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TO:

R.D.S.

Attached are slides & text
(PLMR-58-83) of J.M.P.'s
presentation at Hye Metals Cong.
& Pahrke's report that he
used in a recent trip

Chuck

TEH 0532506

**SUMMARY OF DU PONT'S ANALYSIS
OF THE
NHANES II BLOOD LEAD RESULTS**

**(Pierrard, J. M., Pfeifer, C. G., and Snee, R. D.
E. I. du Pont de Nemours & Co., Inc.)**

PLMR-55-83

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TEH 0532507

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SUMMARY

A split plot covariance analysis of the NHANES II blood lead results indicates changes in site specific gasoline lead use accounts for only 0.5 ug/dl of the observed 5.6 ug/dl change in blood lead reported for the four year test period. Changing demographics of subject groups at the 64 sites sampled accounted for over half of the observed decrease. The 0.5 ug/dl decrease is in agreement with the change expected due to the decrease in air lead. The 0.5 ug/dl is also in agreement with the change expected based on the change in blood levels observed in Frankfurt, Germany when gasoline lead levels were changed from 0.4 g/l to 0.15 g/l.

A special statistical analytical technique was required because the NHANES II protocol was not designed nor intended to provide "within study" chronological trends. Variations in subject and site characteristics throughout the four year test period limited or negated the utility of common data handling methods. The use of national rather than site specific gasoline lead statistics also caused difficulties in data interpretation. The split plot covariance analysis method provided a meaningful way of analyzing the NHANES II results.

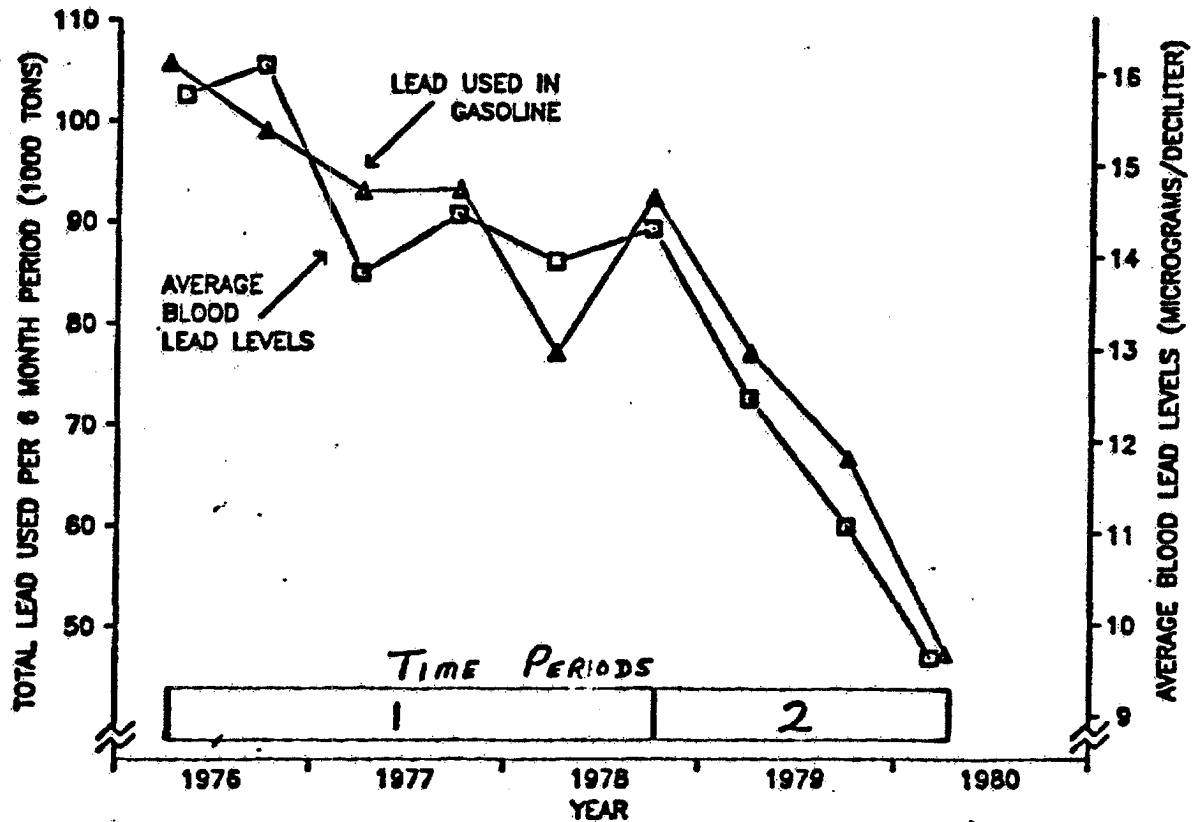
Results of the Du Pont analysis are being presented at International Conference on Heavy Metals in the Environment, Heidelberg, Germany, 6-9 September, 1983. A copy of the paper, "Assessment of Blood Lead Levels in the USA from NHANES II Data," by J. M. Pierrard, C. G. Pfeifer, and R. D. Snee is included in this report. Additional analyses carried out since preparation of this paper have confirmed and strengthened the conclusions made in the paper.

NHANES II PROTOCOL

- National health and nutritional examination survey.
- Public Health Service.
- Carefully designed, stratified, multistage, probability cluster sample survey.
- February 1976 to February 1980.
- 64 Primary sampling locations.
- 6 months to 74 years of age.
- Special groups (young and aged).
- 27,801 persons sampled -- 20,322 examined.
- Lead phase -- blood leads requested on all 6 months-6 years and one-half of others.
- Blind quality control on blood lead analyses.
- Not designed to provide "within-study" chronological trends.
- Quality control program probably did not cover the complete sampling process.

ORIGINAL FIGURE RELEASED BY
V. HOUK, U.S. CENTERS FOR DISEASE CONTROL

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



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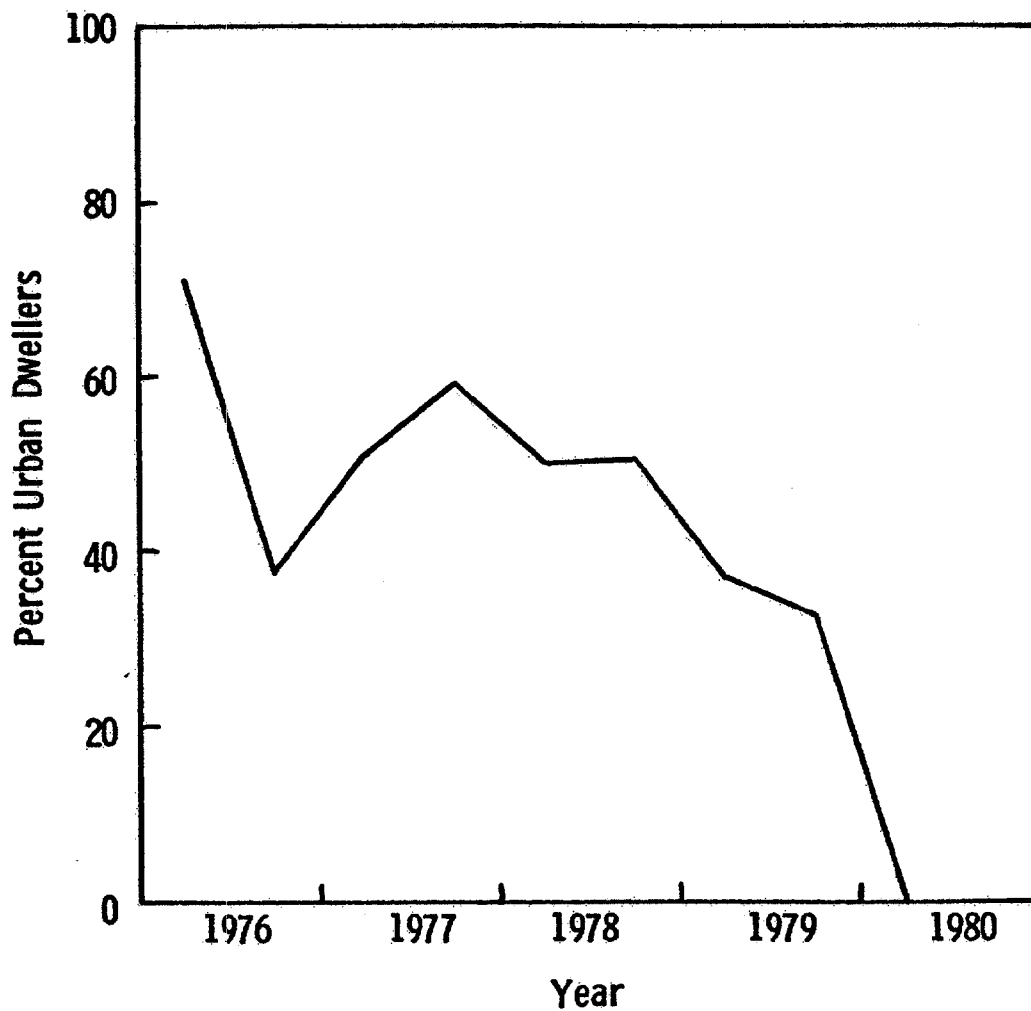
CENTERS FOR DISEASE CONTROL ANALYSIS

- **NHANES II Protocol Not Designed to provide 'within-study' chronological trends**
 - **Variable demographics**
 - **No repeats**
- **CDC Analysis Method Not Appropriate**
 - **Sample population not homogeneous**
 - **National gasoline lead use not representative of individual site lead use**
 - **Other lead exposure variations were not considered**

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VARIATION IN URBAN DWELLER PERCENTAGE IS AN EXAMPLE
OF THE NON-UNIFORM SAMPLING
WHICH OCCURRED DURING NHANES II PROGRAM



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**INDIVIDUAL CHARACTERISTICS POTENTIALLY
INFLUENCING BLOOD LEAD TREND**

- Sex
- Age
- Race
- Income

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**SITE CHARACTERISTICS POTENTIALLY
INFLUENCING BLOOD LEAD TREND**

- Geographic area
- Season
- Degree of urbanization
- Gasoline lead use

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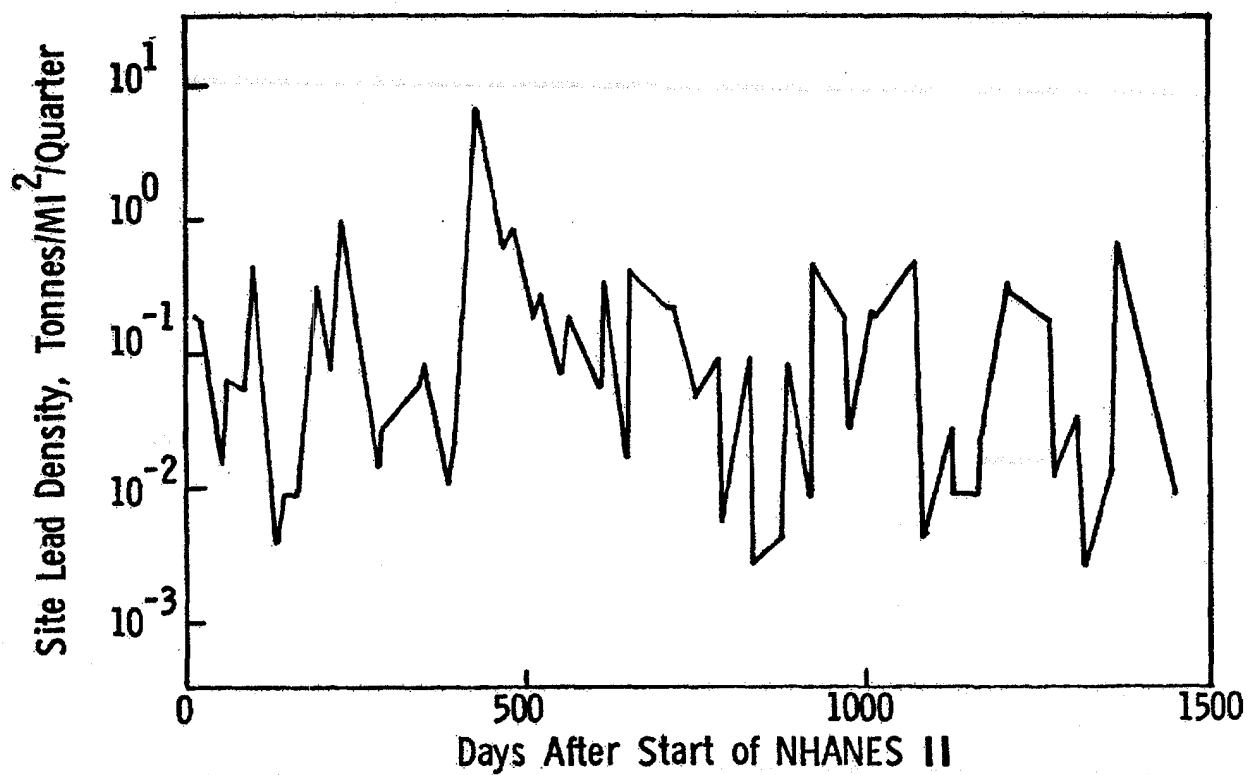
**INFORMATION USED TO DETERMINE
GASOLINE LEAD USE AT A SITE**

- State gasoline lead use
- Lead content
- State population
- Site population
- Site area

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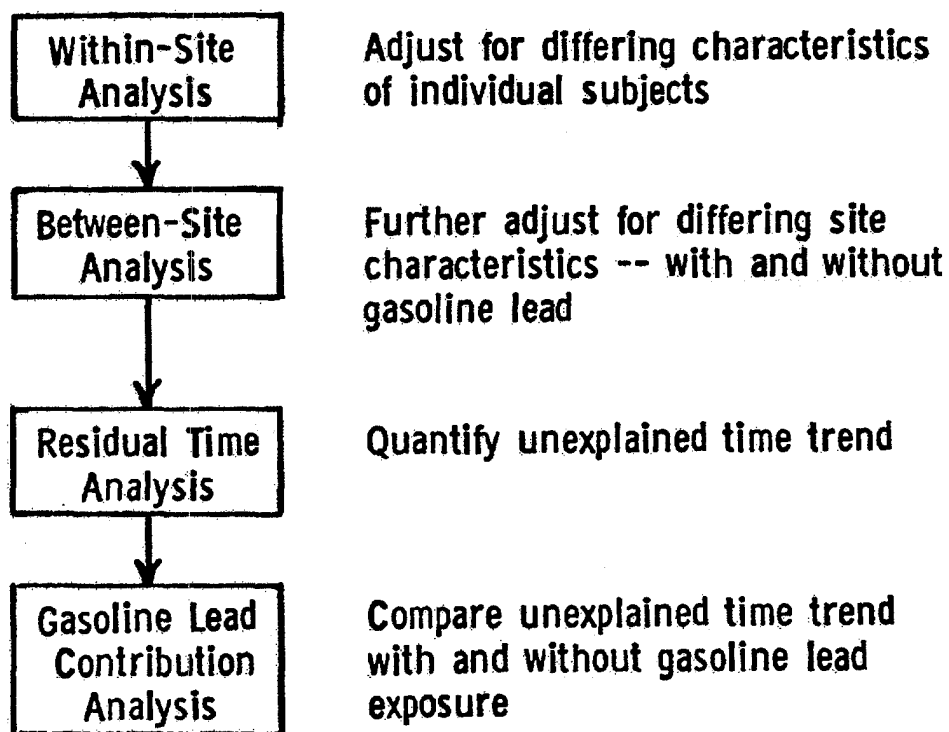
VARIATION IN GASOLINE LEAD USE SITE-TO-SITE



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STEPS IN BLOOD LEAD TREND ANALYSIS



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**TYPICAL RESULTS OF PIERRARD, PFEIFER, SNEE ANALYSIS
(216 DIFFERENT MODELS CONSIDERED IN TOTAL STUDY)**

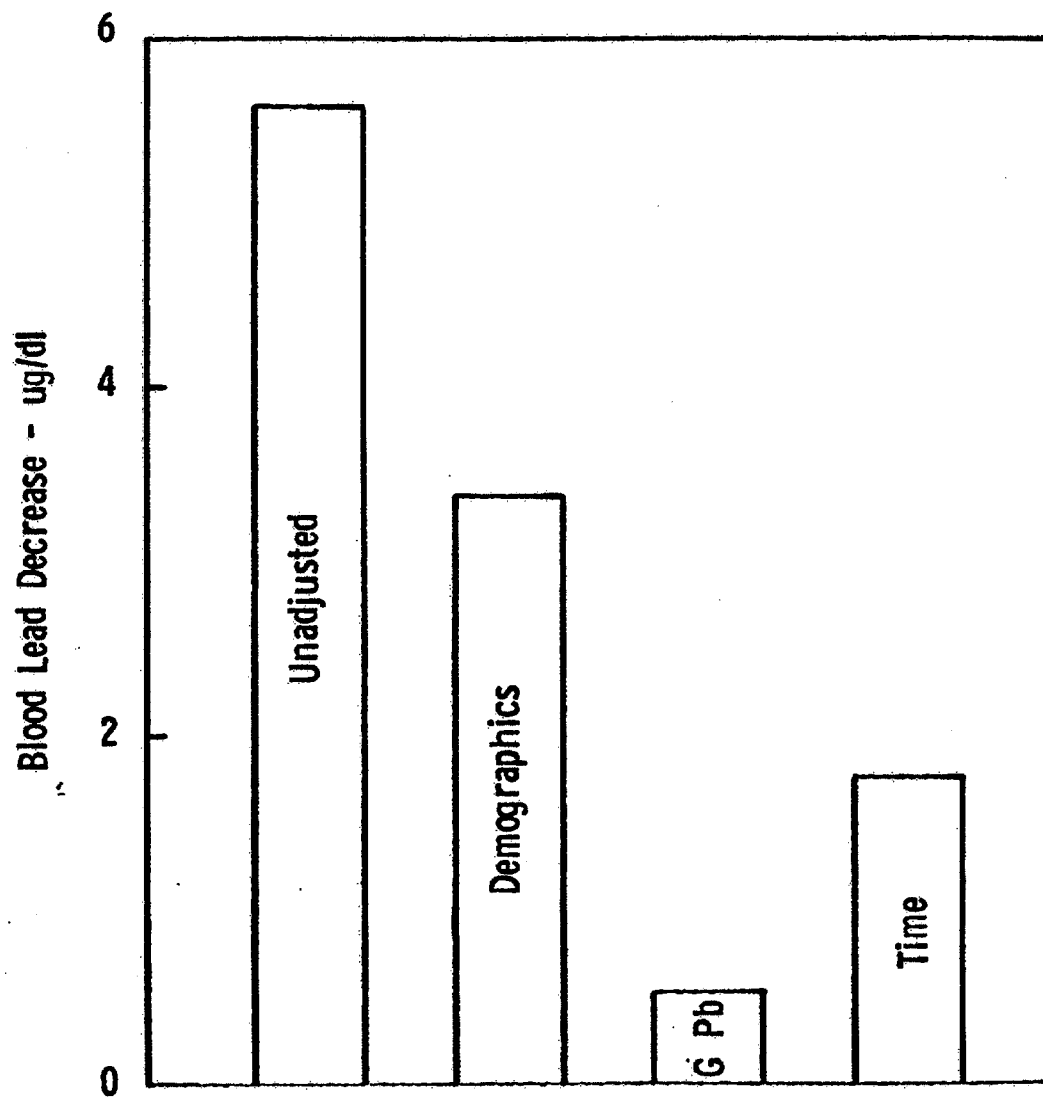
<u>Effects Removed</u>	<u>Remaining Four Year Decrease, ug/dl</u>	<u>Attributable to Gasoline Lead, ug/dl</u>	<u>R_A²</u>
NONE	5.8		
DEM	1.6		0.5
DEM, G Pb	1.3	0.3	0.6
DEM, G Pb, G Pb ₁₅	1.2	0.4	0.6
DEM, G Pb, G Pb ₁₅ , G Pb ₃₀	1.2	0.4	0.6
DEM, log G Pb	1.5	0.1	0.6
DEM, log G Pb, log G Pb ₁₅	1.1	0.5	0.6
DEM, log G Pb, log G Pb ₁₅ , log G Pb ₃₀	1.1	0.5	0.6
G Pb	5.2	0.6*	0.2
log G Pb	4.9	0.9*	0.2

* Not significant as shown by low R_A²

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NHANES II STUDY
CONTRIBUTIONS TO BLOOD LEAD DECREASE - 1976-80
PIERRARD, PFEIFER, SNEE ANALYSIS



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CONCLUSIONS

- National gasoline lead use is not a valid index of exposure at NHANES II sites.
- Over 50% of the apparent blood lead decrease is attributable to demographics.
- 5 to 10% of the apparent blood lead decrease is attributable to gasoline lead exposure.
- The blood lead decrease of 0.3 to 0.6 $\mu\text{g}/\text{m}^3$ attributable to gasoline lead is consistent with the observed air lead decrease.
- A significant blood lead time trend remains after accounting for demographics and gasoline lead exposure.

COMMENTARY

- Du Pont analysis of NHANES II results will be presented at the International Conference on Heavy Metals in the Environment, Heidelberg, Germany, 6-9 September, 1983.
- An EPA appointed review group has concluded: "...despite the strong association between the decline in gasoline-lead usage and the decline in blood-lead levels, the survey results and statistical analyses do not confirm the causal hypothesis."
- Results of the Du Pont analysis using a split plot covariance analysis method were not addressed by the EPA appointed review group. This split plot covariance analysis method is particularly useful for analyzing NHANES II type data.

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