

Subject: The effect of increases in the amount of lead used in gasoline production on blood lead levels in children, specifically how many more children would have lead levels ≥ 30 ug/dl.

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The NHANES II data provide only "semi-quantitative" estimates approximating the number of children in the ≥ 30 ug/dl range for a given amount of lead being used in gasoline production.

Analysis and Results

The NHANES II data were divided into two time periods to provide sufficient sample sizes for estimates to have reasonable standard errors. Time period 1 consisted of blood lead samples obtained from 2/20/76 to 9/23/78; time period 2, from 10/11/78 to 2/27/80 (see figure 1). The data was also divided by race. Results of the data analysis, incorporating the complex sample design of NHANES II, are given in Table 1.

Table 1
Percentage of persons age .5 to 5 years with blood lead levels of 30 ug/dl or more, NHANES II Feb. 1976 - Feb. 1980

	<u>All Races</u>		<u>White</u>		<u>Black</u>	
	<u>Time period</u>		<u>Time period</u>		<u>Time period</u>	
	1	2	1	2	1	2
Pct. ≥ 30 ug/dl	4.65	2.07	2.32	1.03	14.16	6.97
Std. error	.58	.75	.38	.44	1.68	3.51
No. examined	1719	653	1349	527	309	110
Mean blood lead (ug/dl)	17.1	13.1	15.9	12.2	22.1	17.4

For both blacks and whites, the average number of children .5 to 5 years old with blood lead levels ≥ 30 ug/dl over time period 2 was at least 50% less than the average over time period 1.

Table II shows how the percentages translate into numbers and also the 6-month-average amounts of lead used in gasoline production for each time period. A population estimate of 16 million children ages .5 to 5 years old is used in these calculations.

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Table II

Elevated blood lead levels and lead used in gasoline production, all races, ages .5 - 5 yrs, NHANES II, Feb. 1976 - Feb 1980.

	Time period 1	Time period 2
Pct. ≥ 30 ug/dl	4.65%	2.07%
No. children ≥ 30 ug/dl	744,000	331,000
Change between periods	413,000	
6-month-avg amount lead used in gas production (1000 tons)	92.7	70.1
Change between periods	22.6	

$$\frac{\text{change in no. of children}}{\text{change in gas Pb (1000 tons)}} = \frac{413,000}{22.6} = 18300 \text{ children/1000 tons Pb added}$$

Limitations of this calculation

1) This value of approximately 18,300 children / 1000 tons of lead added to gasoline cannot be extrapolated to levels significantly above 92,700 tons / 6 months or below 70,100 tons / 6 months.

2) This calculation would have been best made with many points fit by regression. However, as more subdivisions of the data were made, percentage estimates began relying on an unacceptably small number of persons examined. It must be noted therefore, that this slope calculation had to be based on only two points. The two time periods were chosen to represent as broad a range in gasoline lead and blood lead values as possible.

Summary

The NHANES II data do not provide a good base for accurately answering the question how many more children will have lead levels ≥ 30 ug/dl if the amount of lead added to gasoline is increased by a given amount. A rough estimate of 18,300 additional children ≥ 30 ug/dl per 1000 additional tons of lead added to gas can be applied when the 6-month-average gasoline lead usage is near the range of 71,000 to 92,700 tons. The ballpark figures of 8000 to 28000 additional children / 1000 tons additional gasoline lead would likely apply over a much broader range of gasoline lead usage.

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LEAD USED IN GASOLINE PRODUCTION AND AVERAGE NHANES II BLOOD LEAD LEVELS (FEB. 1976 - FEB. 1980)

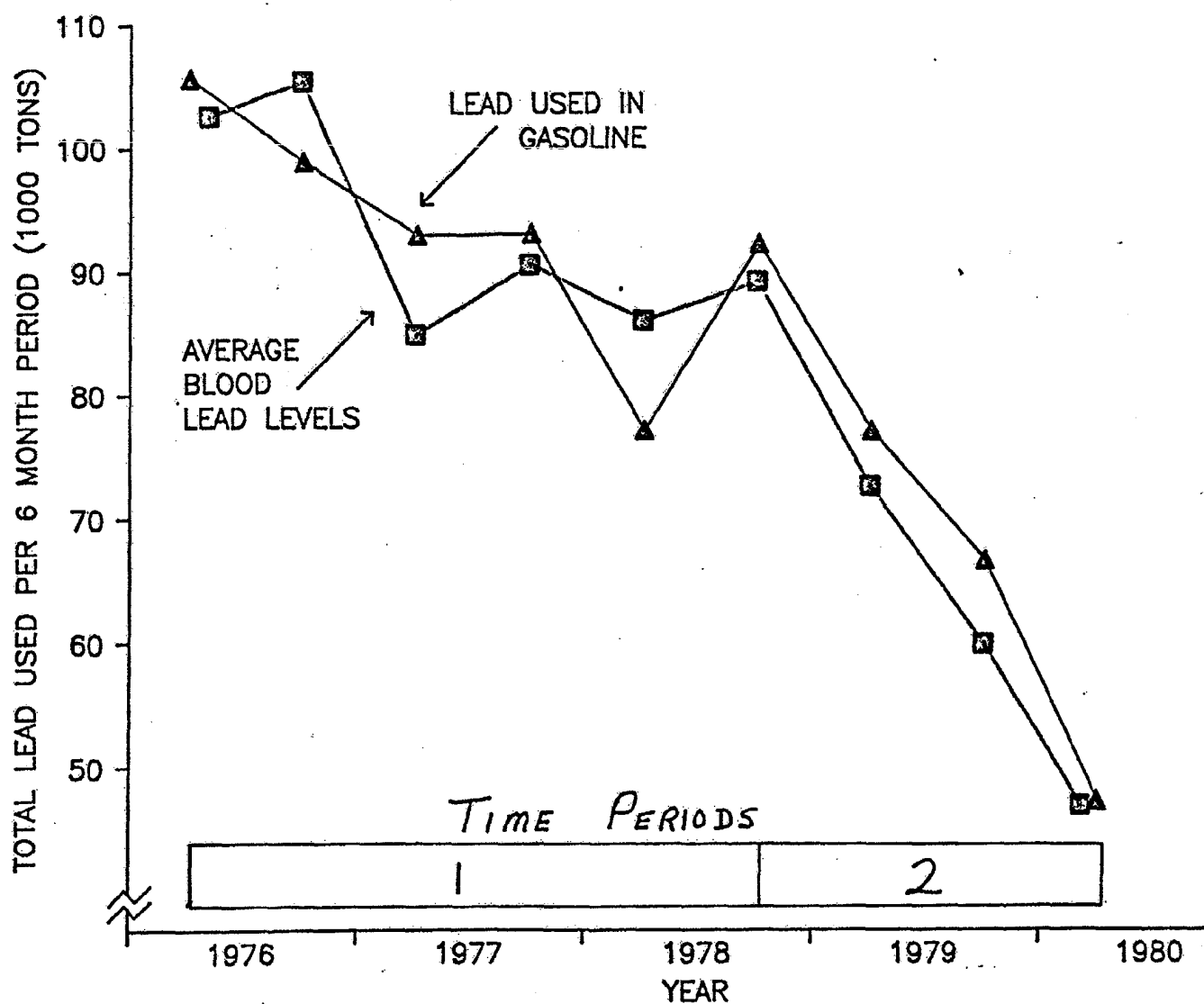


Figure 1

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