

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED

WILMINGTON, DELAWARE 19898

ENGINEERING DEPARTMENT

March 25, 1986

Dr. David Weil
Project Manager
Air Quality Criteria for Lead
U.S. Environmental Protection Agency
Environmental Criteria and Assessment Office
MD-52
Research Triangle Park, NC 27711

Dear Dr. Weil:

Per your phone request of March 20, 1986, attached please find tables illustrating scenarios showing the predicted drop in blood pressure (mm Hg) associated with a given drop in blood lead (ug/dl), assuming a causal relationship. These tables are extensions of Table 8 given in Du Pont's March 7, 1986 written comments to EPA on the February 1986 Addendum to the second external review draft of Air Quality Criteria for Lead and given in Du Pont's March 12, 1986 oral comments to the Clean Air Scientific Advisory Committee.

Du Pont's point in Table 8 was to demonstrate qualitatively the relatively small numerical change in blood pressure associated with a range of blood pressure-log blood lead coefficients. These numerical changes are about 1 mm Hg or less per 5 ug/dl blood lead drop for coefficient values up to 3 when initial blood leads are at least 15 ug/dl. Since the estimated regression coefficients vary from negative to positive depending on analysis approach, model terms and age-race-sex groups considered, the NHANES II epidemiological evidence and resulting implications, as portrayed in the February 1986 Addendum on the blood pressure-blood lead relationship, appear to be highly suspect.

It is evident that these results are only scenarios assuming a causal relationship holds which acts independently of all other covariates affecting blood pressure. The attached tables suggest that a blood lead drop of a given size has a larger effect on blood pressure for smaller initial blood lead values than for larger ones. This is purely a consequence of using the relationship that blood pressure is proportional to natural logarithm blood lead. To my knowledge no appropriate statistical investigation has been performed to preferentially support one of many possible relationship forms relating blood pressure to blood lead.

If I can be of any further assistance please let me know.

Very truly yours,

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TEH 0412533

SCENARIOS SHOWING PRACTICAL IMPACT OF CHANGES IN BLOOD LEAD ($\mu\text{g/dl}$) ON
BLOOD PRESSURE (mm Hg), ASSUMING THE COEFFICIENT SUMMARIZES A CAUSAL
EFFECT INDEPENDENT OF OTHER COVARIATES RELATED TO BLOOD PRESSURE.

INITIAL BLOOD LEAD = 30 $\mu\text{g/dl}$

BP-ln(BPb) Coefficient	Predicted Drop in BP when BPb drops to X $\mu\text{g/dl}$									
	X=29	X=28	X=27	X=26	X=25	X=24	X=23	X=22	X=21	X=20
0.5	0.02	0.03	0.05	0.07	0.09	0.11	0.13	0.16	0.18	0.20
1.0	0.03	0.07	0.11	0.14	0.18	0.22	0.27	0.31	0.36	0.41
1.5	0.05	0.10	0.16	0.21	0.27	0.33	0.40	0.47	0.54	0.61
2.0	0.07	0.14	0.21	0.29	0.36	0.45	0.53	0.62	0.71	0.81
2.5	0.08	0.17	0.26	0.36	0.46	0.56	0.66	0.78	0.89	1.01
3.0	0.10	0.21	0.32	0.43	0.55	0.67	0.80	0.93	1.07	1.22
3.5	0.12	0.24	0.37	0.50	0.64	0.78	0.93	1.09	1.25	1.42
4.0	0.14	0.28	0.42	0.57	0.73	0.89	1.06	1.24	1.43	1.62
4.5	0.15	0.31	0.47	0.64	0.82	1.00	1.20	1.40	1.61	1.82
5.0	0.17	0.34	0.53	0.72	0.91	1.12	1.33	1.55	1.78	2.03

TEH 0412534

DUP050453585

N 31001.01

SCENARIOS SHOWING PRACTICAL IMPACT OF CHANGES IN BLOOD LEAD ($\mu\text{g}/\text{dl}$) ON
BLOOD PRESSURE (mm Hg), ASSUMING THE COEFFICIENT SUMMARIZES A CAUSAL
EFFECT INDEPENDENT OF OTHER COVARIATES RELATED TO BLOOD PRESSURE.

INITIAL BLOOD LEAD = 25 $\mu\text{g}/\text{dl}$

BP- $\ln(\text{BPb})$ Coefficient	Predicted Drop in BP when BPb drops to X $\mu\text{g}/\text{dl}$									
	X=24	X=23	X=22	X=21	X=20	X=19	X=18	X=17	X=16	X=15
0.5	0.02	0.04	0.06	0.09	0.11	0.14	0.16	0.19	0.22	0.26
1.0	0.04	0.08	0.13	0.17	0.22	0.27	0.33	0.39	0.45	0.51
1.5	0.06	0.13	0.19	0.26	0.33	0.41	0.49	0.58	0.67	0.77
2.0	0.08	0.17	0.26	0.35	0.45	0.55	0.66	0.77	0.89	1.02
2.5	0.10	0.21	0.32	0.44	0.56	0.69	0.82	0.96	1.12	1.28
3.0	0.12	0.25	0.38	0.52	0.67	0.82	0.99	1.16	1.34	1.53
3.5	0.14	0.29	0.45	0.61	0.78	0.96	1.15	1.35	1.56	1.79
4.0	0.16	0.33	0.51	0.70	0.89	1.10	1.31	1.54	1.79	2.04
4.5	0.18	0.38	0.58	0.78	1.00	1.23	1.48	1.74	2.01	2.30
5.0	0.20	0.42	0.64	0.87	1.12	1.37	1.64	1.93	2.23	2.55

TEH 0412535

DUP050453586

N 31001.02

SCENARIOS SHOWING PRACTICAL IMPACT OF CHANGES IN BLOOD LEAD (ug/dl) ON
BLOOD PRESSURE (mm Hg), ASSUMING THE COEFFICIENT SUMMARIZES A CAUSAL
EFFECT INDEPENDENT OF OTHER COVARIATES RELATED TO BLOOD PRESSURE.

INITIAL BLOOD LEAD = 20 ug/dl

BP-ln(BPb) Coefficient	Predicted Drop in BP when BPb drops to X ug/dl									
	X=19	X=18	X=17	X=16	X=15	X=14	X=13	X=12	X=11	X=10
0.5	0.03	0.05	0.08	0.11	0.14	0.18	0.22	0.26	0.30	0.35
1.0	0.05	0.11	0.16	0.22	0.29	0.36	0.43	0.51	0.60	0.69
1.5	0.08	0.16	0.24	0.33	0.43	0.54	0.65	0.77	0.90	1.04
2.0	0.10	0.21	0.33	0.45	0.58	0.71	0.86	1.02	1.20	1.39
2.5	0.13	0.26	0.41	0.56	0.72	0.89	1.08	1.28	1.49	1.73
3.0	0.15	0.32	0.49	0.67	0.86	1.07	1.29	1.53	1.79	2.08
3.5	0.18	0.37	0.57	0.78	1.01	1.25	1.51	1.79	2.09	2.43
4.0	0.21	0.42	0.65	0.89	1.15	1.43	1.72	2.04	2.39	2.77
4.5	0.23	0.47	0.73	1.00	1.29	1.61	1.94	2.30	2.69	3.12
5.0	0.26	0.53	0.81	1.12	1.44	1.78	2.15	2.55	2.99	3.47

TEH 0412536

TEH 0412536

DUP050453587

N 31001.03

SCENARIOS SHOWING PRACTICAL IMPACT OF CHANGES IN BLOOD LEAD (ug/dl) ON
BLOOD PRESSURE (mm Hg), ASSUMING THE COEFFICIENT SUMMARIZES A CAUSAL
EFFECT INDEPENDENT OF OTHER COVARIATES RELATED TO BLOOD PRESSURE.

INITIAL BLOOD LEAD = 15 ug/dl

BP-In(BPb) Coefficient	Predicted Drop in BP when BPb drops to X ug/dl									
	X=14	X=13	X=12	X=11	X=10	X=9	X=8	X=7	X=6	X=5
0.5	0.03	0.07	0.11	0.16	0.20	0.26	0.31	0.38	0.46	0.55
1.0	0.07	0.14	0.22	0.31	0.41	0.51	0.63	0.76	0.92	1.10
1.5	0.10	0.21	0.33	0.47	0.61	0.77	0.94	1.14	1.37	1.65
2.0	0.14	0.29	0.45	0.62	0.81	1.02	1.26	1.52	1.83	2.20
2.5	0.17	0.36	0.56	0.78	1.01	1.28	1.57	1.91	2.29	2.75
3.0	0.21	0.43	0.67	0.93	1.22	1.53	1.89	2.29	2.75	3.30
3.5	0.24	0.50	0.78	1.09	1.42	1.79	2.20	2.67	3.21	3.85
4.0	0.28	0.57	0.89	1.24	1.62	2.04	2.51	3.05	3.67	4.39
4.5	0.31	0.64	1.00	1.40	1.82	2.30	2.83	3.43	4.12	4.94
5.0	0.34	0.72	1.12	1.55	2.03	2.55	3.14	3.81	4.58	5.49

TEH 0412537

DUP050453588

N 31001.04

SCENARIOS SHOWING PRACTICAL IMPACT OF CHANGES IN BLOOD LEAD ($\mu\text{g}/\text{dl}$) ON
BLOOD PRESSURE (mm Hg), ASSUMING THE COEFFICIENT SUMMARIZES A CAUSAL
EFFECT INDEPENDENT OF OTHER COVARIATES RELATED TO BLOOD PRESSURE.

INITIAL BLOOD LEAD = $10 \mu\text{g}/\text{dl}$

BP- $\ln(\text{BPb})$ Coefficient	Predicted Drop in BP when BPb drops to X $\mu\text{g}/\text{dl}$									
	X=9	X=8	X=7	X=6	X=5	X=4	X=3	X=2	X=1	X=0
0.5	0.05	0.11	0.18	0.26	0.35	0.46	0.60	0.80	1.15	.
1.0	0.11	0.22	0.36	0.51	0.69	0.92	1.20	1.61	2.30	.
1.5	0.16	0.33	0.54	0.77	1.04	1.37	1.81	2.41	3.45	.
2.0	0.21	0.45	0.71	1.02	1.39	1.83	2.41	3.22	4.61	.
2.5	0.26	0.56	0.89	1.28	1.73	2.29	3.01	4.02	5.76	.
3.0	0.32	0.67	1.07	1.53	2.08	2.75	3.61	4.83	6.91	.
3.5	0.37	0.78	1.25	1.79	2.43	3.21	4.21	5.63	8.06	.
4.0	0.42	0.89	1.43	2.04	2.77	3.67	4.82	6.44	9.21	.
4.5	0.47	1.00	1.61	2.30	3.12	4.12	5.42	7.24	10.36	.
5.0	0.53	1.12	1.78	2.55	3.47	4.58	6.02	8.05	11.51	.

TEH 0412538

DUP050453589

N 31001.05

SCENARIOS SHOWING PRACTICAL IMPACT OF CHANGES IN BLOOD LEAD (ug/dl) ON
BLOOD PRESSURE (mm Hg), ASSUMING THE COEFFICIENT SUMMARIZES A CAUSAL
EFFECT INDEPENDENT OF OTHER COVARIATES RELATED TO BLOOD PRESSURE.

INITIAL BLOOD LEAD = 5 ug/dl

BP-ln(BPb) Coefficient	Predicted Drop in BP when BPb drops to X ug/dl									
	X=4	X=3	X=2	X=1	X=0	X=-1	X=-2	X=-3	X=-4	X=-5
0.5	0.11	0.26	0.46	0.80	.	.	.	.	.	.
1.0	0.22	0.51	0.92	1.61	.	.	.	.	.	.
1.5	0.33	0.77	1.37	2.41	.	.	.	.	.	.
2.0	0.45	1.02	1.83	3.22	.	.	.	.	.	.
2.5	0.56	1.28	2.29	4.02	.	.	.	.	.	.
3.0	0.67	1.53	2.75	4.83	.	.	.	.	.	.
3.5	0.78	1.79	3.21	5.63	.	.	.	.	.	.
4.0	0.89	2.04	3.67	6.44	.	.	.	.	.	.
4.5	1.00	2.30	4.12	7.24	.	.	.	.	.	.
5.0	1.12	2.55	4.58	8.05	.	.	.	.	.	.

TEH 0412539

DUP050453590

N 31001.06