

1927-1929

CONFIDENTIAL

REF 0010000

Filling Station Ethyl 1927 - 1929

Lead in Urine mgs./Liter

Mgs. Pb per liter urine	f	x	1929 fx	fx ²
.0 - .039	7	0	0	0
.04 - .079	7	1	7	7
.08 - .119	9	2	18	36
.12 - .159	0	3	0	0
.16 - .199	1	4	4	16
.20 - .239	1	5	5	25
.24 - .279	0	6	0	0
.28 - .319	0	7	0	0
.32 - .359	0	8	0	0
.36 - .399	0	9	0	0
.40 - .439	0	10	0	0
.44 -	1	11	11	121
	26		45	205

Mgs. Pb per liter urine	f	x	1927 fx	fx ²
.0 - .039	3	0	0	0
.04 - .079	9	1	9	9
.08 - .119	6	2	12	24
.12 - .159	3	3	9	27
.16 - .199	1	4	4	16
.20 - .239	2	5	10	50
.24 - .279	0	6	0	0
.28 - .319	0	7	0	0
.32 - .359	0	8	0	0
.36 - .399	0	9	0	0
.40 - .439	0	10	0	0
.44 -	2	11	22	242
	26		66	368

$$Nu_1 = \frac{45}{26} = 1.730769$$

$$Nu_1 = \frac{66}{26} = 2.538461$$

$$Nu_2 = \frac{205}{26} = 7.884615$$

$$Nu_2 = \frac{368}{26} = 14.153846$$

$$(Nu_1)^2 = 2.995561$$

$$(Nu_1)^2 = 6.443784$$

$$Pi_2 = 4.889054$$

$$Pi_2 = 7.710062$$

$$\text{Sigma} = 2.211121 \times .04 = .088445 \text{ mgs.}$$

$$\text{Sigma} = 2.776700 \times .04 = .111068 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .088445}{\sqrt{52}}$$

$$\text{P.E. sig.} = \frac{.67449 \times .111068}{\sqrt{52}}$$

$$= \frac{.059655}{7.211102} = \pm .008277$$

$$= \frac{.074914}{7.211102} = \pm .010389$$

$$\text{mean} = 1.730769 \times .04 + .02$$

$$\text{mean} = 2.538461 \times .04 + .02$$

$$= .089231 \text{ mgs./liter}$$

$$= .121538 \text{ mgs./liter}$$

$$\text{P.E.}_m = \frac{.059655}{5.099019} = \pm .011699$$

$$\text{P.E.}_m = \frac{.074914}{5.099019} = \pm .014692$$

$$\text{mean} = .089 \pm .012 \text{ mgs./liter}$$

$$\text{mean} = .122 \pm .015 \text{ mgs./liter}$$

$$\text{S.D.} = .088 \pm .008 \text{ mgs.}$$

$$\text{S.D.} = .111 \pm .010 \text{ mgs.}$$

Test of Difference

$$\text{mean 1927} = .122$$

$$= \pm .019$$

$$\text{mean 1929} = .089$$

$$\text{Diff.} = .033$$

$$\frac{\text{Diff.}}{\text{P.E. sig.}} = \frac{.033}{.019} = 1.7$$

$$\begin{aligned} \text{P.E.}_{\text{dif.}} &= \sqrt{(.012)^2 + (.015)^2} \\ &= \sqrt{.000144 + .000225} \\ &= \sqrt{.000369} \end{aligned}$$

There is a decrease in lead mg./liter of urine in 1929 as compared to 1927 but this is not significant. There is some importance to be attached to the fact that in all findings the difference is always in favor of 1929.

KE 0019098

Filling Station Ethyl 1927 - 1929

Lead in Urine (Total)

Pb in urine mgs.	f	x	<u>1927</u> fx	fx ²
.0 - .039	2	0	0	0
.04 - .079	0	1	0	0
.08 - .119	6	2	12	24
.12 - .159	9	3	27	81
.16 - .199	4	4	16	64
.20 - .239	3	5	15	75
.24 - .279	0	6	0	0
.28 - .319	0	7	0	0
.32 - .359	0	8	0	0
.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 -	2	13	26	338
	<u>26</u>		<u>96</u>	<u>582</u>

$$Nu_1 = \frac{96}{26} = 3.692308$$

$$Nu_2 = \frac{582}{26} = 22.384615$$

$$(Nu_1)^2 = 13.633138$$

$$Pi_2 = 8.751477$$

$$\text{Sigma} = 2.958290 \times .04 = .118332 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .118332}{\sqrt{52}} = \frac{.079814}{7.211102}$$

$$= \pm .011068$$

$$\text{mean} = 3.692308 \times .04 + .02$$

$$= .187692 \text{ mgs. Pb}$$

$$\text{P.E.}_m = \frac{.079814}{\sqrt{26}} = \frac{.079814}{5.099019} = \pm .015653$$

$$\text{mean} = .188 \pm .016 \text{ mgs. Pb}$$

$$\text{S.D.} = .118 \pm .011 \text{ mgs.}$$

Pb in urine mgs.	f	x	<u>1929</u> fx	fx ²
.0 - .039	5	0	0	0
.04 - .079	8	1	8	8
.08 - .119	6	2	12	24
.12 - .159	2	3	6	18
.16 - .199	1	4	4	16
.20 - .239	3	5	15	75
.24 - .279	0	6	0	0
.28 -	1	7	7	49
	<u>26</u>		<u>52</u>	<u>190</u>

$$Nu_1 = \frac{52}{26} = 2.000000$$

$$Nu_2 = \frac{190}{26} = 7.307692$$

$$(Nu_1)^2 = 4.000000$$

$$Pi_2 = 3.307692$$

$$\text{Sigma} = 1.818706 \times .04 = .072748 \text{ mgs.}$$

$$\text{P.E. sig.} = \frac{.67449 \times .072748}{\sqrt{52}} = \frac{.049068}{7.211102}$$

$$= \pm .006805$$

$$\text{mean} = 2.000000 \times .04 + .02$$

$$= .100000$$

$$\text{P.E.}_m = \frac{.049068}{5.099019} = \pm .009623$$

$$\text{mean} = .100 \pm .010$$

$$\text{S.D.} = .073 \pm .007$$

Test of Difference

$$\text{mean 1927} = .188$$

$$\text{mean 1929} = .100$$

$$\text{Diff.} = .088$$

$$\text{P.E. dif.} = \sqrt{(.016)^2 + (.010)^2}$$

$$= \sqrt{.000256 + .000100}$$

$$= \sqrt{.000356}$$

$$= \pm .018868$$

$$\frac{\text{Diff.}}{\text{P.E. dif.}} = \frac{.088}{.019} = 4.6$$

There is a decrease in total lead for 1929 as compared to 1927 and this decrease is verging onto significance being slightly more than four times its own probable error.

KE 0019099

Filling Station Ethyl 1927 - 1929

Lead in Faeces mgs./gm. Ash

Mgs. Pb per gm. ash	f	<u>1929</u> x	fx	fx ²
.0 - .039	1	0	0	0
.04 - .079	7	1	7	7
.08 - .119	6	2	12	24
.12 - .159	3	3	9	27
.16 - .199	1	4	4	16
.20 - .239	1	5	5	25
.24 -	1	6	6	36
	<u>20</u>		<u>43</u>	<u>135</u>

Mgs. Pb per gm. ash	f	<u>1927</u> x	fx	fx ²
.0 - .039	2	0	0	0
.04 - .079	5	1	5	5
.08 - .119	5	2	10	20
.12 - .159	2	3	6	18
.16 - .199	1	4	4	16
.20 - .239	0	5	0	0
.24 - .279	1	6	6	36
.28 - .319	1	7	7	49
.32 - .359	0	8	0	0
.36 - .399	0	9	0	0
.40 - .439	1	10	10	100
.44 - .479	0	11	0	0
.48 -	1	12	12	144
	<u>19</u>		<u>60</u>	<u>388</u>

$$Nu_1 = \frac{43}{20} = 2.150000$$

$$Nu_1 = \frac{60}{19} = 3.157894$$

$$Nu_2 = \frac{135}{20} = 6.750000$$

$$Nu_2 = \frac{388}{19} = 20.421052$$

$$(Nu_1)^2 = 4.622500$$

$$(Nu_1)^2 = 9.972295$$

$$Pi_2 = 2.127500$$

$$Pi_2 = 10.448757$$

$$\text{Sigma} = 1.458595 \times .04 = .058344 \text{ mgs.}$$

$$\text{Sigma} = 3.232450 \times .04 = .129298 \text{ mgs.}$$

$$\begin{aligned} \text{P.E. sig.} &= \frac{.67449 \times .058344}{\sqrt{40}} = \frac{.039352}{6.324553} \\ &= \pm .006222 \end{aligned}$$

$$\begin{aligned} \text{P.E. sig.} &= \frac{.67449 \times .129298}{6.164414} = \frac{.087210}{6.164414} \\ &= \pm .014147 \end{aligned}$$

$$\text{mean} = 2.150000 \times .04 + .02$$

$$\text{mean} = 3.157894 \times .04 + .02$$

$$= .106000 \text{ mgs./gm. ash}$$

$$= .146316 \text{ mgs./gm. ash}$$

$$\text{P.E.m} = \frac{.039352}{4.472135} = \pm .008799$$

$$\text{P.E.m} = \frac{.087210}{4.358898} = \pm .020007$$

$$\text{mean} = .106 \pm .009 \text{ mgs./gm. ash}$$

$$\text{mean} = .146 \pm .020 \text{ mgs./gm. ash}$$

$$\text{S.D.} = .058 \pm .006 \text{ mgs.}$$

$$\text{S.D.} = .129 \pm .014 \text{ mgs.}$$

Test of Difference

$$\begin{aligned} \text{mean 1927} &= .146 \\ \text{mean 1929} &= .106 \\ \text{Diff.} &= .040 \end{aligned}$$

$$\frac{\text{Diff.}}{\text{P.E. dif.}} = \frac{.040}{.022} < 4$$

$$\begin{aligned} \text{P.E. dif.} &= \sqrt{(.009)^2 + (.020)^2} \\ &= \sqrt{.000081 + .000400} \\ &= \sqrt{.000481} \\ &= \pm .022 \end{aligned}$$

There is no significant difference between 1927 and 1929 for lead in faeces mgs./gm. ash.

KE 0019100

Filling Station Ethyl 1927 - 1929

Pb in Faeces (Total)

Pb in faeces mgs.	1927 (excluding case no. 4)			
	f	x	fx	fx ²
.0 - .079	1	0	0	0
.08 - .159	6	1	6	6
.16 - .239	2	2	4	8
.24 - .319	3	3	9	27
.32 - .399	2	4	8	32
.40 - .479	1	5	5	25
.48 - .559	0	6	0	0
.56 - .639	2	7	14	98
.64 - .719	1	8	8	64
.72 - .799	0	9	0	0
.80 - .879	0	10	0	0
.88 - .959	0	11	0	0
.96 - 1.039	0	12	0	0
1.04 -	1	13	13	169
	19		67	429

Pb in faeces mgs.	1929			
	f	x	fx	fx ²
.0 - .079	3	0	0	0
.08 - .159	3	1	3	3
.16 - .239	8	2	16	32
.24 - .319	0	3	0	0
.32 - .399	3	4	12	48
.40 - .479	1	5	5	25
.48 - .559	1	6	6	36
.56 -	1	7	7	49
	20		49	193

$$Nu_1 = \frac{67}{19} = 3.526316$$

$$Nu_1 = \frac{49}{20} = 2.450000$$

$$Nu_2 = \frac{429}{19} = 22.578947$$

$$Nu_2 = \frac{193}{20} = 9.650000$$

$$(Nu_1)^2 = 12.434905$$

$$(Nu_1)^2 = 6.002500$$

$$Pi_2 = 10.144042$$

$$Pi_2 = 3.647500$$

$$\text{Sigma} = 3.184971 \times .08 = .254798 \text{ mgs. Pb}$$

$$\text{Sigma} = 1.909842 \times .08 = .152787 \text{ mgs. Pb}$$

$$\text{P.E.sig.} = \frac{.67449 \times .254798}{\sqrt{38}} = \frac{.171859}{6.164414}$$

$$\text{P.E.sig.} = \frac{.67449 \times .152787}{\sqrt{40}} = \frac{.103053}{6.324555}$$

$$= \pm .027879$$

$$= \pm .016294$$

$$\text{mean} = 3.526316 \times .08 + .04$$

$$\text{mean} = 2.45 \times .08 + .04 = .1960 + .04$$

$$= .322105 \text{ mgs. Pb}$$

$$= .236000 \text{ mgs. Pb}$$

$$\text{P.E.m} = \frac{.171859}{\sqrt{19}} = \frac{.171859}{4.358898} = \pm .039427$$

$$\text{P.E.m} = \frac{.103053}{\sqrt{20}} = \frac{.103053}{4.472135} = \pm .023043$$

$$\text{mean} = .322 \pm .039$$

$$\text{mean} = .236 \pm .023$$

$$\text{S.D.} = .255 \pm .028 \text{ mgs. Pb}$$

$$\text{S.D.} = .153 \pm .016$$

Test of Difference

$$\text{mean 1927} = .322$$

$$\text{mean 1929} = .236$$

$$\text{Diff.} = .086$$

$$\frac{\text{Diff.}}{\text{P.E.dif.}} = \frac{.086}{.026} < 4$$

$$\begin{aligned} \text{P.E.dif.} &= \sqrt{(.039)^2 + (.023)^2} \\ &= \sqrt{.001521 + .000529} \\ &= \sqrt{.002050} \\ &= .045277 \\ &= \pm .026096 \end{aligned}$$

Although there is a decrease in total lead for 1929 as compared to 1927, the difference is not statistically significant.

KE 0019101