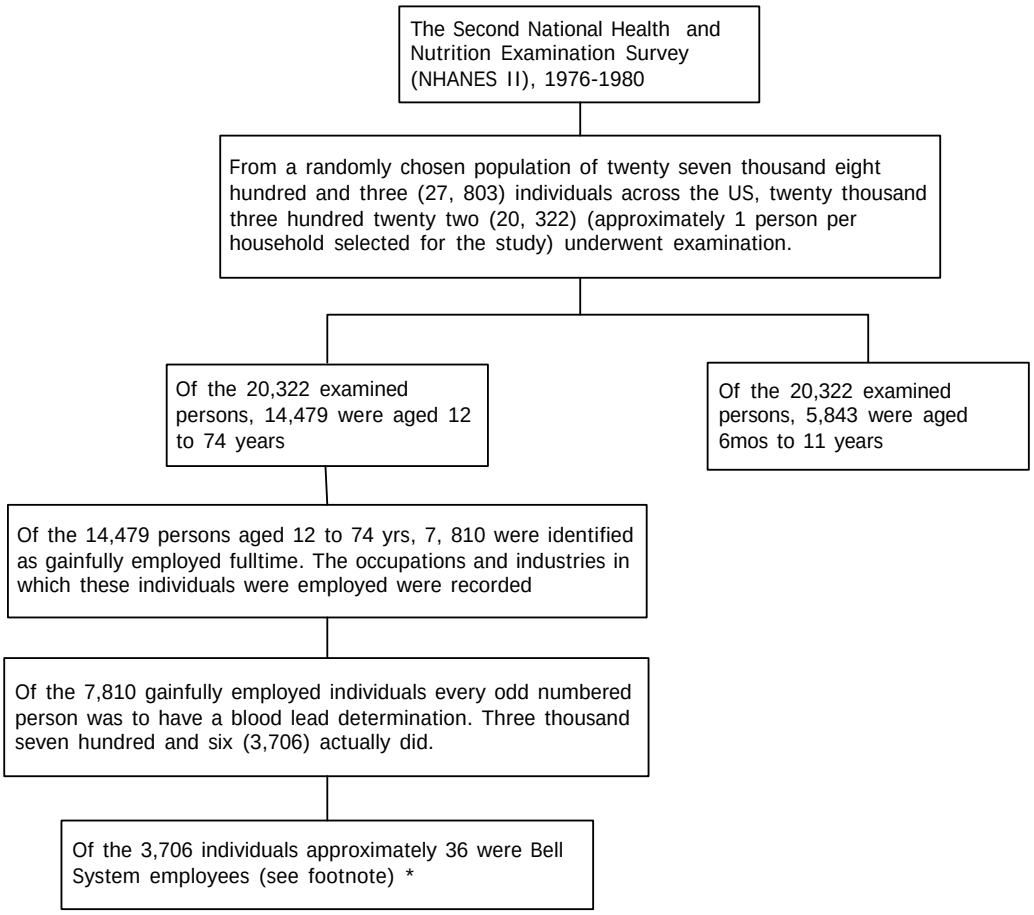
Blood Lead Levels in a Group of Bell System Employees – 1976 to 1980

Between 1976 and 1980 approximately 75 Bell System employees [1], including some with occupational lead exposure, participated in a government sponsored national health survey that included a determination of blood lead levels in 50% of participating adults. Of the 75 Bell System employees blood lead levels were determined in approximately 36. The Centers for Disease Control and Prevention in Atlanta Georgia (the 'CDC'), which conducted the survey, randomly selected households, and within households individuals, for health interviews, medical examinations, and laboratory studies including blood work. The first segment of the first National Health Assessment and Nutrition Examination Survey (NHANES I) was conducted from 1971 through 1974. That survey was continued with NHANES II from 1976 through 1980. The CDC has made the NHANES data available to the public at http://www.cdc.gov/nchs/nhanes/nhanesii.htm.

The design of NHANES II as it relates to the determination of blood lead levels in a subgroup of study participants that includes the 36 Bell System employees is seen in the following diagram.



(The relevant NHANES data only identify individuals as telephone co. employees without reference to whether the company was a member of the Bell System. A small minority of telephone cos. were not.)*

The occupations of fulltime gainfully employed study participants, and the industries in which they worked, were recorded in the NHANES database. Occupations and industries were defined and

[1] representing selected occupations in the Bell System as described elsewhere in the article.

recorded according to criteria originally developed for use by the U.S Census Bureau. These criteria are described in a manual titled the Classified Index of Industries and Occupations [2]. In the Index there is an occupation titled "telephone installers and repairmen"[3] [4] in an industry titled "Telephone (wire and radio) [5]". As defined in the Index the occupation "telephone installers and repairmen" includes the following job titles.

Central office man	Central office deskman	Central office equipment installer	Central office supervisor
Exchange-trouble man	Frameman	Inside wirer	Interior block wireman
Line maintenance	Central office mechanic	Switchboard mechanic	PBX installer
Repeater attendant	Repeater installer	Station installer	Switchboard man
Switchboard wireman	Telephone installer	Test deskman	Testboard operator
Toll-test deskman	Wireman		

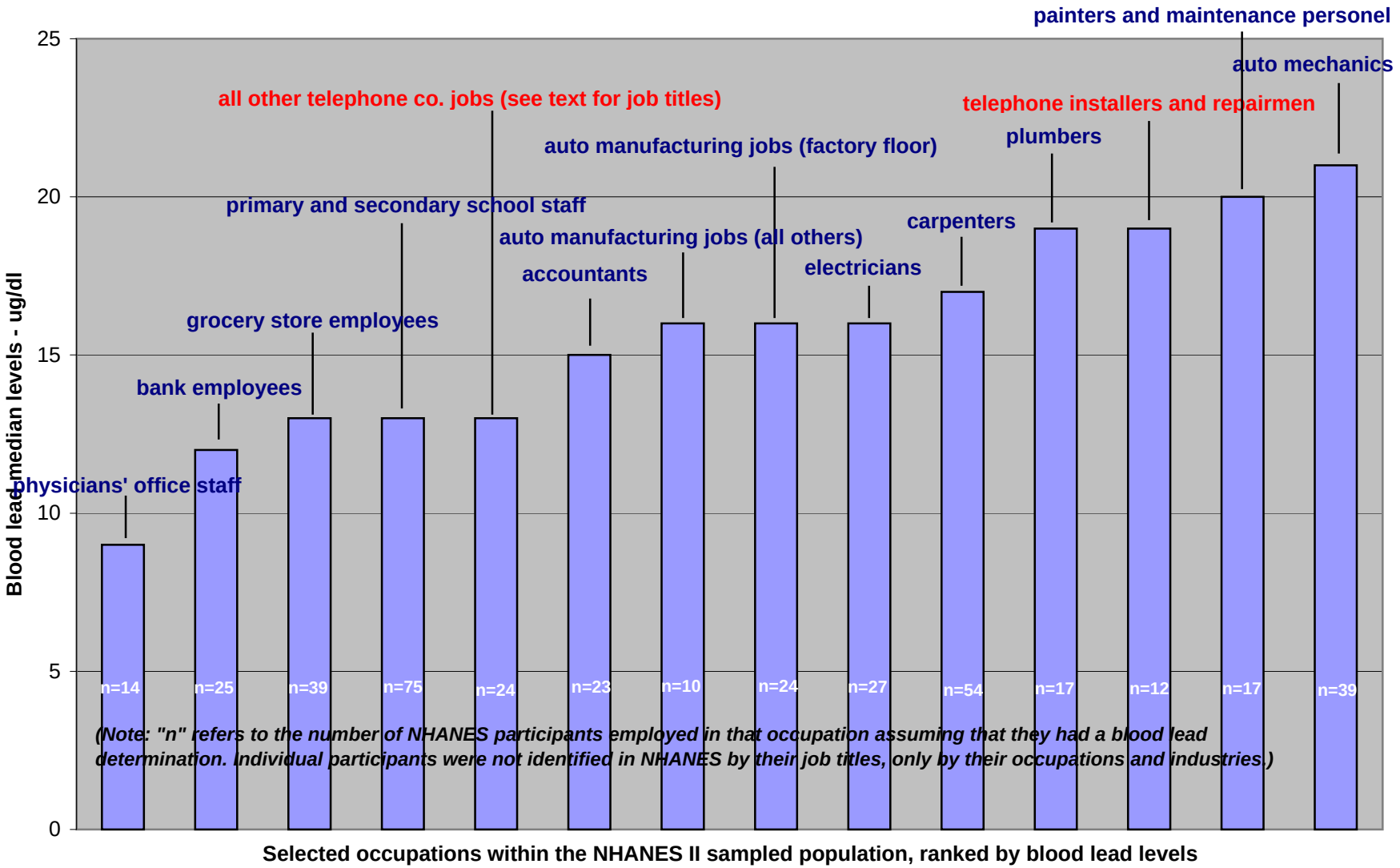
In addition, all NHANES participants identified as being employed by a telephone company [6] except those in the two occupations already mentioned [7] were also identified. Again according to the Index those occupations included the following job titles;

Accountant	Clerical	Managers and administrators	Automobile mechanics
Electrical engineers	Telephone operators	Construction equipment operator	Payroll clerk
Cashier	Civil engineer	Sales manager	Janitor
Engineering technician	Financial manager	Warehouseman	Computer programmer

In the bar graph on the following page the median blood lead levels of 14 arbitrarily chosen occupation and industry groups, including the telephone industry occupations just described, are shown for comparison purposes. An appendix that describes the data in more detail can be found on page 5.

[2] The manual can be found at http://www2.census.gov/prod2/decennial/documents/42034664_TOC.pdf
[3] US Census industry and occupation code # 552
[4] The lead exposure and lead poisoning history of a related occupation, identified in the census code as "554 – telephone linemen and splicers", has been previously studied and reported on elsewhere and will not be addressed here (see Fischbein et.al., American Journal of Public Health, 70(7), p 697, July 1980).
[5] US Census industry and occupation code # 448
[6] That is, US Census industry code # 448
[7] That is, occupation codes 552 ("telephone installers and repairmen") and 554 (Telephone linemen and splicers") in industry 448 ("telephone (wire and radio)")

Median blood lead levels of fourteen arbitrarily choosen occupational groups in the NHANES II database



Discussion

Researchers in Italy published results from a study of lead exposure in Italian telephone installers and repairmen (n = 97) in 1998. Their results trend in the same direction as the NHANES II data reported here. The researchers looked at a window of occupational lead exposure that began in 1988 and ended in 1994. In 1988 the telephone workers had median blood lead levels that were approximately 27% higher then those in an unexposed group of males (n= 1,802) living in Rome during the same period (blood lead levels 11.3 ug/dL vs. 15 ug/dL) [8]. Blood lead levels from a group of telephone cable splicers (n = 365), data that although collected independently from those of the first group of workers were none-the-less included in the results, were 22% higher still (19 ug/dL). By 1994 blood lead levels in the first group of workers had fallen by 40% coincident with technological improvements in the method of installing and repairing telecommunications equipment, improvements that reduced the amount of lead needed to construct telephone circuits.

From a strictly scientific point of view the strength of any conclusions drawn from the analysis of the NHANES data described here are limited. Although the NHANES II study was carefully considered and expertly designed, it was never intended to rigorously compare blood lead levels across industries and occupations. For example, because of the small number of individuals in each occupational group there is room left for random error to adversely affect the comparisons. Also, it is remarkable that in several thousand determinations of blood lead levels not one came back as a zero level. This suggests the possibility of self-selection among study participants.[9] That is, participants who knew or suspected that they had been exposed to lead were more likely to show up for a blood lead determination then participants who were sure that they had not been exposed. Never-the-less the data are consistent with what is known about lead exposure and lead absorption, that is, the higher the exposure the higher the absorption all else being equal. They also confirm what previously had only been suspected, and that is that due to either ignorance or callous disregard some jobs in the Bell System were riskier than others because of exposure to lead. Although an elevated blood lead level does not by itself define lead poisoning, at some point in the progression of the disease lead is always present in the blood.

The difference in median blood lead levels between "telephone installers and repairmen" and "all other telephone company jobs"as is seen in the bar graph (a difference of 32%; 19 ug/dl vs. 13 ug/dl) was roughly duplicated in those children (age <= 4 years) whose head-of-household parent was employed under one or the other of these two categories. The percent difference in median blood lead levels for the two groups of children was 30%, 10.5 ug/dl for children [n= 10] whose head-of-household parent's occupation was included under "all other telephone co. jobs", vs. 15 ug/dl for children [n = 9] whose head-of-household's parent's occupation was included under "telephone installers and repairmen". Although these data must be viewed with caution due to the low number of individuals in each group (as well as the large number of missing values), they never-the-less suggest that for children whose head-of-household parent was employed under the occupation heading "telephone installers and repairmen" the children's blood lead levels were

[8] "Blood Lead Concentration and Biological Effects in Workers Exposed to Very Low Lead Levels" Masci, Oliviero MD; Carelli, Giovanni ChD; Vinci, Francesco MD; Castellino, Nicolò MD; Journal of Occupational and Environmental Medicine, 40(10), October 1998, pp 886-894.

[9] By the decade of the '70s lead poisoning must have very much been on the minds of the American public. This is suggested by the fact that in the New York Times the number of articles making reference to lead poisoning between 1970 and 1980 was 318. That was more than a 600% increase over the number of articles published during the previous decade (50 vs. 318).

determined in part by lead brought home from work by the parent, probably in the form of dust, lead residue, and sweat.

Finally, it should be kept in mind that by the time NHANES II was launched in 1976 the use of lead by the Bell System had been in decline for at least 25 years. If NHANES II had taken place between 1946 and 1950 instead of between 1976 and 1980, far higher levels of blood lead would surely have been found.

Appendix; A closer look at the data

Industry or occupation	Individuals who had a blood lead level determination	Individuals who were suppose to have a blood lead level determination but did not	Individuals who were not suppose to have a blood lead level determination and did not.	Comments (if any)
	Mean age (years)	Mean age (years)	Mean age (years)	
Physicians' office staff	45	(no missing values)	53	In addition to what were perhaps low rates of exposure to lead, physicians' office staff were also in the habit of frequently washing their hands
Primary and Secondary school staff	41	46 (n=5)	43	
Banking staff	44	29 (n=1)	43	
Auto manufacturing jobs (all others)	44	(no missing values)	44	The fact that median lead levels were not different on or off the factory floor suggests that lead levels in part or in whole were not occupational in origin
Auto manufacturing jobs (factory floor)	38	31 (n=2)	42	
Automobile mechanics	42	40 (n=2)	43	Auto mechanics were exposed to leaded gasoline and its residue. A phase out of leaded gasoline was begun in the late '70s and completed in the early '80s
Grocery store employees	43	(no missing values)	41	
All other telephone co. jobs	37	(no missing values)	42	The large difference between the median lead levels of this group and the following group strongly suggests that occupational lead exposure was an important factor in determining blood lead levels
Telephone installers and repairmen	38	42 (n=1)	39	
Carpenters	42	63 (n=2)	45	Besides ordinary lumber and nails pursuits this occupation includes the following job titles: bridge carpenter, car framer, boat builder, flume man, engine setter, boat mechanic, sheather, ship carpenter
Accountants	43	59 (n=1)	42	
Painters and maintenance personnel	40	(no missing values)	53	
Plumbers	44	(no missing values)	41	
Electricians	48	(no missing values)	41	