Childhood lead: Worrisome national levels

One in five inner-city black children under five years old is carrying a body burden of lead that could affect his or her intellectual and behavioral development. That statistic comes from the recently completed Second National Health and Nutrition Examination Survey, also known as HANES II. Conducted by Joseph Annest and colleagues at the National Center for Health Statistics, HANES II data provide the first national estimates of blood-lead levels obtained on a representative sample of the U. S. population.

Its significance, explains Herbert Needleman of the Children's Hospital of Pittsburgh, "is that a study, carefully designed to be representative of all the kids in this country, shows an incidence of blood lead [levels] much greater than anticipated by anybody who had any savvy.

"And there is a clear class relationship," he told SCIENCE NEWS, noting that children from families whose incomes were below $6,000 had dangerous blood lead levels — 30 micrograms per deciliter or higher — at 8 to 9 times the frequency of children from homes where the annual family income exceeded $15,000. "The impact of [blood lead] being roughly 10 times higher in poor people is just another example of the regenerative cycle of poverty," Needleman says. "It impairs brain function so that the poor can't get as good a job and therefore stay poor. What an extraordinary environmental load on top of everything else [the poor] have to deal with."

The author of *Low Level Lead Exposure — Clinical Implications of Current Research,* Needleman has been on the forefront of investigations into the subacute effects of moderate lead levels. His landmark study, measuring lead in children's teeth (SN: 4/7/79, p. 230), established that what had previously been considered relatively innocuous blood-lead levels — perhaps 35 μg/dl — correlated with a reduction in learning skills, lower IQ scores and decreased ability to concentrate on classroom tasks. And a new follow up of those children who he first studied as first and second graders (and who are now in the fifth and sixth grades) indicates that "kids with high lead in their teeth were off tasks significantly more than other children," Needleman told SCIENCE NEWS. So blood-lead levels on the order found in the new HANES study "do seem to affect a child's real-life behavior," he says, "that is a child's job, which is to learn."

Where does the lead come from? Ned Groth, staff environmental scientist at Consumers Union, agrees with Needleman: The biggest problem is still leaded paint and soil or dust saturated with lead deposited by auto exhaust and industrial emissions. In fact, Devra Davis of the Environmental Law Institute says an inner-city child can ingest 300 to 400 μg of lead just from licking his or her fingers after playing outdoors — well in excess of the 100 μg/day recommended limit for children.

But a growing body of evidence is pointing toward food as an important supplemental source of lead. In September the U. S. Food and Drug Administration published an advisory warning that lead levels of foods packaged in lead-soldered cans may increase once the can is opened if the food is not removed. It said studies confirmed that lead levels in orange juice that had been stored in the original can "increased about 7 times, from 0.05 to 0.36 parts per million, over a five-day period." The advisory noted that South Carolina health officials became worried about the issue after investigating what appeared to be the lead poisoning of an infant and two three-year-olds by fruit juices stored in opened cans.

The contribution of lead from canned food is likely to be small relative to that from paint and dust, Groth says, "But it's misleading to trivialize any source."

—J. Raloff

U.S. children (6 mos. to 5 years old) with blood-lead levels of 30 micrograms per deciliter or more.

DEMOGRAPHIC VARIABLE	All (%)	RACE White (%)	Black (%)
Both sexes	4.0	2.0	12.2
Male	4.4	2.1	13.4
Female	3.5	1.8	10.9
Annual family income			
Under $6,000	10.9	5.9	18.5
$6,000 to $14,999	4.2	2.2	12.1
$15,000 or more	1.2	0.7	2.8
Urbanization			
Urban (1,000,000 persons or more)	7.2	4.0	15.2
Urban— city center	11.6	4.5	18.6
Urban— city noncenter	3.7	3.8	3.3
Urban (under 1,000,000 persons)	3.5	1.6	10.2
Rural	2.1	1.2	10.3

National Health and Nutrition Examination Survey (1981)

The span of a charmed life

In physics, charm is a basic property of matter. It is a fundamental quality — one might say the basic identity of one of the fundamental building blocks out of which the particles of physics are made. Charm is called a "flavor" with quarks, and it identifies one of the six varieties of quark that theorists now use to explain the properties of all kinds of matter from protons to galaxies.

Particles containing charm were first discovered in 1974 in experiments done at the Stanford Linear Accelerator Center in Palo Alto, Calif., and at Brookhaven National Laboratory in Upton, N.Y. Since then, charm has been the subject of intense investigation in all the laboratories of the world that can reach the energy level at which it is created. Physicists trying to catalog the various particles that contain charmed quarks observe what other particles they change into and when. This business of cataloging particles according to their properties and seeing how the properties permute among the various changes that take place in collisions, radioactive decay, etc., is the basic data-gathering of particle physics.

Among these data a crucial one is the lifetime. How long does it last before it turns into something else? Two experiments, one done at Fermi National Accelerator Laboratory, the other at SLAC, now claim measurements of the lifetime of charmed particles to a reasonable accuracy for comparison theory. The SLAC result tends to agree with theory; the Fermilab result does not.

It is far from an easy measurement to make. It is a matter of measuring periods counted in 10-trillionths of a second (10^{-13} seconds). The two experiments used different techniques. The Fermilab group, led by Neville W. Reay of Ohio State University, used nuclear emulsion, which is photographic emulsion made in a block rather than a thin film, to record the production and disappearance of charmed particles. The SLAC group, which was represented at the meeting by Kenneth C. Moffett of SLAC, collided á beam of electrons of 30 billion electron-volts energy with a beam of light from an ultraviolet laser. The collision turned the light into gamma rays, and the gamma rays entered a bubble chamber where they produced charmed particles, the behavior of which was then recorded. In both cases it was possible to measure the lifetimes of these particles, the so-called D mesons. The most-wanted piece of data is the ratio of the lifetimes of the electrically charged D mesons to the neutral ones. This ratio can help tell which forces are acting on charm and which are in control when charm changes into another quark flavor, called strangeness. Theory says the ratio of the lifetimes of charged and uncharged D mesons should be 1. The Fermilab results yield between 3 and 5, the SLAC result 1.2, consistent with theoretical prediction, Moffett says.

The disagreement is causing interested concern, but not any dismay. Physicists commenting say that it is not surprising that two attempts at such difficult measurements using such basically different techniques should come up with different numbers at first. Further experimentation ought to produce a conversion to a common number, and most physicists hope that that will be the theoretical number. That remains to be seen. *—D.E. Thomsen*