

1927-1929

Lead in urine, total ✓

" " " " mg / liter ✓

" " faeces, total ✓

" " " " mg / gm ash ✓

Tank Wagon Ethyl + Filling Station Ethyl 1927 - 1929

Lead in Urine (Total)

Pb in urine mgs.	1927 (exclusive of case No. 104)				Pb in urine mgs.	1929			
	f	x	fx	fx ²		f	x	fx	fx ²
.0 - .039	5	0	0	0	.0 - .039	8	0	0	0
.04 - .079	3	1	3	3	.04 - .079	14	1	14	14
.08 - .119	12	2	24	48	.08 - .119	15	2	30	60
.12 - .159	13	3	39	117	.12 - .159	6	3	18	54
.16 - .199	8	4	32	128	.16 - .199	2	4	8	32
.20 - .239	4	5	20	100	.20 - .239	3	5	15	75
.24 - .279	1	6	6	36	.24 - .279	0	6	0	0
.28 - .319	1	7	7	49	.28 - .319	2	7	14	98
.32 - .359	0	8	0	0	.	50		99	333
.36 - .399	0	9	0	0					
.40 - .439	0	10	0	0					
.44 - .479	0	11	0	0					
.48 - .519	0	12	0	0					
.52 -	4	13	52	676					
	49		183	1157					

$$Nu_1 = \frac{183}{49} = 3.734694$$

$$Nu_1 = \frac{99}{50} = 1.980000$$

$$Nu_2 = \frac{1157}{49} = 23.612244$$

$$Nu_2 = \frac{333}{50} = 6.660000$$

$$(Nu_1)^2 = 13.947939$$

$$(Nu_1)^2 = 3.920400$$

$$Pi_2 = 9.664305$$

$$Pi_2 = 2.749600$$

$$\text{Sigma} = 3.108747 \times .04 = .124350 \text{ mgs.}$$

$$\text{Sigma} = 1.658192 \times .04 = .066328 \text{ mgs.}$$

$$\begin{aligned} \text{P.E. sig.} &= \frac{.67449 \times .124350}{\sqrt{98}} = \frac{.083873}{9.899494} \\ &= \pm .008472 \end{aligned}$$

$$\begin{aligned} \text{P.E. sig.} &= \frac{.67449 \times .066328}{10} \\ &= \pm .004474 \end{aligned}$$

$$\begin{aligned} \text{mean} &= 3.734694 \times .04 + .02 \\ &= .169388 \text{ mgs. Pb} \end{aligned}$$

$$\begin{aligned} \text{mean} &= 1.980000 \times .04 + .02 \\ &= .099200 \text{ mgs. Pb} \end{aligned}$$

$$\text{P.E.}_m = \frac{.083873}{7} = \pm .011982$$

$$\text{P.E.}_m = \frac{.044740}{\sqrt{50}} = \frac{.044740}{7.071067} = \pm .006327$$

$$\text{mean} = .169 \pm .012 \text{ mgs. Pb}$$

$$\text{mean} = .099 \pm .006 \text{ mgs.}$$

$$\text{S.D.} = .124 \pm .008 \text{ mgs. Pb}$$

$$\text{S.D.} = .066 \pm .004 \text{ mgs.}$$

Test of Difference

$$\begin{aligned} \text{mean 1927} &= .169 \\ \text{mean 1929} &= .099 \\ \text{Diff.} &= .070 \end{aligned}$$

$$\frac{\text{Diff.}}{\text{P.E. dif.}} = \frac{.070}{.013} = 5.3$$

$$\begin{aligned} \text{P.E. dif.} &= \sqrt{(.012)^2 + (.006)^2} \\ &= \sqrt{.000144 + .000036} \\ &= \sqrt{.000180} \\ &= \pm .013 \end{aligned}$$

The difference is in favor of 1929 and is beginning to be significant, i.e., 5.3 x P.E. dif.

KE 0019103

Tank Wagon Ethyl + Filling Station Ethyl 1927 - 1929

Lead in Faeces mgs./gm. Ash

Mgs. Pb per gm. ash	1927 (excluding case No. 4.)				Mgs. Pb per gm. ash	1929			
	f	x	fx	fx ²		f	x	fx	fx ²
.0 - .039	3	0	0	0	.0 - .039	1	0	0	0
.04 - .079	9	1	9	9	.04 - .079	14	1	14	14
.08 - .119	10	2	20	40	.08 - .119	8	2	16	32
.12 - .159	6	3	18	54	.12 - .159	6	3	18	54
.16 - .199	4	4	16	64	.16 - .199	3	4	12	48
.20 - .239	0	5	0	0	.20 - .239	2	5	10	50
.24 - .279	1	6	6	36	.24 - .279	2	6	12	72
.28 - .319	1	7	7	49	.28 - .319	0	7	0	0
.32 - .359	0	8	0	0	.32 - .359	0	8	0	0
.36 - .399	0	9	0	0	.36 - .399	0	9	0	0
.40 - .439	1	10	10	100	.40 - .439	0	10	0	0
.44 - .479	0	11	0	0	.44 - .479	0	11	0	0
.48 -	1	12	12	144	.48 - .519	0	12	0	0
	36		98	496	.52 -	1	13	13	169
						37		95	439

$$Nu_1 = \frac{98}{36} = 2.722222$$

$$Nu_1 = \frac{95}{37} = 2.567568$$

$$Nu_2 = \frac{496}{36} = 13.777777$$

$$Nu_2 = \frac{439}{37} = 11.864864$$

$$(Nu_1)^2 = 7.410493$$

$$(Nu_1)^2 = 6.592405$$

$$Pi_2 = 6.367284$$

$$Pi_2 = 5.272459$$

$$\text{Sigma} = 2.523348 \times .04 = .100934 \text{ mgs.}$$

$$\text{Sigma} = 2.296184 \times .04 = .091847 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .100934}{8.485281} = \frac{.068079}{8.485281}$$

$$\text{P.E. sig.} = \frac{.67449 \times .091847}{8.602325} = \frac{.059222}{8.602325}$$

$$= \pm .008023$$

$$= \pm .006884$$

$$\text{mean} = 2.722222 \times .04 + .02$$

$$\text{mean} = 2.567568 \times .04 + .02$$

$$= .128888 \text{ mgs./gm. ash}$$

$$= .122703 \text{ mgs./gm. ash.}$$

$$\text{P.E.}_m = \frac{.068079}{6} = \pm .011347$$

$$\text{P.E.}_m = \frac{.059222}{6.082232} = \pm .009737$$

$$\text{mean} = .129 \pm .011 \text{ mgs./gm. ash}$$

$$\text{mean} = .123 \pm .010 \text{ mgs./gm. ash}$$

$$\text{S.D.} = .101 \pm .008 \text{ mgs.}$$

$$\text{S.D.} = .092 \pm .007 \text{ mgs.}$$

Test of Difference

$$\text{mean 1927} = .129$$

$$\text{mean 1929} = .123$$

$$\text{Diff.} = .006$$

$$\frac{\text{Diff.}}{\text{P.E.}_{\text{dif.}}} = \frac{.006}{.018} < 1$$

$$\begin{aligned} \text{P.E.}_{\text{dif.}} &= \sqrt{(.011)^2 + (.010)^2} \\ &= \sqrt{.000121 + .000100} \\ &= \sqrt{.000321} \\ &= \pm .018 \end{aligned}$$

The difference between the two years is certainly not significant.

KE 0019104

Tank Wagon Ethyl + Filling Station Ethyl 1927 - 1929

Lead in Faeces (Total)

1927					1929				
Pb in faeces mgs.	f	x	fx	fx ²	Pb in faeces mgs.	f	x	fx	fx ²
.0 - .079	1	0	0	0	.0 - .079	3	0	0	0
.08 - .159	9	1	9	9	.08 - .159	5	1	5	5
.16 - .239	6	2	12	24	.16 - .239	10	2	20	40
.24 - .319	6	3	18	54	.24 - .319	3	3	9	27
.32 - .399	4	4	16	64	.32 - .399	6	4	24	96
.40 - .479	4	5	20	100	.40 - .479	2	5	10	50
.48 - .559	0	6	0	0	.48 - .559	4	6	24	144
.56 - .639	4	7	28	196	.56 - .639	2	7	14	98
.64 - .719	1	8	8	64	.64 - .719	1	8	8	64
.72 - .799	0	9	0	0	.72 - .799	0	9	0	0
.80 - .879	0	10	0	0	.80 - .879	0	10	0	0
.88 - .959	0	11	0	0	.88 - .959	0	11	0	0
.96 - 1.039	0	12	0	0	.96 - 1.039	0	12	0	0
1.04 -	1	13	13	169	1.04 -	1	13	13	169
	36		124	680		37		127	693

$$Nu_1 = \frac{124}{36} = 3.444444$$

$$Nu_1 = \frac{127}{37} = 3.432432$$

$$Nu_2 = \frac{680}{36} = 18.888889$$

$$Nu_2 = \frac{693}{37} = 18.729730$$

$$(Nu_1)^2 = 11.864194$$

$$(Nu_1)^2 = 11.781589$$

$$Pi_2 = 7.024695$$

$$Pi_2 = 6.948141$$

$$\text{Sigma} = 2.650414 \times .08 = .212033 \text{ mgs.}$$

$$\text{Sigma} = 2.635933 \times .08 = .210875 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .212033}{8.485281} = \frac{.143014}{8.485281}$$

$$\text{P.E. sig.} = \frac{.67449 \times .210875}{\sqrt{74}} = \frac{.142233}{8.602325}$$

$$= \pm .016854$$

$$= \pm .016534$$

$$\text{mean} = 3.444444 \times .08 + .04$$

$$\text{mean} = 3.432432 \times .08 + .04$$

$$= .315556 \text{ mgs.}$$

$$= .314595 \text{ mgs.}$$

$$\text{P.E.}_m = \frac{.143014}{6} \pm .023836$$

$$\text{P.E.}_m = \frac{.142233}{6.082232} = \pm .023385$$

$$\text{mean} = .316 \pm .024 \text{ mgs. Pb}$$

$$\text{mean} = .315 \pm .023 \text{ mgs. Pb}$$

$$\text{S.D.} = .212 \pm .017 \text{ mgs.}$$

$$\text{S.D.} = .211 \pm .017 \text{ mgs.}$$

Test of Difference

$$\text{mean 1927} = .316$$

$$\text{mean 1929} = .315$$

$$\text{Diff.} = .001$$

$$\begin{aligned} \text{P.E.}_{\text{dif.}} &= \sqrt{(.024)^2 + (.023)^2} \\ &= \sqrt{.000576 + .000529} \\ &= \sqrt{.001105} \\ &= \pm .033 \end{aligned}$$

$$\frac{\text{Diff.}}{\text{P.E.}_{\text{dif.}}} = \frac{.001}{.033} < 1$$

There is a slight difference in favor of 1929 but it is certainly not significant.

KE 0019105

Tank Wagon Ethyl + Filling Station Ethyl 1927 - 1929

Lead in Urine Mgs./Liter

Mgs. Pb per liter urine	1927 (exclusive of case No. 104)				Mgs. Pb per liter urine	1929			
	f	x	fx	fx ²		f	x	fx	fx ²
.0 - .039	3	0	0	0	.0 - .039	13	0	0	0
.04 - .079	19	1	19	19	.04 - .079	18	1	18	18
.08 - .119	11	2	22	44	.08 - .119	11	2	22	44
.12 - .159	6	3	18	54	.12 - .159	1	3	3	9
.16 - .199	2	4	8	32	.16 - .199	2	4	8	32
.20 - .239	2	5	10	50	.20 - .239	1	5	5	25
.24 - .279	0	6	0	0	.24 - .279	1	6	6	36
.28 - .319	0	7	0	0	.28 - .319	0	7	0	0
.32 - .359	1	8	8	64	.32 - .359	1	8	8	64
.36 - .399	1	9	9	81	.36 - .399	0	9	0	0
.40 - .439	1	10	10	100	.40 - .439	0	10	0	0
.44 - .479	2	11	22	242	.44 - .479	1	11	11	121
.48 - .519	0	12	0	0	.48 - .519	0	12	0	0
.52 -	1	13	13	169	.52 -	1	13	13	169
	49		139	855		50		94	518

$$Nu_1 = \frac{139}{49} = 2.836735$$

$$Nu_1 = \frac{90}{50} = 1.800000$$

$$Nu_2 = \frac{855}{49} = 17.448979$$

$$Nu_2 = \frac{518}{50} = 10.360000$$

$$(Nu_1)^2 = 8.047065$$

$$(Nu_1)^2 = 3.240000$$

$$Pi_2 = 9.401914$$

$$Pi_2 = 7.120000$$

$$\text{Sigma} = 3.066254 \times .04 = .122650 \text{ mgs.}$$

$$\text{Sigma} = 2.668333 \times .04 = .106733$$

$$\text{P.E.sig.} = \frac{.67449 \times .122650}{\sqrt{98}} = \frac{.082726}{9.899494}$$

$$\text{P.E.sig.} = \frac{.67449 \times .106733}{10}$$

$$= \pm .008357$$

$$= \pm .007199$$

$$\text{mean} = 2.836735 \times .04 + .02$$

$$\text{mean} = 1.800000 \times .04 + .02$$

$$= .133469 \text{ mgs./liter}$$

$$= .092000 \text{ mgs./liter}$$

$$\text{P.E.m} = \frac{.082726}{7} = \pm .011818$$

$$\text{P.E.m} = \frac{.071990}{7.071067} = \pm .010181$$

$$\text{mean} = .133 \pm .012 \text{ mgs./liter}$$

$$\text{mean} = .092 \pm .010 \text{ mgs./liter}$$

$$\text{S.D.} = .123 \pm .008$$

$$\text{S.D.} = .107 \pm .007$$

Test of Difference

$$\text{mean 1927} = .133$$

$$\text{mean 1929} = .092$$

$$\text{Diff.} = .041$$

$$\frac{\text{Diff.}}{\text{P.E.dif.}} = \frac{.041}{.016} = 2 \pm$$

$$\begin{aligned} \text{P.E.dif.} &= \sqrt{(.012)^2 + (.010)^2} \\ &= \sqrt{.000144 + .000100} \\ &= \sqrt{.000244} \\ &= \pm .016 \end{aligned}$$

The difference (in favor of 1929) is certainly not significant.

KE 0019106