature=CfT~9mobIWW8u4~chFYe4z4qzjwvYu4PIrEqvcNqokdL0yOlr0KS9f5RG4MZZ7OkpmRKaicwCjOxV~1j1xxrukjr3TX~sV3sGE5RJshqdzJxvYmA9W50znmX2bk56t1tUvwMH-hH8VFxizgpvL2sO7OLmzwu8IiZsw~l89ts6lfmF07YmvpjWASmiVakJexFg49Gb~xdD6qe4uml4gk8~tKma-A1r3inxPEOrMXBFAxaDirFBctBgwtJD9UyXgtxlZTH7eOM9KG-k39rXDUtCXaG2Silbucw9TQnvl-F1o84CF7dAAgZ-Mvm9d3cFPOLkIjILclthpelxZxoT5Qt-A__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA>

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Bradley et al US correlations IQ Pb

<https://europepmc.org/article/med/93417>

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Baghurst et al NEJM Port Pirie study Oct 1992

<https://www.nejm.org/doi/full/10.1056/NEJM199210293271805>

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Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood

[Aaron Reuben](https://pubmed.ncbi.nlm.nih.gov/?term=Reuben+A&cauthor_id=28350927)[1](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-1), [Avshalom Caspi](https://pubmed.ncbi.nlm.nih.gov/?term=Caspi+A&cauthor_id=28350927)[2](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-2), [Daniel W Belsky](https://pubmed.ncbi.nlm.nih.gov/?term=Belsky+DW&cauthor_id=28350927)[3](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-3), [Jonathan Broadbent](https://pubmed.ncbi.nlm.nih.gov/?term=Broadbent+J&cauthor_id=28350927)[4](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-4), [Honalee Harrington](https://pubmed.ncbi.nlm.nih.gov/?term=Harrington+H&cauthor_id=28350927)[1](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-1), [Karen Sugden](https://pubmed.ncbi.nlm.nih.gov/?term=Sugden+K&cauthor_id=28350927)[1](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-1), [Renate M Houts](https://pubmed.ncbi.nlm.nih.gov/?term=Houts+RM&cauthor_id=28350927)[1](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-1), [Sandhya Ramrakha](https://pubmed.ncbi.nlm.nih.gov/?term=Ramrakha+S&cauthor_id=28350927)[5](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-5), [Richie Poulton](https://pubmed.ncbi.nlm.nih.gov/?term=Poulton+R&cauthor_id=28350927)[5](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-5), [Terrie E Moffitt](https://pubmed.ncbi.nlm.nih.gov/?term=Moffitt+TE&cauthor_id=28350927)[2](https://pubmed.ncbi.nlm.nih.gov/28350927/#full-view-affiliation-2)

<https://pubmed.ncbi.nlm.nih.gov/28350927/>

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We aimed to quantify the relative contribution of environmental lead exposure to all-cause mortality, cardiovascular disease mortality, and ischaemic heart disease mortality.

from Lanphear March 12 2018

<https://www.cdc.gov/nchs/fastats/leading-causes-of-death>.

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Bruce Lanphear 400,000 US deaths a year from Pb poisoning.

[Low-level lead exposure and mortality in US adults: a population-based cohort study - The Lancet Public Health](https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667%2818%2930025-2/fulltext)

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de Silva & Christophers ca 1990

<http://www.geoffstuff.com/leadex.docx>

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Wikipedia on standard error of numbers from IQ tests

<https://en.wikipedia.org/wiki/Intelligence_quotient#:~:text=Like%20all%20statistical%20quantities%2C%20any,low%20as%20about%20three%20points>.

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Search numbers of US children treated each year for lead poisoning.

Jacobs D E and Brown M J March 2023

National Library of Medicine

Childhood Lead Poisoning 1970-2022: Charting Progress and Needed Reforms

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9897265/>

*“Childhood lead poisoning prevention in the United States was marked by a largely failed medical approach from 1971 to 1990; an emergent (but small) healthy housing primary prevention strategy from 1991 to 2015; and implementation of large-scale proven interventions since then.”*

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Avogadro’s number.

Who detection limits analytical.

<https://iris.who.int/bitstream/handle/10665/77912/9789241502139_eng.pdf;jsessionid=FB4510C6D2D1681B4BCC9495E857FA6D?sequence=1>

“**Avogadro’s number**, number of units in one [mole](https://www.britannica.com/science/mole-chemistry) of any substance (defined as its [molecular weight](https://www.britannica.com/science/molecular-weight) in grams), equal to 6.02214076 × 1023. The units may be [electrons](https://www.britannica.com/science/electron), [atoms](https://www.britannica.com/science/atom), [ions](https://www.britannica.com/science/ion-physics), or [molecules](https://www.britannica.com/science/molecule),”

<https://www.britannica.com/science/Avogadros-number>

The element lead numbered 82 in the Periodic Table of the Elements has an atomic weight of 207.2 grams per mole. Therefore, one gram of Pb has 29 \* 10^20 atoms.

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There is a cost when Lead content of gasoline is reduced, because the octane rating is reduced and more gasoline is needed to perform the same work. [The US EPA calculated this cost in 1985](https://nepis.epa.gov/Exe/ZyNET.exe/9100YK16.txt?ZyActionD=ZyDocument&Client=EPA&Index=1981%20Thru%201985&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C81THRU85%5CTXT%5C00000021%5C9100YK16.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=14). United States Environmental Protection Agency, Costs and Benefits of Reducing Lead in Gasoline: Final Regulatory Impact Analysis, 1985.

*“Our base case results suggest that the final rule will cost less than $100 million for the second half of 1985, when the 0.50 gplg limit will apply. For later years, when the 0.10 gplg limit will apply, the estimated costs range from $608 million in 1986 to $441 million in 1992”.*

<https://nepis.epa.gov/Exe/ZyNET.exe/9100YK16.txt?ZyActionD=ZyDocument&Client=EPA&Index=1981%20Thru%201985&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C81THRU85%5CTXT%5C00000021%5C9100YK16.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=14>

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[Savings from ban on leaded gasoline globally](https://www.unep.org/news-and-stories/press-release/era-leaded-petrol-over-eliminating-major-threat-human-and-planetary)

*“Official end of use of leaded petrol will prevent more than 1.2 million premature deaths and save USD 2.45 trillion a year.“*

UN Environment programme, August 2021.

https://www.unep.org/news-and-stories/press-release/era-leaded-petrol-over-eliminating-major-threat-human-and-planetary

<https://www.unep.org/news-and-stories/press-release/era-leaded-petrol-over-eliminating-major-threat-human-and-planetary>

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Hormesis

Wikipedia

<https://en.wikipedia.org/wiki/Hormesis>

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Hormesis by Lead in plants.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8514553/>

[Sci Rep.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8514553/) 2021; 11: 20329.

Published online 2021 Oct 13. doi: [10.1038/s41598-021-99657-3](https://doi.org/10.1038/s41598-021-99657-3)

PMCID: PMC8514553

PMID: [34645888](https://pubmed.ncbi.nlm.nih.gov/34645888)

Induction of hormesis in plants by urban trace metal pollution

[Mirko Salinitro](https://pubmed.ncbi.nlm.nih.gov/?term=Salinitro%20M%5BAuthor%5D), [Gaia Mattarello](https://pubmed.ncbi.nlm.nih.gov/?term=Mattarello%20G%5BAuthor%5D), [Giorgia Guardigli](https://pubmed.ncbi.nlm.nih.gov/?term=Guardigli%20G%5BAuthor%5D), [Mihaela Odajiu](https://pubmed.ncbi.nlm.nih.gov/?term=Odajiu%20M%5BAuthor%5D), and [Annalisa Tassoni](https://pubmed.ncbi.nlm.nih.gov/?term=Tassoni%20A%5BAuthor%5D)

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