

Lead and Copper Rule (LCR)

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The original LCR was promulgated in 1991. It differed from all previous regulations. An MCL was not feasible because of the unique origin of lead in drinking water at the tap, which is from the corrosive effect on metal surfaces that water contacted on the way to the tap, and thus the variability of conditions and effects in virtually each dwelling and building. Lead service lines, old galvanized iron pipe in old residences, leaded brass faucets, and perhaps old (pre 1986) lead solders are the sources. The LCR was geared to determine whether the water being served by the supplier was excessively aggressive to those features to warrant corrective actions to reduce corrosion and lead releases. That determination is to be made using a virtual worst case collection of a 1 liter first draw sample after sufficient stagnation. Monitoring sites were required to be weighted toward likely worst case locations, such as likely presence of lead service lines. Compliance was specified to begin with corrosion control, which, if inadequate, would require a lead service line replacement schedule. The later would be only a partial resolution, because lead service lines are not the only source of lead contamination, old galvanized pipe in old housing is another important source. A study of high lead detections in Washington, DC showed a very high correlation with high iron, and that was consistent with old galvanized plumbing in the home. Trace water lead accumulates on the iron oxide coatings that develop. Thus, emphasis on adequate corrosion control is essential so as not to suspend the internal iron oxide deposits. Washington and others have successfully utilized phosphate addition as a very effective way to significantly reduce lead releases.

That regulation has been successful where it was implemented and enforced. Unfortunately, that has not always been the case in some states and water systems. Flint is a prime example where the LCR was not enforced, and further, the state regulator allowed the water supplier to make significant changes of water source and treatment without the routine measures to evaluate the consequences of the choices prior to implementation. Fortunately, although water lead increased in some homes, only a small temporary increase in blood lead occurred in a small percentage of children. That was likely because consumption was greatly limited when the water became so obviously contaminated by discoloration and taste from suspension of sediments. However, the most likely adverse health outcome was many cases of legionellosis and at least 12 deaths due to inhalation of the microbe contaminated water aerosols probably during showering.

Figure 1 shows the downward trend of child blood leads in Flint over about 10 years (2006-2016). Note the 2014-2016 period when the water problem occurred, and also 2008 and 2011.

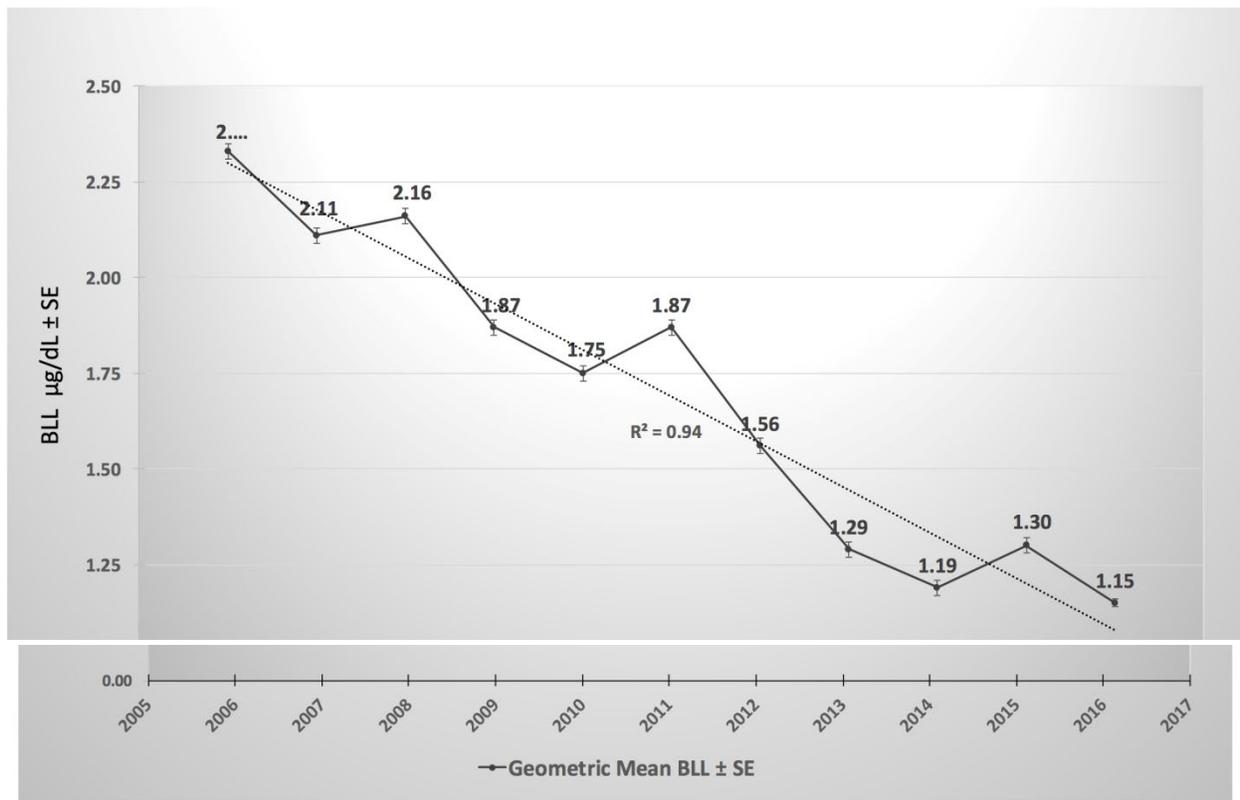


Figure 1. From Gomez et al.

<https://www.ncbi.nlm.nih.gov/pubmed/?term=Blood+Lead+Levels+of+Children+in+Flint%2C+Michigan%3A+2006-2016>

There would not have been a lead problem in Flint if they had been in compliance with the LCR. So, the critical issue to be resolved is the best way to require the states to enforce and achieve universal compliance with the LCR, rather than establishing additional potentially more confusing regulatory requirements. The proposed new LCR is so complex that it probably raises more barriers to universal compliance as well as providing burdens that many, especially smaller, water suppliers would have serious difficulties understanding it, let alone complying with it.

Overall there has been more than 95% reduction (from about 16 µg/dL to much less than 1 µg/dL) of average US child blood lead since the 1976-1980 NHANES study prior to elimination of leaded gasoline. Old lead paint seems to be the cause of remaining high values. The attachment: Lead Reduction is a National Success Story, (Cotruvo, JA (2019). JAWWA April, 111:4, 73-75, 2019) describes several recommendations aimed at simplifying the existing LCR while facilitating the monitoring requirements, which are difficult to implement in their current form. Perhaps a good approach to facilitate removal of lead service lines would be legislation to

include lead service and galvanized pipe mitigation as part of real estate transactions, like radon and lead paint mitigation that is often required. The cost would be buried in the sale price and effectively shared between the buyer and seller.