MEMORANDUM

To:	Timothy Leighton, EPA; Alexander Kliminsky, EPA; Shawn Garred, EPA; Kathryn Korthauer, EPA
From:	Jonathan Cohen, ICF
Date:	December 13, 2021
Re:	Supplement to Statistical Review of the AEATF II Electrostatic Sprayer Study

This memorandum is a Supplement to the main review of the AEATF II Electrostatic Sprayer Study. Section 2 of this Supplement presents the statistical analyses of the data after excluding the potential outlier for ME 17. Section 3 of this Supplement presents the threshold analyses of the original data set and of the data set without the potential outlier.

As in the main memorandum, we will use the following labeling scheme for the tables and figures. Each Table or Figure is labeled as Table Xn or Figure Xn. The letter X is A if the analysis uses all the data as in the main memorandum and the first half of Section 3, either unstratified or stratified by sprayer type or volume / concentration. The letter X is B if the analysis excludes the potential outlier ME 17 as in the Supplement, either unstratified or stratified by sprayer type or volume / concentration. The number n denotes the table or figure number for the data set A or B. The same sequence of analyses applies for each data set. To make it easier to compare results between the different sprayer type groups, the tables and figures in the Supplement repeat the results for the Cart and Handheld sprayer type groups and for the three other volume / concentration groups (Vol Conc Low, Vol Conc Mid, and Vol Conc LoHi) in the main memorandum that are not affected by removal of the potential outlier in the Backpack sprayer type group.

References to “All data” in the Supplement are to the 17 MEs after excluding ME 17. References to the Backpack sprayer type in the Supplement are to the group of seven Backpack sprayer MEs after excluding ME 17. Results for the Cart and Handheld sprayer types are the same as they were in the main memorandum but have been repeated to make comparisons easier. References to the Vol Conc High volume / concentration group in the Supplement are to the group of five high volume and high concentration MEs after excluding ME 17. Results for the Cart and Handheld sprayer types and for the other three volume / concentration groups are the same as they were in the main memorandum but have been repeated to make comparisons easier. To avoid too much repetition, the descriptions of the statistical methodology in the main memorandum are not repeated in this Supplement.

2. Detailed Results using the 17 MEs After Excluding ME 17.

Summary Statistics of Exposure per Pound of Active Ingredient.

Tables B1 to B11 summarize the normalized exposure data (per pound of active ingredient) with the summary statistics from the 17 MEs (all data), or the 7, 7, and 3 MEs from the three sprayer type groups Backpack, Cart, and Handheld, respectively, and each dermal and inhalation exposure route. Tables B12 to B22 summarize the normalized exposure data (per pound of active ingredient) with the summary statistics from the 17 MEs (all data), or the 6, 5, 5, and 1 MEs from the four volume / concentration groups A = Vol Conc Low, B = Vol Conc Mid, C = Vol Conc High, and D = Vol Conc LoHi, respectively, and each dermal and inhalation exposure route. These analyses assume that the exposure measurements within each sprayer type or volume / concentration group come from some unspecified distribution for that group. Note that for the Vol Conc LoHi group there was only one ME, so the Arithmetic and Geometric Standard Deviations are undefined, and the other statistics are all equal.

Table B1. Summary statistics by sprayer type group for normalized long dermal hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	498.723	742.642	315.682	356.671
Arithmetic Standard Deviation	257.823	157.928	115.269	247.645
Geometric Mean	422.965	729.756	300.717	262.587
Geometric Standard Deviation	1.929	1.218	1.385	3.029
Min	73.200	582.166	193.491	73.200
5%	73.200	582.166	193.491	73.200
10%	193.491	582.166	193.491	73.200
25%	293.459	633.464	239.866	73.200
50%	530.983	685.663	293.459	465.830
75%	662.237	812.265	332.308	530.983
90%	812.265	1053.638	555.096	530.983
95%	1053.638	1053.638	555.096	530.983
Max	1053.638	1053.638	555.096	530.983

Table B2. Summary statistics by sprayer type group for normalized long short dermal hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	819.411	1114.025	541.763	779.824
Arithmetic Standard Deviation	353.093	148.950	217.309	461.754
Geometric Mean	730.549	1105.615	507.038	651.393

Statistic	All	Type Backpack	Type Cart	Type Handheld
Geometric Standard Deviation	1.703	1.142	1.485	2.250
Min	256.788	955.960	259.607	256.788
5%	256.788	955.960	259.607	256.788
10%	259.607	955.960	259.607	256.788
25%	553.865	989.073	428.718	256.788
50%	955.960	1027.080	553.865	951.671
75%	1027.080	1264.743	567.028	1131.014
90%	1264.743	1291.668	968.396	1131.014
95%	1291.668	1291.668	968.396	1131.014
Max	1291.668	1291.668	968.396	1131.014

Table B3. Summary statistics by sprayer type group for normalized hands only dermal exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	465.127	705.920	291.585	308.208
Arithmetic Standard Deviation	253.270	152.802	108.706	249.782
Geometric Mean	374.261	692.645	277.498	178.865
Geometric Standard Deviation	2.274	1.231	1.386	4.847
Min	29.120	535.191	191.492	29.120
5%	29.120	535.191	191.492	29.120
10%	191.492	535.191	191.492	29.120
25%	263.585	588.267	204.921	29.120
50%	510.788	677.792	263.585	384.716
75%	608.638	800.855	304.016	510.788
90%	800.855	981.533	518.812	510.788
95%	981.533	981.533	518.812	510.788
Max	981.533	981.533	518.812	510.788

Table B4. Summary statistics by sprayer type group for normalized long dermal no hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	580.147	821.708	384.461	473.107
Arithmetic Standard Deviation	272.498	163.034	152.014	299.225

Statistic	All	Type Backpack	Type Cart	Type Handheld
Geometric Mean	507.884	808.279	362.802	376.526
Geometric Standard Deviation	1.779	1.215	1.430	2.544
Min	128.179	620.644	222.280	128.179
5%	128.179	620.644	222.280	128.179
10%	222.280	620.644	222.280	128.179
25%	353.096	702.642	278.569	128.179
50%	628.118	795.203	353.096	628.118
75%	724.890	1012.218	429.953	663.023
90%	1012.218	1063.323	693.806	663.023
95%	1063.323	1063.323	693.806	663.023
Max	1063.323	1063.323	693.806	663.023

Table B5. Summary statistics by sprayer type group for normalized long short dermal exposure no hat (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	900.836	1193.091	610.542	896.260
Arithmetic Standard Deviation	391.256	242.091	253.720	511.646
Geometric Mean	806.706	1173.854	568.805	759.813
Geometric Standard Deviation	1.676	1.210	1.504	2.168
Min	288.396	982.101	288.396	311.766
5%	288.396	982.101	288.396	311.766
10%	311.766	982.101	288.396	311.766
25%	596.676	1009.843	467.421	311.766
50%	1009.843	1065.557	596.676	1113.959
75%	1113.959	1319.590	658.774	1263.054
90%	1319.590	1643.497	1107.106	1263.054
95%	1643.497	1643.497	1107.106	1263.054
Max	1643.497	1643.497	1107.106	1263.054

Table B6. Summary statistics by sprayer type group for normalized inhalation (total inhalable) concentration ((mg/m^3)/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	6.868	4.261	11.505	2.130

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Standard Deviation	5.775	3.241	5.754	1.804
Geometric Mean	4.322	2.795	10.257	1.590
Geometric Standard Deviation	3.134	3.101	1.699	2.687
Min	0.477	0.477	4.746	0.571
5%	0.477	0.477	4.746	0.571
10%	0.571	0.477	4.746	0.571
25%	1.714	1.045	6.016	0.571
50%	6.016	5.130	10.061	1.714
75%	9.376	6.934	17.736	4.106
90%	17.736	8.475	20.264	4.106
95%	20.264	8.475	20.264	4.106
Max	20.264	8.475	20.264	4.106

Table B7. Summary statistics by sprayer type group for normalized inhalation (total inhalable) dose (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	5.361	3.169	9.265	1.368
Arithmetic Standard Deviation	4.424	3.194	3.214	0.940
Geometric Mean	3.383	2.161	8.879	1.013
Geometric Standard Deviation	3.089	2.518	1.351	2.996
Min	0.286	0.787	6.784	0.286
5%	0.286	0.787	6.784	0.286
10%	0.787	0.787	6.784	0.286
25%	1.734	0.974	7.040	0.286
50%	4.104	1.734	8.443	1.848
75%	8.443	4.104	10.229	1.971
90%	10.229	9.747	15.939	1.971
95%	15.939	9.747	15.939	1.971
Max	15.939	9.747	15.939	1.971

Table B8. Summary statistics by sprayer type group for normalized inhalation (total inhalable) time-weighted average concentration ((mg/m^3)/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	0.670	0.396	1.158	0.171
Arithmetic Standard Deviation	0.553	0.399	0.402	0.117
Geometric Mean	0.423	0.270	1.110	0.127
Geometric Standard Deviation	3.089	2.518	1.351	2.996
Min	0.036	0.098	0.848	0.036
5%	0.036	0.098	0.848	0.036
10%	0.098	0.098	0.848	0.036
25%	0.217	0.122	0.880	0.036
50%	0.513	0.217	1.055	0.231
75%	1.055	0.513	1.279	0.246
90%	1.279	1.218	1.992	0.246
95%	1.992	1.218	1.992	0.246
Max	1.992	1.218	1.992	0.246

Table B9. Summary statistics by sprayer type group for normalized inhalation (respirable) concentration ((mg/m^3)/lb ai) using empirical sampling model

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	1.314	0.485	2.607	0.230
Arithmetic Standard Deviation	1.659	0.831	1.818	0.150
Geometric Mean	0.504	0.184	2.149	0.179
Geometric Standard Deviation	5.110	4.321	1.966	2.684
Min	0.023	0.023	0.857	0.057
5%	0.023	0.023	0.857	0.057
10%	0.057	0.023	0.857	0.057
25%	0.137	0.079	1.006	0.057
50%	0.444	0.137	2.476	0.312
75%	2.342	0.444	2.791	0.322
90%	2.791	2.342	6.323	0.322
95%	6.323	2.342	6.323	0.322
Max	6.323	2.342	6.323	0.322

Table B10. Summary statistics by sprayer type group for normalized inhalation (respirable) dose (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	1.088	0.471	2.118	0.122
Arithmetic Standard Deviation	1.295	0.981	1.167	0.050
Geometric Mean	0.395	0.142	1.861	0.114
Geometric Standard Deviation	5.138	4.070	1.742	1.617
Min	0.038	0.038	0.817	0.066
5%	0.038	0.038	0.817	0.066
10%	0.059	0.038	0.817	0.066
25%	0.096	0.059	1.271	0.066
50%	0.218	0.096	1.559	0.141
75%	1.559	0.218	2.805	0.161
90%	2.805	2.693	4.209	0.161
95%	4.209	2.693	4.209	0.161
Max	4.209	2.693	4.209	0.161

Table B11. Summary statistics by sprayer type group for normalized inhalation (respirable) time-weighted average concentration ((mg/m^3)/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Type Backpack	Type Cart	Type Handheld
Arithmetic Mean	0.136	0.059	0.265	0.015
Arithmetic Standard Deviation	0.162	0.123	0.146	0.006
Geometric Mean	0.049	0.018	0.233	0.014
Geometric Standard Deviation	5.138	4.070	1.742	1.617
Min	0.005	0.005	0.102	0.008
5%	0.005	0.005	0.102	0.008
10%	0.007	0.005	0.102	0.008
25%	0.012	0.007	0.159	0.008
50%	0.027	0.012	0.195	0.018
75%	0.195	0.027	0.351	0.020
90%	0.351	0.337	0.526	0.020
95%	0.526	0.337	0.526	0.020
Max	0.526	0.337	0.526	0.020

Table B12. Summary statistics by volume / concentration group for normalized long dermal hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	498.723	318.374	553.257	633.658	633.464
Arithmetic Standard Deviation	257.823	183.410	140.291	352.642	
Geometric Mean	422.965	264.187	536.565	540.970	633.464
Geometric Standard Deviation	1.929	2.091	1.336	1.944	
Min	73.200	73.200	332.308	239.866	633.464
5%	73.200	73.200	332.308	239.866	633.464
10%	193.491	73.200	332.308	239.866	633.464
25%	293.459	193.491	530.983	293.459	633.464
50%	530.983	297.779	555.096	769.062	633.464
75%	662.237	465.830	662.237	812.265	633.464
90%	812.265	582.166	685.663	1053.638	633.464
95%	1053.638	582.166	685.663	1053.638	633.464
Max	1053.638	582.166	685.663	1053.638	633.464

Table B13. Summary statistics by volume / concentration group for normalized long short dermal hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	819.411	583.768	986.039	846.489	1264.743
Arithmetic Standard Deviation	353.093	335.175	262.666	347.538	
Geometric Mean	730.549	503.899	952.088	784.366	1264.743
Geometric Standard Deviation	1.703	1.830	1.367	1.569	
Min	256.788	256.788	561.129	428.718	1264.743
5%	256.788	256.788	561.129	428.718	1264.743
10%	259.607	256.788	561.129	428.718	1264.743
25%	553.865	259.607	968.396	567.028	1264.743
50%	955.960	503.733	1012.717	955.960	1264.743
75%	1027.080	951.671	1131.014	989.073	1264.743
90%	1264.743	1027.080	1256.937	1291.668	1264.743
95%	1291.668	1027.080	1256.937	1291.668	1264.743
Max	1291.668	1027.080	1256.937	1291.668	1264.743

Table B14. Summary statistics by volume / concentration group for normalized hands only exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	465.127	283.131	524.009	600.012	588.267
Arithmetic Standard Deviation	253.270	171.637	140.899	345.479	
Geometric Mean	374.261	211.369	506.198	501.775	588.267
Geometric Standard Deviation	2.274	2.805	1.361	2.045	
Min	29.120	29.120	304.016	204.921	588.267
5%	29.120	29.120	304.016	204.921	588.267
10%	191.492	29.120	304.016	204.921	588.267
25%	263.585	191.492	510.788	263.585	588.267
50%	510.788	279.135	518.812	749.165	588.267
75%	608.638	384.716	608.638	800.855	588.267
90%	800.855	535.191	677.792	981.533	588.267
95%	981.533	535.191	677.792	981.533	588.267
Max	981.533	535.191	677.792	981.533	588.267

Table B15. Summary statistics by volume / concentration group for normalized long dermal no hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	580.147	381.409	642.863	669.503	1012.218
Arithmetic Standard Deviation	272.498	205.133	121.073	330.075	
Geometric Mean	507.884	331.132	631.886	594.162	1012.218
Geometric Standard Deviation	1.779	1.843	1.243	1.775	
Min	128.179	128.179	429.953	278.569	1012.218
5%	128.179	128.179	429.953	278.569	1012.218
10%	222.280	128.179	429.953	278.569	1012.218
25%	353.096	222.280	663.023	377.387	1012.218
50%	628.118	344.615	693.806	795.203	1012.218
75%	724.890	620.644	702.642	833.034	1012.218
90%	1012.218	628.118	724.890	1063.323	1012.218
95%	1063.323	628.118	724.890	1063.323	1012.218
Max	1063.323	628.118	724.890	1063.323	1012.218

Table B16. Summary statistics by volume / concentration group for normalized long short dermal no hat exposure (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	900.836	646.803	1075.644	882.335	1643.497
Arithmetic Standard Deviation	391.256	362.510	260.535	326.909	
Geometric Mean	806.706	563.818	1045.922	829.493	1643.497
Geometric Standard Deviation	1.676	1.787	1.319	1.500	
Min	288.396	288.396	658.774	467.421	1643.497
5%	288.396	288.396	658.774	467.421	1643.497
10%	311.766	288.396	658.774	467.421	1643.497
25%	596.676	311.766	1029.696	650.956	1643.497
50%	1009.843	550.569	1107.106	982.101	1643.497
75%	1113.959	1065.557	1263.054	1009.843	1643.497
90%	1319.590	1113.959	1319.590	1301.353	1643.497
95%	1643.497	1113.959	1319.590	1301.353	1643.497
Max	1643.497	1113.959	1319.590	1301.353	1643.497

Table B17. Summary statistics by volume / concentration group for normalized inhalation (total inhalable) concentration ((mg/m^3)/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	6.868	10.324	4.863	4.824	6.377
Arithmetic Standard Deviation	5.775	7.785	3.549	4.100	
Geometric Mean	4.322	6.451	3.749	2.850	6.377
Geometric Standard Deviation	3.134	3.780	2.340	3.778	
Min	0.477	0.571	1.391	0.477	6.377
5%	0.477	0.571	1.391	0.477	6.377
10%	0.571	0.571	1.391	0.477	6.377
25%	1.714	4.106	1.714	1.045	6.377
50%	6.016	9.634	5.130	4.746	6.377
75%	9.376	17.736	6.016	8.475	6.377
90%	17.736	20.264	10.061	9.376	6.377
95%	20.264	20.264	10.061	9.376	6.377
Max	20.264	20.264	10.061	9.376	6.377

Table B18. Summary statistics by volume / concentration group for normalized inhalation (total inhalable) dose (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	5.361	4.365	5.321	6.925	3.720
Arithmetic Standard Deviation	4.424	3.459	4.234	6.338	
Geometric Mean	3.383	2.681	3.760	3.948	3.720
Geometric Standard Deviation	3.089	3.675	2.744	3.861	
Min	0.286	0.286	0.974	0.787	3.720
5%	0.286	0.286	0.974	0.787	3.720
10%	0.787	0.286	0.974	0.787	3.720
25%	1.734	1.734	1.971	1.114	3.720
50%	4.104	4.316	4.104	7.040	3.720
75%	8.443	7.094	9.325	9.747	3.720
90%	10.229	8.443	10.229	15.939	3.720
95%	15.939	8.443	10.229	15.939	3.720
Max	15.939	8.443	10.229	15.939	3.720

Table B19. Summary statistics by volume / concentration group for normalized inhalation (total inhalable) time-weighted average concentration ((mg/m^3)/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	0.670	0.546	0.665	0.866	0.465
Arithmetic Standard Deviation	0.553	0.432	0.529	0.792	
Geometric Mean	0.423	0.335	0.470	0.494	0.465
Geometric Standard Deviation	3.089	3.675	2.744	3.861	
Min	0.036	0.036	0.122	0.098	0.465
5%	0.036	0.036	0.122	0.098	0.465
10%	0.098	0.036	0.122	0.098	0.465
25%	0.217	0.217	0.246	0.139	0.465
50%	0.513	0.539	0.513	0.880	0.465
75%	1.055	0.887	1.166	1.218	0.465
90%	1.279	1.055	1.279	1.992	0.465
95%	1.992	1.055	1.279	1.992	0.465
Max	1.992	1.055	1.279	1.992	0.465

Table B20. Summary statistics by volume / concentration group for normalized inhalation (respirable) concentration ((mg/m^3)/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	1.314	2.039	0.846	1.155	0.101
Arithmetic Standard Deviation	1.659	2.340	1.133	1.192	
Geometric Mean	0.504	1.082	0.359	0.391	0.101
Geometric Standard Deviation	5.110	3.606	4.705	8.226	
Min	0.023	0.312	0.057	0.023	0.101
5%	0.023	0.312	0.057	0.023	0.101
10%	0.057	0.312	0.057	0.023	0.101
25%	0.137	0.322	0.137	0.079	0.101
50%	0.444	1.243	0.273	0.857	0.101
75%	2.342	2.791	1.006	2.342	0.101
90%	2.791	6.323	2.759	2.476	0.101
95%	6.323	6.323	2.759	2.476	0.101
Max	6.323	6.323	2.759	2.476	0.101

Table B21. Summary statistics by volume / concentration group for normalized inhalation (respirable) dose (mg/lb ai) using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	1.088	0.900	0.949	1.659	0.059
Arithmetic Standard Deviation	1.295	1.016	1.210	1.791	
Geometric Mean	0.395	0.450	0.360	0.541	0.059
Geometric Standard Deviation	5.138	3.927	5.350	8.336	
Min	0.038	0.111	0.066	0.038	0.059
5%	0.038	0.111	0.066	0.038	0.059
10%	0.059	0.111	0.066	0.038	0.059
25%	0.096	0.141	0.096	0.084	0.059
50%	0.218	0.489	0.218	1.271	0.059
75%	1.559	1.535	1.559	2.693	0.059
90%	2.805	2.634	2.805	4.209	0.059
95%	4.209	2.634	2.805	4.209	0.059
Max	4.209	2.634	2.805	4.209	0.059

Table B22. Summary statistics by volume / concentration group for normalized inhalation (respirable) time-weighted average concentration ((mg/m^3)/lb ai)using empirical sampling model. Excludes ME 17.

Statistic	All	Vol Conc Low	Vol Conc Mid	Vol Conc High	Vol Conc LoHi
Arithmetic Mean	0.136	0.112	0.119	0.207	0.007
Arithmetic Standard Deviation	0.162	0.127	0.151	0.224	
Geometric Mean	0.049	0.056	0.045	0.068	0.007
Geometric Standard Deviation	5.138	3.927	5.350	8.336	
Min	0.005	0.014	0.008	0.005	0.007
5%	0.005	0.014	0.008	0.005	0.007
10%	0.007	0.014	0.008	0.005	0.007
25%	0.012	0.018	0.012	0.011	0.007
50%	0.027	0.061	0.027	0.159	0.007
75%	0.195	0.192	0.195	0.337	0.007
90%	0.351	0.329	0.351	0.526	0.007
95%	0.526	0.329	0.351	0.526	0.007
Max	0.526	0.329	0.351	0.526	0.007

The results for the different sprayer types generally show the highest normalized dermal exposure for the Backpack sprayer and the highest normalized inhalation exposure for the Cart sprayer. The results for the different volume / concentration groups generally show the highest normalized dermal exposure for the LoHi group, although this is based on a single ME. There is no obvious pattern among the different volume / concentration groups for normalized inhalation exposure. Note that although the amount of active ingredient increases from the Low to Mid to High volume / concentration groups, so does the exposure (generally), so the normalized exposure does not necessarily increase.

The results can be used to calculate the proportion of the normalized dermal exposure from hands only. For All MEs, based on the arithmetic means, the overall percentages of normalized exposure from hands only are 93% for Long Dermal Hat, 57% for Long Short Dermal Hat, 80% for Long Dermal No Hat, and 52% for Long Short Dermal No Hat. Among the sprayer type groups and volume / concentration groups, the overall percentages of normalized exposure from hands only range from 86 to 95% for Long Dermal Hat, 40 to 71% for Long Short Dermal Hat, 58 to 90% for Long Dermal No Hat, and 34 to 68% for Long Short Dermal No Hat. Similarly, for the unnormalized dermal exposure, the overall arithmetic mean hands only exposure is 94% of the arithmetic mean Long Dermal Hat exposure, 65% of the arithmetic mean Long Short Dermal No Hat exposure, 86% of the arithmetic mean Long Dermal No Hat exposure, and 61% of the arithmetic mean Long Dermal No Hat exposure.

Compare Sprayer Type Groups

The results in Tables B1 to B11 show some differences between the normalized exposure statistics for the three sprayer type groups “Type Backpack,” “Type Cart”, and “Type Handheld.” To compare these groups, an analysis of variance was performed to test whether the geometric means were statistically significantly different at the 5% significance level. This analysis assumes that that for each group, the normalized exposure is lognormally distributed, an assumption that is evaluated below in the sections “Empirical Quantile Plots” and “Normality Tests.”

The p-values for these ANOVA tests are shown in Table B23. These analyses show that there were statistically significant differences (at the 5% significance level) between the three sprayer type groups for all of the exposure modes. For dermal exposures, this finding is very different to the analysis in the main memorandum that included the potential outlier that had very low dermal exposures.

Table B23. P-values for testing differences in geometric means for different sprayer type groups. Excludes ME 17.

Exposure Route	ANOVA	Welch's ANOVA
Long Dermal Hat	0.006	0.008
Long Short Dermal Hat	0.010	0.021
Hands Only	0.014	0.007
Long Dermal No Hat	0.010	0.015
Long Short Dermal No Hat	0.019	0.033
Inhalation (total inhalable) Conc	0.014	0.040
Inhalation (total inhalable) Dose	0.002	0.021
Inhalation (total inhalable) 8hr TWA	0.002	0.021
Inhalation (respirable) Conc	0.002	0.010
Inhalation (respirable) Dose	0.000	0.000
Inhalation (respirable) 8hr TWA	0.000	0.000

Compare Volume / Concentration Groups

The results in Tables B12 to B22 show some differences between the normalized exposure statistics for the four volume / concentration groups "Vol Conc Low," "Vol Conc Mid", "Vol Conc High," and "Vol Conc LoHi." To compare these groups, an analysis of variance was performed to test whether the geometric means were statistically significantly different at the 5% significance level.

The p-values for these ANOVA tests are shown in Table B24. These analyses show that there were no statistically significant differences (at the 5% significance level) between the four volume / concentration groups for any of the exposure modes.

Table B24. P-values for testing differences in geometric means for different volume / concentration groups. Excludes ME 17.

Exposure Route	ANOVA	Welch's ANOVA
Long Dermal Hat	0.185	0.176
Long Short Dermal Hat	0.143	0.155
Hands Only	0.215	0.231
Long Dermal No Hat	0.107	0.135

Exposure Route	ANOVA	Welch's ANOVA
Long Short Dermal No Hat	0.093	0.135
Inhalation (total inhalable) Conc	0.702	0.612
Inhalation (total inhalable) Dose	0.952	0.868
Inhalation (total inhalable) 8hr TWA	0.952	0.868
Inhalation (respirable) Conc	0.490	0.441
Inhalation (respirable) Dose	0.703	0.946
Inhalation (respirable) 8hr TWA	0.703	0.946

Statistical Models

Tables B25 to B28 present the arithmetic mean and 95th percentile estimates from the lognormal simple random sampling model, together with 95% confidence intervals, for each of the exposure routes, for all the data and for each sprayer type group. These are the values of AMu and P95u. The other summary statistics are presented in more detail below.

Note that the bootstrap simulations used to compute the confidence intervals and (later on in this memo) the fold relative accuracy estimates give slightly different results if different sequences of random number seeds are used. For this reason, the confidence intervals and fold relative accuracy values for the Cart and Handheld sprayer types were copied from the main memorandum rather than the outputs of the SAS program used for the analysis excluding ME 17.

Table B25. Arithmetic mean and 95th percentile estimates from lognormal simple random sampling model for normalized exposure for All. Excludes ME 17.

Exposure Route	Clothing	Arithmetic Mean (95% Confidence Interval)	95th Percentile (95% Confidence Interval)
Dermal (mg/lb ai)	Long Dermal Hat	524.81 (372.76, 748.82)	1,246.09 (757.10, 2,004.30)
	Long Short Dermal Hat	841.72 (642.78, 1,109.72)	1,753.39 (1,170.93, 2,577.11)
	Hands Only	524.41 (336.70, 836.88)	1,445.17 (775.06, 2,618.29)
	Long Dermal No Hat	599.57 (446.81, 812.29)	1,310.14 (846.31, 1.987.71)
	Long Short Dermal No Hat	921.77 (710.32, 1,203.99)	1,886.32 (1,274.95, 2,740.86)
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		8.300 (4.219, 17.376)	28.297 (11.896, 64.674)
Inhalation (total inhalable) Dose (mg/lb ai)		6.391 (3.289, 13.175)	21.628 (9.193, 48.912)
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		0.799 (0.411, 1.647)	2.703 (1.149, 6.114)
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		1.907 (0.621, 6.960)	7.374 (2.140, 24.006)

Exposure Route	Clothing	Arithmetic Mean (95% Confidence Interval)	95th Percentile (95% Confidence Interval)
Inhalation (respirable) Dose (mg/lb ai)		1.506 (0.488, 5.537)	5.824 (1.683, 19.034)
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		0.188 (0.061, 0.692)	0.728 (0.210, 2.379)

Table B26. Arithmetic mean and 95th percentile estimates from lognormal simple random sampling model for normalized exposure for Type Backpack. Excludes ME 17.

Exposure Route	Clothing	Arithmetic Mean (95% Confidence Interval)	95th Percentile (95% Confidence Interval)
Dermal (mg/lb ai)	Long Dermal Hat	744.10 (642.02, 863.09)	1,009.50 (797.62, 1,260.61)
	Long Short Dermal Hat	1,115.37 (1,00.52, 1,232.12)	1,374.97 (1,173.68, 1,596.29)
	Hands Only	707.76 (605.67, 827.60)	974.91 (760.66, 1,231.93)
	Long Dermal No Hat	823.80 (711.98, 953.99)	1,114.02 (882.56, 1,387.63)
	Long Short Dermal No Hat	1.195.43 (1,036.42, 1,379.80)	1,606.79 (1,279.31, 1,992.03)
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		5.304 (1.882, 17.106)	17.986 (4.656, 64.332)
Inhalation (total inhalable) Dose (mg/lb ai)		3.311 (1.485, 7.890)	9.874 (3.277, 27.934)
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		0.414 (0.186, 0.986)	1.234 (0.410, 3.492)
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		0.537 (0.124, 3.167)	2.044 (0.356, 10.623)
Inhalation (respirable) Dose (mg/lb ai)		0.381 (0.096, 1.985)	1.433 (0.268, 6.960)
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		0.048 (0.012, 0.248)	0.179 (0.034, 0.870)

Table B27. Arithmetic mean and 95th percentile estimates from lognormal simple random sampling model for normalized exposure for Type Cart

Exposure Route	Clothing	Arithmetic Mean (95% Confidence Interval)	95th Percentile (95% Confidence Interval)
Dermal (mg/lb ai)	Long Dermal Hat	317.07 (247.39, 408.26)	513.65 (348.46, 741.52)
	Long Short Dermal Hat	548.26 (404.58, 750.72)	971.58 (606.42, 1,517.70)
	Hands Only	292.66 (228.21, 377.05)	474.54 (321.66, 685.63)
	Long Dermal No Hat	386.75 (294.11, 512.10)	653.27 (426.55, 977.86)
	Long Short Dermal No Hat	618.23 (451.30, 855.67)	1,113.19 (684.26, 1,764.27)
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		11.802 (7.761, 18.173)	24.519 (13.037, 44.574)

Exposure Route	Clothing	Arithmetic Mean (95% Confidence Interval)	95th Percentile (95% Confidence Interval)
Inhalation (total inhalable) Dose (mg/lb ai)		9.290 (7.394, 11.725)	14.569 (10.175, 20.462)
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		1.161 (0.924, 1.466)	1.821 (1.272, 2.558)
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		2.701 (1.561, 4.802)	6.533 (2.919, 14.002)
Inhalation (respirable) Dose (mg/lb ai)		2.170 (1.399, 3.423)	4.635 (2.392, 8.666)
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		0.271 (0.175, 0.428)	0.579 (0.299, 1.083)

Table B28. Arithmetic mean and 95th percentile estimates from lognormal simple random sampling model for normalized exposure for Type Handheld

Exposure Route	Clothing	Arithmetic Mean (95% Confidence Interval)	95th Percentile (95% Confidence Interval)
Dermal (mg/lb ai)	Long Dermal Hat	485.23 (103.18, 3,674.49)	1,625.19 (193.41, 12,860.78)
	Long Short Dermal Hat	904.86 (314.91, 3,123.33)	2,471.78 (520.83, 11,227.05)
	Hands Only	621.59 (54.09, 25,378.68)	2,399.09 (115.72. 45,665.72)
	Long Dermal No Hat	582.18 (166.44, 2,692.05)	1,748.65 (291.02, 9,989.20)
	Long Short Dermal No Hat	1,025.19 (378.62, 3,270.78)	2,714,14 (613.70, 11,510.82)
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		2.592 (0.678. 13.893)	8.082 (1.210, 51.147)
Inhalation (total inhalable) Dose (mg/lb ai)		1.850 (0.401, 13.531)	6.159 (0.749, 47.756)
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		0.231 (0.050, 1.691)	0.770 (0.094, 5.969)
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		0.292 (0.076, 1.558)	0.909 (0.136, 5.741)
Inhalation (respirable) Dose (mg/lb ai)		0.128 (0.072, 0.239)	0.252 (0.100, 0.617)
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		0.016 (0.009, 0.030)	0.031 (0.013, 0.077)

For each exposure route, the empirical and lognormal statistical models were fitted to the observed data and the summary statistics listed above were calculated together with 95% confidence intervals. The 95% confidence intervals in Tables B25 to B28 were computed using a parametric bootstrap. The unit exposure estimates (from the lognormal simple random sampling model) displayed in Tables B24 to B28 are recommended over the empirical arithmetic means and 95th percentiles displayed in the Tables B1 to B11.

Non-detects

All the values for hand, face/neck, and hat exposures as well as the PVC filters were above the LOQ but there were several other cases with values below the corresponding LOQ. Note that if the outer dosimeter residue for a body part was found to be below the LOQ, then the inner dosimeter residue for the same body part was not measured and the inner dosimeter residue was treated as being exactly zero. Also note that for the inner and outer dosimeters, the Excel files provided by the study director also reported measured values (below the LOQ) for the non-detects, but those values were not used for these analyses. For the inner dosimeters there were 15 non-detects out of the 87 measured values. For the lower arm outer dosimeters there was only 1 non-detect out of the 17 measured values. For the inner hat there were 8 non-detects out of the 17 measured values. For the OVS tubes there was only 1 non-detect out of the 17 measured values.

For all the analyses presented in this memorandum except for Table B29 and B42, measurements below the LOQ were replaced by the mid-value, the midpoint of the lowest and highest possible value for that measurement. In Tables B29 and B42 we investigated the impact on the summary statistics of the censored values. This analysis in Table B29 is only presented for all 17 MEs.

Table B29. Exposure summary statistics calculated using alternative estimated exposures for values below the LOQ. Excludes ME 17.

Exposure Route	Method for Substituting Values Below the LOQ	Arithmetic Mean	95th Percentile
Long Dermal Hat (mg/lb ai)	Substitute mid value	524.81 (372.76, 748.82)	1,246.09 (757.10, 2,004.30)
	Substitute max value	526.94 (374.87, 750.70)	1,248.00 (759.73, 2,003.67)
	Substitute min value	522.71 (370.59, 747.55)	1,244.64 (754.57, 2,006.15)
	Censored data MLE	518.19 (372.50, 730.69)	1,206.61 (744.07, 1,913.55)
Long Short Dermal Hat (mg/lb ai)	Substitute mid value	841.72 (642.78, 1,109.72)	1,753.39 (1,170.93, 2,577.11)
	Substitute max value	843.84 (654.57, 1,095.19)	1,704.41 (1,162.12, 2,455.98)
	Substitute min value	843.29 (629.58, 1,140.53)	1,189.23 (1,189.23, 2,780.96)
	Censored data MLE	835.16 (645.44, 1,087.95)	1,699.80 (1,153.09, 2,461.28)
Hands Only (mg/lb ai)	Substitute mid value	524.41 (336.70, 836.88)	1,445.17 (775.06, 2,618.29)
	Substitute max value	524.41 (336.70, 836.88)	1,445.17 (775.06, 2,618.29)
	Substitute min value	524.41 (336.70, 836.88)	1,445.17 (775.06, 2,618.29)
	Censored data MLE	514.11 (334.94, 806.10)	1,388.04 (758.40, 2,470.55)
Long Dermal No Hat (mg/lb ai)	Substitute mid value	599.57 (446.81, 812.29)	1,310.14 (846.31, 1.987.71)
	Substitute max value	601.61 (449.07, 813.78)	1,310.83 (848.47, 1.984.90)
	Substitute min value	597.56 (444.52, 811.44)	1,309.91 (844.25, 1.991.65)
	Censored data MLE	593.75 (446.85, 796.19)	1,273.68 (833.52, 1.908.55)
Long Short Dermal No Hat (mg/lb ai)	Substitute mid value	921.77 (710.32, 1,203.99)	1,886.32 (1,274.95, 2,740.86)
	Substitute max value	923.84 (722.35, 1,188.75)	1,835.68 (1,265.25, 2,617.95)
	Substitute min value	922.92 (696.54, 1,233.22)	1,967.58 (1,293.20, 2,936.25)

Exposure Route	Method for Substituting Values Below the LOQ	Arithmetic Mean	95th Percentile
	Censored data MLE	914.96 (713.03, 1,181.86)	1,830.61 (1,256.04, 2,622.05)
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)	Substitute mid value	8.300 (4.219, 17.376)	28.297 (11.896, 64.674)
	Substitute max value	8.032 (4.294, 15.802)	26.430 (11.684, 57.576)
	Censored data MLE	7.964 (4.196, 15.951)	26.515 (11.537, 58.643)
Inhalation (total inhalable) Dose (mg/lb ai)	Substitute mid value	6.391 (3.289, 13.175)	21.628 (9.193, 48.912)
	Substitute max value	6.066 (3.332, 11.568)	19.566 (8.875, 41.590)
	Censored data MLE	6.061 (3.268, 11.806)	19.826 (8.833, 42.871)
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai))	Substitute mid value	0.799 (0.411, 1.647)	2.703 (1.149, 6.114)
	Substitute max value	0.758 (0.417, 1.446)	2.446 (1.109, 5.199)
	Censored data MLE	0.758 (0.409, 1.476)	2.478 (1.104, 5.359)
Inhalation (respirable) Conc ((mg/m^3)/lb ai)	Substitute mid value	1.907 (0.621, 6.960)	7.374 (2.140, 24.006)
	Substitute max value	1.907 (0.621, 6.960)	7.374 (2.140, 24.006)
	Censored data MLE	1.763 (0.061, 6.036)	6.807 (2.049, 21.390)
Inhalation (respirable) Dose (mg/lb ai)	Substitute mid value	1.506 (0.488, 5.537)	5.824 (1.683, 19.034)
	Substitute max value	1.506 (0.488, 5.537)	5.824 (1.683, 19.034)
	Censored data MLE	1.392 (0.475, 4.799)	5.375 (1.612, 16.954)
Inhalation (respirable) 8hr TWA ((mg/m^3)/lb ai))	Substitute mid value	0.188 (0.061, 0.692)	0.728 (0.210, 2.379)
	Substitute max value	0.188 (0.061, 0.692)	0.728 (0.210, 2.379)
	Censored data MLE	0.174 (0.059, 0.600)	0.672 (0.201, 2.119)

The results in Table B29 for dermal and inhalation exposure show very small impacts of the alternative substitution approaches for treating values below the LOQ on the unit exposure arithmetic mean and 95th percentile.

Detailed Summary Statistics with Confidence Intervals and Fold Relative Accuracy

Tables B30 to B40 present the estimates, parametric and non-parametric confidence intervals and fold relative accuracy values for all the summary statistics for the All group and the three sprayer type groups. All these analyses use non-detects substituted by the mid-value.

Table B30. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized long dermal hat exposure (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	1.93	1.54	2.41	1.25	1.47	2.43	1.30
	GMs	422.96	309.88	580.34	1.37	307.36	560.35	1.35
	AMs	498.72	368.96	736.19	1.42	382.41	620.43	1.27
	AMu	524.81	372.76	748.82	1.42	399.62	649.27	1.28
	P95s	1,053.64	753.85	2,958.25	2.43	685.66	1,053.64	1.37
	P95u	1,246.09	757.10	2,004.30	1.63	834.68	1,670.50	1.44
Backpack	GSDs	1.22	1.10	1.36	1.11	1.07	1.30	1.12
	GMs	729.76	631.22	845.22	1.16	643.86	844.58	1.14
	AMs	742.64	640.68	860.44	1.16	646.40	863.02	1.15
	AMu	744.10	642.02	863.09	1.16	646.76	865.96	1.15
	P95s	1,053.64	760.17	1,235.49	1.34	769.06	1,053.64	1.37
	P95u	1,009.50	797.62	1,260.61	1.26	748.08	1,244.44	1.32
Cart	GSDs	1.38	1.16	1.66	1.19	1.10	1.56	1.24
	GMs	300.72	235.89	383.94	1.28	243.74	384.46	1.25
	AMs	315.68	245.97	403.83	1.28	248.46	405.89	1.28
	AMu	317.07	247.39	408.26	1.28	249.22	409.91	1.28
	P95s	555.10	325.08	720.03	1.63	310.28	555.10	1.79
	P95u	513.65	348.46	741.52	1.46	327.17	734.85	1.53
Handheld	GSDs	3.03	1.18	8.49	2.62	1.00	3.14	3.03
	GMs	262.59	73.36	916.41	3.54	73.20	530.98	2.02
	AMs	356.67	94.49	1,652.30	4.20	73.20	530.98	1.75
	AMu	485.23	103.18	3,674.49	5.76	73.20	530.98	2.02
	P95s	530.98	142.33	3,960.00	5.69	73.20	530.98	1.14
	P95u	1,625.19	193.41	12,860.78	8.19	73.20	1800.81	3.49

Table B31. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized long short dermal hat exposure (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	1.70	1.42	2.04	1.20	1.40	1.91	1.18

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	GMs	730.55	567.76	943.99	1.29	567.16	921.57	1.27
	AMs	819.41	638.92	1,098.18	1.31	653.31	978.14	1.22
	AMu	841.72	642.78	1,109.72	1.31	662.98	1,001.13	1.23
	P95s	1,291.67	1,166.86	3,532.91	2.43	1,131.01	1,291.67	1.03
	P95u	1,753.39	1,170.93	2,577.11	1.49	1,349.29	2,066.74	1.25
Backpack	GSDs	1.14	1.06	1.23	1.07	1.08	1.16	1.04
	GMs	1,105.61	1,002.94	1,220.30	1.10	1,016.24	1,220.34	1.09
	AMs	1,114.03	1,009.28	1,229.98	1.10	1,020.58	1,224.86	1.10
	AMu	1,115.37	1,010.52	1,232.12	1.10	1,021.10	1,226.03	1.10
	P95s	1,291.67	1,136.37	1,574.85	1.19	1,256.94	1,291.67	1.03
	P95u	1,374.97	1,173.68	1,596.29	1.17	1,192.87	1,459.46	1.15
Cart	GSDs	1.48	1.20	1.85	1.24	1.12	1.72	1.31
	GMs	507.04	377.53	682.24	1.34	383.64	664.69	1.31
	AMs	541.76	400.29	737.14	1.36	404.36	704.33	1.32
	AMu	548.26	404.58	750.72	1.36	407.50	712.48	1.32
	P95s	968.40	557.37	1,464.42	1.67	561.13	968.40	1.73
	P95u	971.58	606.42	1,517.70	1.59	603.03	1,382.42	1.57
Handheld	GSDs	2.25	1.13	4.78	2.02	1.00	2.35	2.25
	GMs	651.39	256.25	1,625.46	2.52	256.79	1131.01	1.74
	AMs	779.82	298.84	2,228.05	2.74	256.79	1131.01	1.60
	AMu	904.86	314.91	3,123.33	3.11	256.79	1131.01	1.71
	P95s	1,131.01	416.15	4,742.34	3.50	256.79	1131.01	1.19
	P95u	2,471.78	520.83	11,227.05	4.66	256.79	2820.43	2.60

Table B32. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized hands only exposure (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	2.27	1.71	3.01	1.33	1.50	3.32	1.50
	GMs	374.26	253.64	555.84	1.48	246.75	523.12	1.46
	AMs	465.13	329.65	816.39	1.64	350.59	584.99	1.29
	AMu	524.41	336.70	836.88	1.58	391.96	668.40	1.31

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	P95s	981.53	770.91	4,260.18	3.63	677.79	981.53	1.31
	P95u	1,445.17	775.06	2,618.29	1.84	799.41	2,180.48	1.72
Backpack	GSDs	1.23	1.10	1.38	1.12	1.10	1.31	1.10
	GMs	692.64	594.50	808.56	1.17	602.72	801.60	1.15
	AMs	705.92	604.19	824.44	1.17	607.11	817.55	1.16
	AMu	707.76	605.67	827.60	1.17	607.77	820.26	1.16
	P95s	981.53	723.09	1,206.09	1.32	749.17	981.53	1.31
	P95u	974.91	760.66	1,231.93	1.27	730.05	1,172.92	1.29
Cart	GSDs	1.39	1.16	1.66	1.20	1.14	1.56	1.20
	GMs	277.50	217.56	354.49	1.28	226.04	354.14	1.25
	AMs	291.59	226.89	372.93	1.28	228.75	377.37	1.28
	AMu	292.66	228.21	377.05	1.29	229.26	380.66	1.29
	P95s	518.81	300.03	665.71	1.65	294.81	518.81	1.76
	P95u	474.54	321.66	685.63	1.46	300.11	685.19	1.54
Handheld	GSDs	4.85	1.26	21.05	3.95	1.00	5.23	4.85
	GMs	178.86	29.09	1,060.87	6.06	29.12	510.79	2.86
	AMs	308.21	44.63	3,198.84	8.57	29.12	510.79	2.09
	AMu	621.59	54.09	25,378.68	20.91	29.12	771.78	2.97
	P95s	510.79	74.76	8,530.14	11.59	29.12	510.79	1.33
	P95u	2,399.09	115.72	45,665.72	19.99	29.12	2,985.23	6.24

Table B33. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized long dermal no hat exposure (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	1.78	1.46	2.17	1.22	1.43	2.09	1.22
	GMs	507.88	386.60	670.28	1.32	384.93	653.69	1.30
	AMs	580.15	443.16	801.56	1.35	454.82	705.95	1.24
	AMu	599.57	446.81	812.29	1.35	465.73	725.05	1.25
	P95s	1,063.32	843.12	2,796.66	2.32	795.20	1,063.32	1.28
	P95u	1,310.14	846.31	1,987.71	1.53	954.26	1,639.39	1.33
Backpack	GSDs	1.22	1.09	1.35	1.11	1.09	1.28	1.10

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	GMs	808.28	700.29	934.61	1.16	710.41	925.76	1.14
	AMs	821.71	710.57	951.15	1.16	717.42	937.98	1.14
	AMu	823.80	711.98	953.99	1.16	718.08	941.56	1.15
	P95s	1,063.32	841.58	1,360.29	1.27	833.03	1,063.32	1.28
	P95u	1,114.02	882.56	1,387.63	1.25	844.30	1,272.32	1.28
Cart	GSDs	1.43	1.18	1.74	1.22	1.13	1.62	1.23
	GMs	362.80	277.86	474.50	1.31	287.41	470.42	1.28
	AMs	384.46	292.05	505.00	1.32	294.85	502.39	1.30
	AMu	386.75	294.11	512.10	1.32	295.74	507.98	1.31
	P95s	693.81	395.22	946.76	1.67	377.39	693.81	1.84
	P95u	653.27	426.55	977.86	1.52	398.89	943.41	1.57
Handheld	GSDs	2.54	1.15	6.06	2.25	1.00	2.58	2.54
	GMs	376.53	128.60	1,079.17	2.90	128.18	663.02	1.76
	AMs	473.11	155.69	1,637.27	3.25	128.18	663.02	1.60
	AMu	582.18	166.44	2,692.05	3.99	128.18	663.02	1.76
	P95s	663.02	224.76	3,703.03	4.41	128.18	663.02	1.06
	P95u	1,748.65	291.02	9,989.20	5.88	128.18	1,825.60	2.78

Table B34. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized long short dermal no hat exposure (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	1.68	1.40	2.00	1.19	1.39	1.88	1.17
	GMs	806.71	631.67	1,034.47	1.28	632.18	1,011.77	1.26
	AMs	900.84	706.42	1,192.33	1.30	721.36	1,081.21	1.22
	AMu	921.77	710.32	1,203.99	1.30	729.63	1,101.87	1.23
	P95s	1,643.50	1,270.65	3,722.25	2.02	1,263.05	1,643.50	1.26
	P95u	1,886.32	1,274.95	2,740.86	1.47	1,443.63	2,256.71	1.26
Backpack	GSDs	1.21	1.09	1.34	1.11	1.09	1.27	1.10
	GMs	1,173.85	1,020.15	1,353.11	1.15	1,044.72	1,349.63	1.14
	AMs	1,193.09	1,034.42	1,376.19	1.15	1,049.23	1,370.68	1.15
	AMu	1,195.43	1,036.42	1,379.80	1.15	1,049.71	1,375.38	1.15

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	P95s	1,643.50	1,221.16	1,953.62	1.31	1,301.35	1,643.50	1.26
	P95u	1,606.79	1,279.31	1,992.03	1.25	1,232.14	1,924.52	1.29
Cart	GSDs	1.50	1.20	1.89	1.25	1.14	1.75	1.30
	GMs	568.80	419.49	772.76	1.36	426.25	752.96	1.33
	AMs	610.54	446.36	839.06	1.37	450.66	800.42	1.33
	AMu	618.23	451.30	855.67	1.38	455.78	813.09	1.34
	P95s	1,107.11	627.19	1,700.37	1.69	650.96	1,107.11	1.70
	P95u	1,113.19	684.26	1,764.27	1.61	680.24	1,599.56	1.58
Handheld	GSDs	2.17	1.12	4.46	1.96	1.00	2.24	2.17
	GMs	759.81	311.81	1,819.05	2.42	311.77	1,263.05	1.66
	AMs	896.26	359.34	2,432.24	2.60	311.77	1,263.05	1.55
	AMu	1,025.19	378.62	3,270.78	2.92	311.77	1,263.05	1.64
	P95s	1,263.05	495.37	5,055.82	3.34	311.77	1,263.05	1.13
	P95u	2,714.14	613.70	11,510.82	4.34	311.77	2,991.55	2.44

Table B35. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized inhalation (total inhalable) concentration ((mg/m^3)/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	3.134	2.116	4.627	1.48	2.064	4.014	1.42
	GMs	4.322	2.516	7.492	1.72	2.446	7.131	1.71
	AMs	6.868	4.043	16.368	2.13	4.261	9.708	1.51
	AMu	8.300	4.219	17.376	2.02	4.741	12.089	1.61
	P95s	20.264	11.807	127.285	4.89	10.061	20.264	1.64
	P95u	28.297	11.896	64.674	2.34	15.119	42.017	1.72
Backpack	GSDs	3.101	1.686	5.757	1.84	1.786	3.904	1.64
	GMs	2.795	1.216	6.492	2.31	1.237	5.686	2.14
	AMs	4.261	1.742	13.122	2.76	2.043	6.454	1.79
	AMu	5.304	1.882	17.106	2.98	1.979	7.789	2.11
	P95s	8.475	3.533	57.316	5.15	6.377	8.475	1.33
	P95u	17.986	4.656	64.332	3.73	5.821	26.571	2.30
Cart	GSDs	1.699	1.273	2.278	1.34	1.299	1.940	1.26

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	GMs	10.257	6.908	15.266	1.49	7.125	14.542	1.43
	AMs	11.505	7.638	17.594	1.52	7.769	15.471	1.42
	AMu	11.802	7.761	18.173	1.53	7.857	15.928	1.44
	P95s	20.264	11.644	42.490	1.92	12.334	20.264	1.64
	P95u	24.519	13.037	44.574	1.85	13.215	33.333	1.68
Handheld	GSDs	2.687	1.156	6.741	2.36	1.000	3.123	2.69
	GMs	1.590	0.510	4.848	3.09	0.571	4.106	2.58
	AMs	2.130	0.631	7.760	3.49	0.571	4.106	2.24
	AMu	2.592	0.678	13.893	4.47	0.571	4.106	2.57
	P95s	4.106	0.921	17.886	4.42	0.571	4.106	2.40
	P95u	8.082	1.210	51.147	6.53	0.571	13.849	4.71

Table B36. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized inhalation (total inhalable) dose (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	3.089	2.096	4.537	1.47	2.156	4.040	1.39
	GMs	3.383	1.983	5.824	1.71	1.973	5.557	1.68
	AMs	5.361	3.151	12.451	2.09	3.388	7.447	1.48
	AMu	6.391	3.289	13.175	2.00	3.641	9.321	1.62
	P95s	15.939	9.126	95.436	4.68	9.325	15.939	1.64
	P95u	21.628	9.193	48.912	2.31	11.327	33.031	1.76
Backpack	GSDs	2.518	1.531	4.172	1.65	1.559	3.179	1.50
	GMs	2.161	1.096	4.299	1.98	1.178	4.139	1.87
	AMs	3.169	1.415	6.818	2.20	1.380	5.601	2.10
	AMu	3.311	1.485	7.890	2.30	1.354	6.469	2.25
	P95s	9.747	2.617	25.422	3.31	3.720	9.747	2.62
	P95u	9.874	3.277	27.934	2.93	2.817	21.132	3.03
Cart	GSDs	1.351	1.147	1.596	1.18	1.113	1.492	1.20
	GMs	8.879	7.093	11.130	1.25	7.403	11.130	1.22
	AMs	9.265	7.352	11.622	1.26	7.447	11.736	1.25
	AMu	9.290	7.394	11.725	1.26	7.452	11.883	1.26

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	P95s	15.939	9.542	19.912	1.60	9.325	15.939	1.71
	P95u	14.569	10.175	20.462	1.42	8.995	20.471	1.55
Handheld	GSDs	2.996	1.175	8.316	2.60	1.000	3.051	3.00
	GMs	1.013	0.287	3.493	3.50	0.286	1.971	1.95
	AMs	1.368	0.368	6.235	4.13	0.286	1.971	1.70
	AMu	1.850	0.401	13.531	5.61	0.286	1.971	1.94
	P95s	1.971	0.553	14.876	5.71	0.286	1.971	1.07
	P95u	6.159	0.749	47.756	8.02	0.286	6.485	3.33

Table B37. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized inhalation (total inhalable) time-weighted average concentration ((mg/m^3)/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	3.089	2.096	4.537	1.47	3.089	2.156	1.39
	GMs	0.423	0.248	0.728	1.71	0.423	0.247	1.68
	AMs	0.670	0.394	1.556	2.09	0.670	0.424	1.48
	AMu	0.799	0.411	1.647	2.00	0.799	0.455	1.62
	P95s	1.992	1.141	11.929	4.68	1.992	1.166	1.64
	P95u	2.703	1.149	6.114	2.31	2.703	1.416	1.76
Backpack	GSDs	2.518	1.531	4.172	1.65	2.518	1.559	1.50
	GMs	0.270	0.137	0.537	1.98	0.270	0.147	1.87
	AMs	0.396	0.177	0.852	2.20	0.396	0.172	2.10
	AMu	0.414	0.186	0.986	2.30	0.414	0.169	2.25
	P95s	1.218	0.327	3.178	3.31	1.218	0.465	2.62
	P95u	1.234	0.410	3.492	2.93	1.234	0.352	3.03
Cart	GSDs	1.351	1.147	1.596	1.18	1.113	1.492	1.20
	GMs	1.110	0.887	1.391	1.25	0.925	1.391	1.22
	AMs	1.158	0.919	1.453	1.26	0.931	1.467	1.25
	AMu	1.161	0.924	1.466	1.26	0.931	1.485	1.26
	P95s	1.992	1.193	2.489	1.60	1.166	1.992	1.71
	P95u	1.821	1.272	2.558	1.42	1.124	2.559	1.55
Handheld	GSDs	2.996	1.175	8.316	2.60	1.000	3.051	3.00

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	GMs	0.127	0.036	0.437	3.50	0.036	0.246	1.95
	AMs	0.171	0.046	0.779	4.13	0.036	0.246	1.70
	AMu	0.231	0.050	1.691	5.61	0.036	0.246	1.94
	P95s	0.246	0.069	1.860	5.71	0.036	0.246	1.07
	P95u	0.770	0.094	5.969	8.02	0.036	0.811	3.33

Table B38. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized inhalation (respirable) concentration ((mg/m^3)/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	5.110	2.916	8.912	1.75	3.198	7.044	1.51
	GMs	0.504	0.233	1.106	2.18	0.231	1.046	2.12
	AMs	1.314	0.546	5.683	3.40	0.632	2.166	1.87
	AMu	1.907	0.621	6.960	3.33	0.685	3.969	2.45
	P95s	6.323	2.117	63.121	7.06	2.476	6.323	2.29
	P95u	7.374	2.140	24.006	3.36	2.483	14.900	2.51
Backpack	GSDs	4.321	1.965	9.616	2.21	1.759	7.051	2.30
	GMs	0.184	0.063	0.547	2.95	0.069	0.517	2.73
	AMs	0.485	0.108	1.781	4.15	0.102	1.129	4.09
	AMu	0.537	0.124	3.167	4.99	0.108	2.207	4.47
	P95s	2.342	0.249	9.150	7.46	0.273	2.342	8.59
	P95u	2.044	0.356	10.623	5.49	0.270	8.436	6.25
Cart	GSDs	1.966	1.361	2.858	1.45	1.398	2.445	1.37
	GMs	2.149	1.298	3.570	1.66	1.381	3.366	1.56
	AMs	2.607	1.517	4.516	1.73	1.572	4.000	1.61
	AMu	2.701	1.561	4.802	1.76	1.585	4.233	1.63
	P95s	6.323	2.527	13.173	2.36	2.759	6.323	2.29
	P95u	6.533	2.919	14.002	2.20	3.062	11.410	2.00
Handheld	GSDs	2.684	1.156	6.725	2.36	1.000	2.706	2.68
	GMs	0.179	0.058	0.546	3.09	0.057	0.322	1.79
	AMs	0.230	0.071	0.872	3.52	0.057	0.322	1.62
	AMu	0.292	0.076	1.558	4.46	0.057	0.322	1.79

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
	P95s	0.322	0.104	2.010	4.85	0.057	0.322	1.03
	P95u	0.909	0.136	5.741	6.51	0.057	0.931	2.91

Table B39. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized inhalation (respirable) dose (mg/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	5.138	2.926	8.976	1.75	3.622	6.300	1.35
	GMs	0.395	0.182	0.868	2.18	0.183	0.832	2.13
	AMs	1.088	0.429	4.507	3.30	0.531	1.711	1.80
	AMu	1.506	0.488	5.537	3.35	0.484	2.959	2.54
	P95s	4.209	1.665	50.208	8.34	2.634	4.209	1.56
	P95u	5.824	1.683	19.034	3.38	1.796	11.332	2.59
Backpack	GSDs	4.070	1.911	8.766	2.14	1.371	7.007	2.81
	GMs	0.142	0.051	0.405	2.83	0.064	0.414	2.55
	AMs	0.471	0.085	1.199	4.69	0.070	1.220	6.10
	AMu	0.381	0.096	1.985	4.49	0.071	2.379	5.82
	P95s	2.693	0.190	6.031	10.98	0.111	2.693	24.25
	P95u	1.433	0.268	6.960	5.12	0.122	8.721	10.75
Cart	GSDs	1.742	1.288	2.368	1.35	1.315	2.021	1.29
	GMs	1.861	1.230	2.822	1.52	1.274	2.731	1.46
	AMs	2.118	1.372	3.300	1.55	1.389	2.982	1.47
	AMu	2.170	1.399	3.423	1.57	1.405	3.086	1.49
	P95s	4.209	2.125	8.243	1.97	2.634	4.209	1.60
	P95u	4.635	2.392	8.666	1.91	2.393	6.848	1.79
Handheld	GSDs	1.617	1.073	2.529	1.52	1.000	1.673	1.62
	GMs	0.114	0.066	0.196	1.73	0.066	0.161	1.41
	AMs	0.122	0.070	0.220	1.77	0.066	0.161	1.35
	AMu	0.128	0.072	0.239	1.82	0.066	0.161	1.37
	P95s	0.161	0.088	0.370	2.09	0.066	0.161	1.14
	P95u	0.252	0.100	0.617	2.49	0.066	0.279	1.79

Table B40. Arithmetic mean, geometric mean, geometric standard deviation, and 95th percentiles (with 95% confidence intervals and fold relative accuracy), for different statistical models of the normalized inhalation (respirable) time-weighted average concentration ((mg/m³)/lb ai). Excludes ME 17.

			Parametric Bootstrap			Non-parametric Bootstrap		
Group	Parameter	Estimate	Lower Bound	Upper Bound	Fold Relative Accuracy	Lower Bound	Upper Bound	Fold Relative Accuracy
All	GSDs	5.138	2.926	8.976	1.75	3.622	6.300	1.35
	GMs	0.049	0.023	0.108	2.18	0.023	0.104	2.13
	AMs	0.136	0.054	0.563	3.30	0.066	0.214	1.80
	AMu	0.188	0.061	0.692	3.35	0.060	0.370	2.54
	P95s	0.526	0.208	6.276	8.34	0.329	0.526	1.56
	P95u	0.728	0.210	2.379	3.38	0.224	1.416	2.59
Backpack	GSDs	4.070	1.911	8.766	2.14	1.371	7.007	2.81
	GMs	0.018	0.006	0.051	2.83	0.008	0.052	2.55
	AMs	0.059	0.011	0.150	4.69	0.009	0.153	6.10
	AMu	0.048	0.012	0.248	4.49	0.009	0.297	5.82
	P95s	0.337	0.024	0.754	10.98	0.014	0.337	24.25
	P95u	0.179	0.034	0.870	5.12	0.015	1.090	10.75
Cart	GSDs	1.742	1.288	2.368	1.35	1.315	2.021	1.29
	GMs	0.233	0.154	0.353	1.52	0.159	0.341	1.46
	AMs	0.265	0.172	0.412	1.55	0.174	0.373	1.47
	AMu	0.271	0.175	0.428	1.57	0.176	0.386	1.49
	P95s	0.526	0.266	1.030	1.97	0.329	0.526	1.60
	P95u	0.579	0.299	1.083	1.91	0.299	0.856	1.79
Handheld	GSDs	1.617	1.073	2.529	1.52	1.000	1.673	1.62
	GMs	0.014	0.008	0.025	1.73	0.008	0.020	1.41
	AMs	0.015	0.009	0.028	1.77	0.008	0.020	1.35
	AMu	0.016	0.009	0.030	1.82	0.008	0.020	1.37
	P95s	0.020	0.011	0.046	2.09	0.008	0.020	1.14
	P95u	0.031	0.013	0.077	2.49	0.008	0.035	1.79

Tables B30 to B40 show that for all data combined, the study benchmark design value of 3 for the fold relative accuracy was met in every case, with the exception of the empirical 95th percentile using the parametric bootstrap for hands only and all the inhalation exposure routes, together with the empirical and lognormal random sampling 95th percentile and arithmetic mean using the parametric bootstrap for all the inhalation (respirable) exposure routes.

Tables B30 to B40 also show that in all cases all the statistics met the study benchmark for the Cart sprayer type. For the Backpack sprayer type, all of the benchmarks were met for dermal exposure but most of the benchmarks were generally not met for inhalation exposure. For the Handheld sprayer type, most of the benchmarks were not met for the parametric bootstrap but they were mostly met for the non-parametric bootstrap. This is somewhat surprising since there were only 3 MEs using a Handheld sprayer, which would typically lead to large uncertainty for that group.

Empirical Quantile Plots

Quantile-quantile plots of the normalized exposure values were used to evaluate whether the data were lognormally distributed, as implied by the assumed statistical lognormal models.

In each case the quantile-quantile plot compared the observed quantiles of the measured values with the corresponding quantiles of a normal or lognormal distribution. A perfect fit would imply that the plotted values lie in a straight line. The quantile-quantile plots for all exposure routes using all 17 MEs are presented in Figures B1 to B22. Quantile-quantile plots are not presented for the sprayer type groups to avoid having a voluminous memorandum but can be made available. For the dermal exposure routes the plots in Figures B1 to B10 seem to generally show a (slightly) better fit for the normal distributions, supporting the use of the untransformed dermal exposure values over the log-transformed values. For the inhalation exposure routes the plots in Figures B11 to B22 seem to generally show a better fit for the lognormal distributions, supporting the use of the log-transformed inhalation exposure values over the untransformed values.

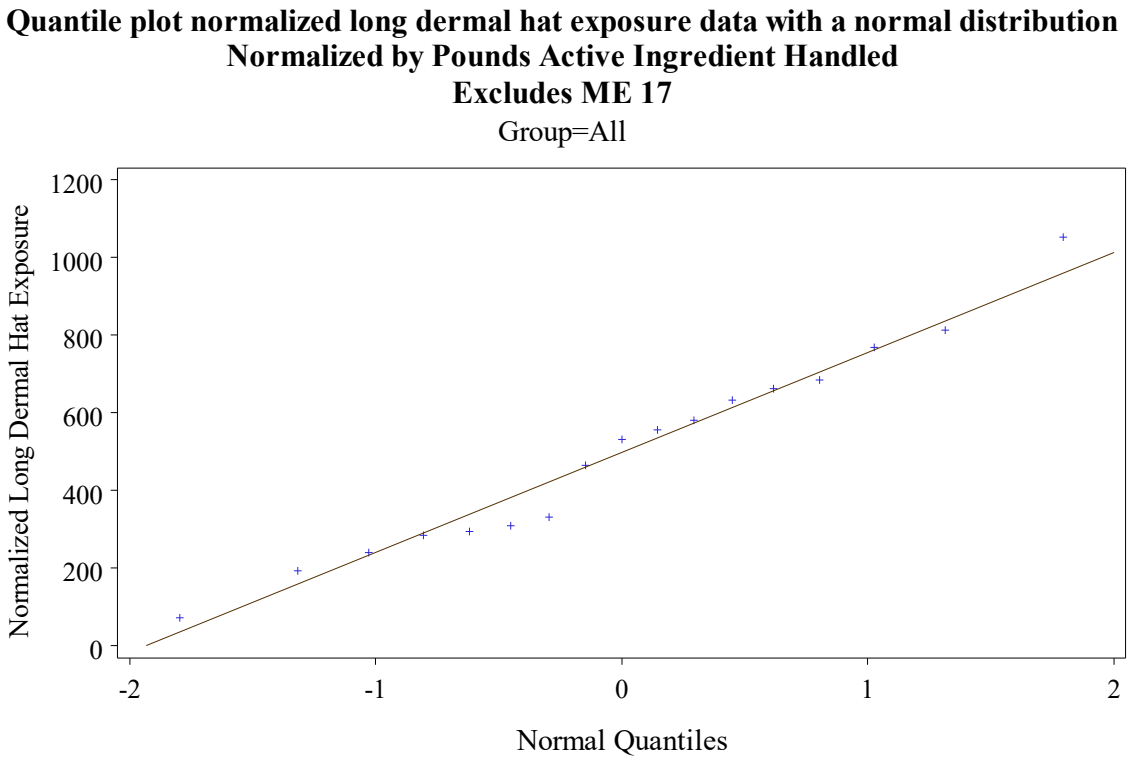


Figure B1. Empirical quantile plot for Long Dermal Hat, with a normal distribution. Excludes ME 17.

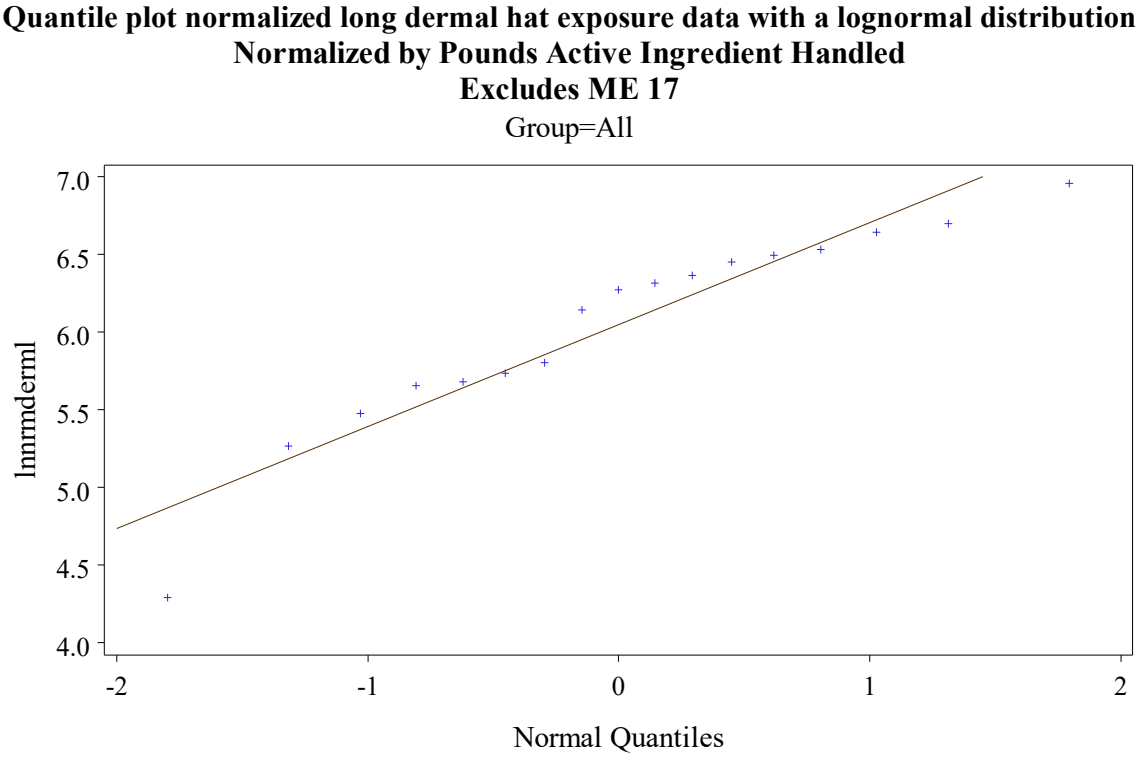


Figure B2. Empirical quantile plot for Long Dermal Hat, with a lognormal distribution. Excludes ME 17.

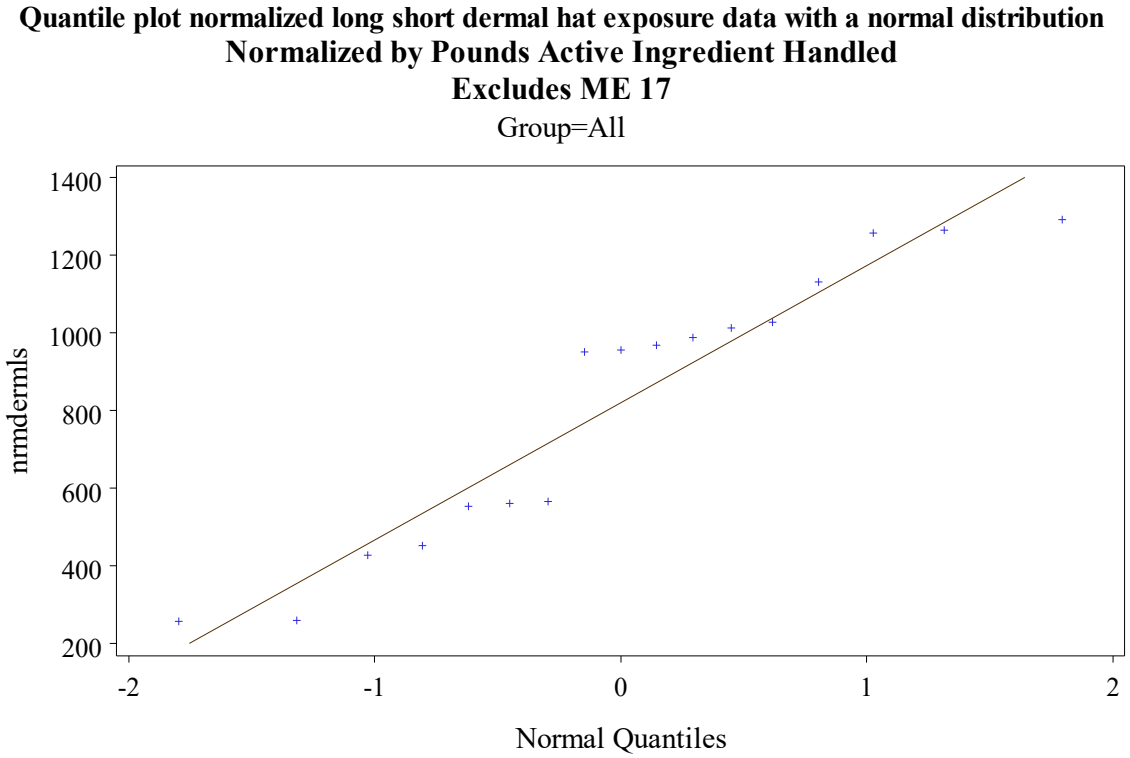


Figure B3. Empirical quantile plot for Long Short Dermal Hat, with a normal distribution. Excludes ME 17.

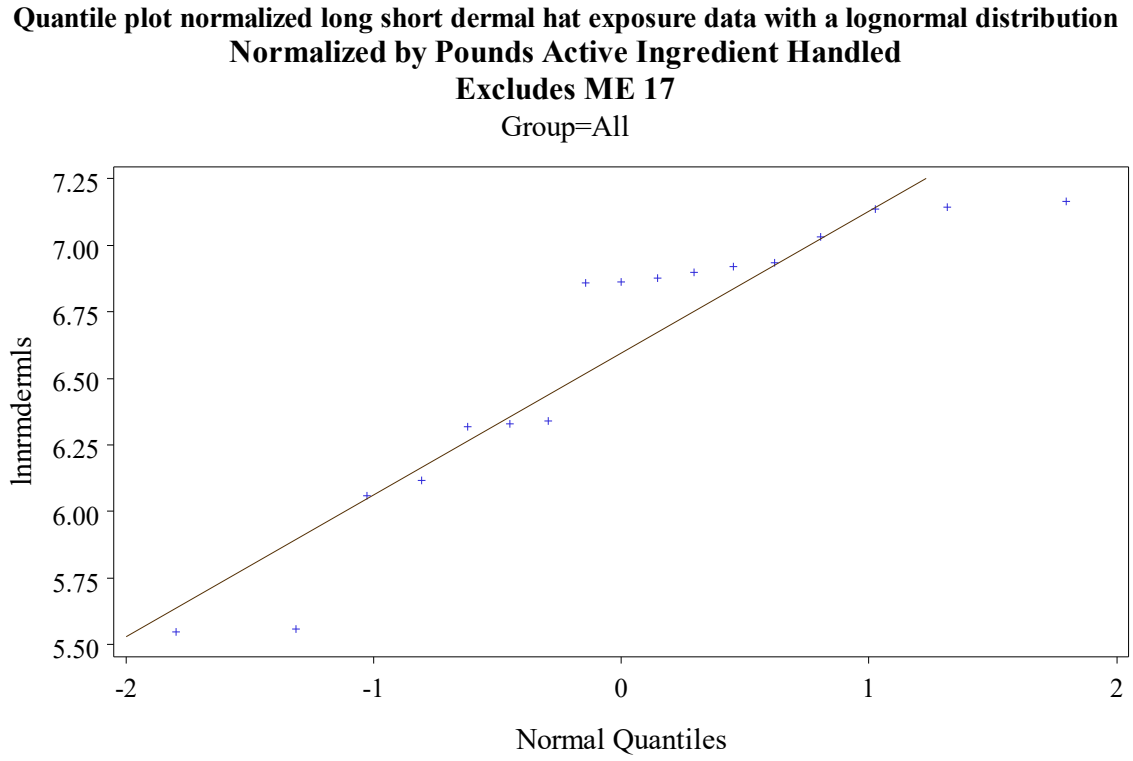


Figure B4. Empirical quantile plot for Long Short Dermal Hat, with a lognormal distribution. Excludes ME 17.

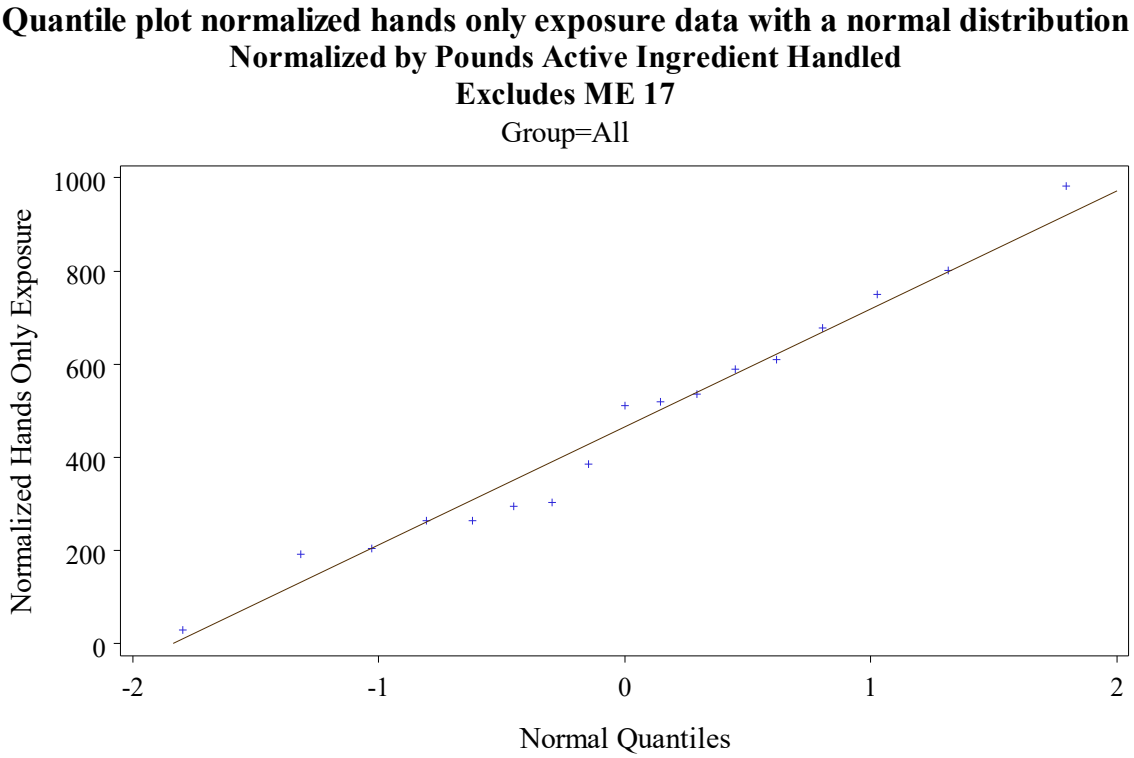


Figure B5. Empirical quantile plot for Hands Only, with a normal distribution. Excludes ME 17.

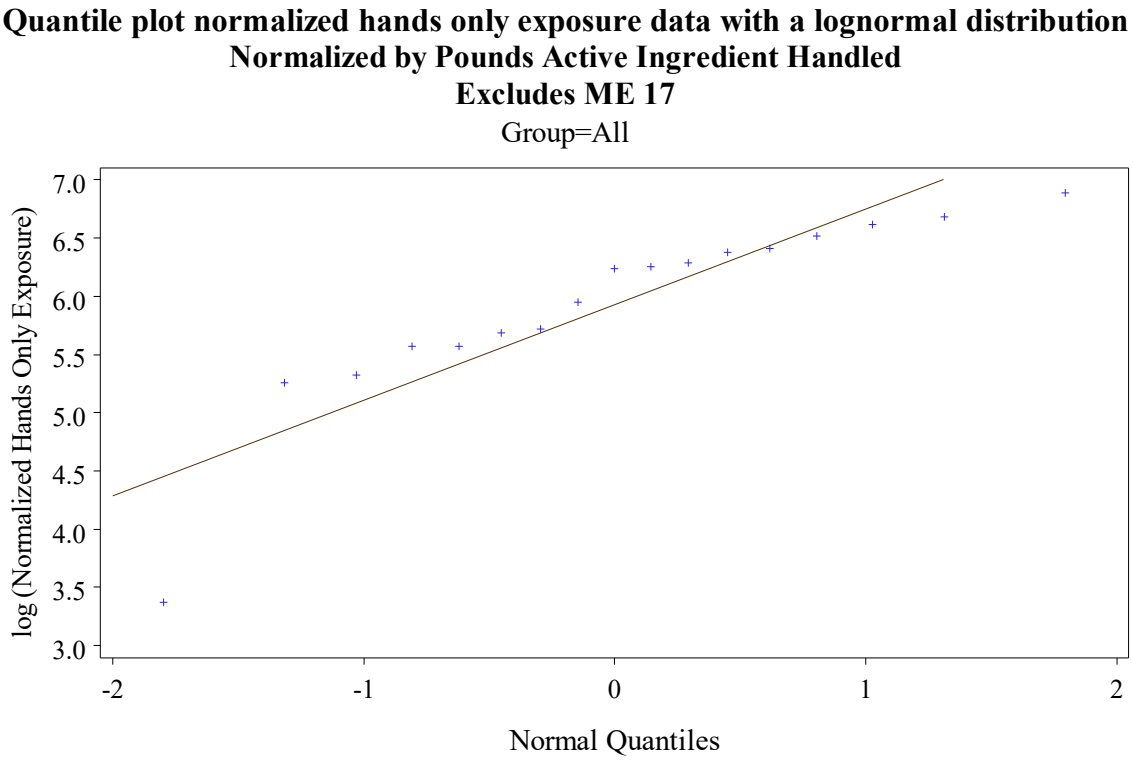


Figure B6. Empirical quantile plot for Hands Only, with a lognormal distribution. Excludes ME 17.

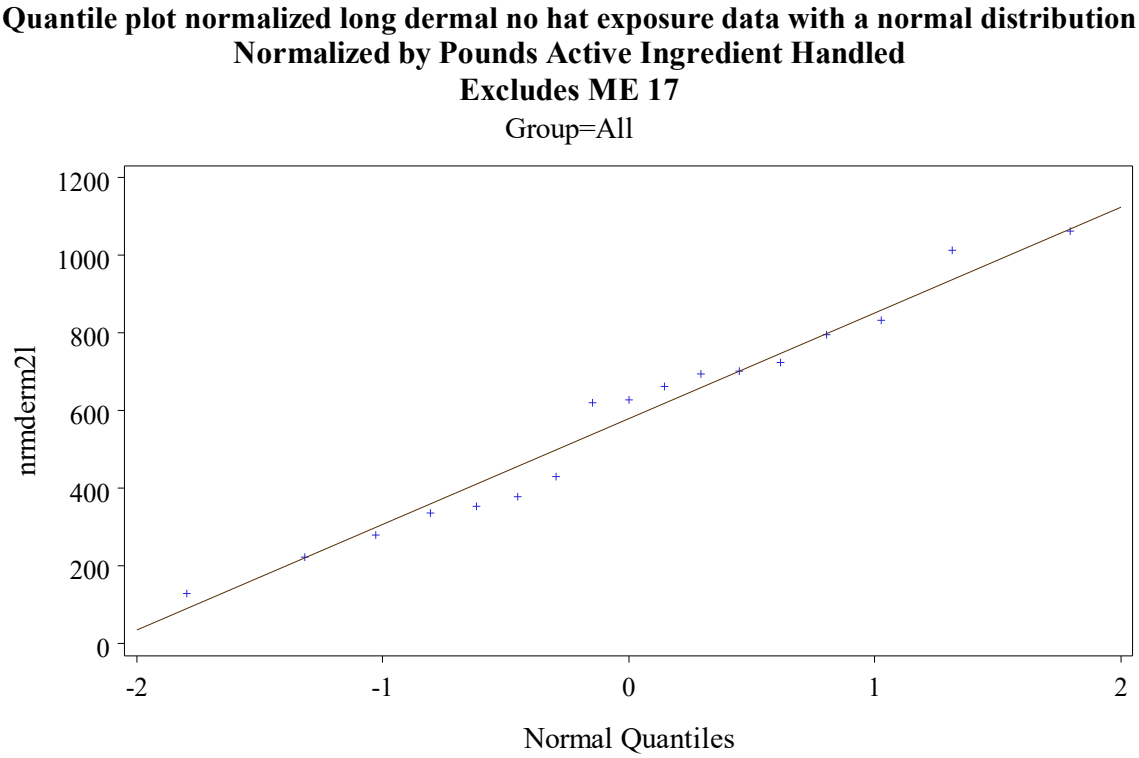


Figure B7. Empirical quantile plot for Long Dermal No Hat, with a normal distribution. Excludes ME 17.

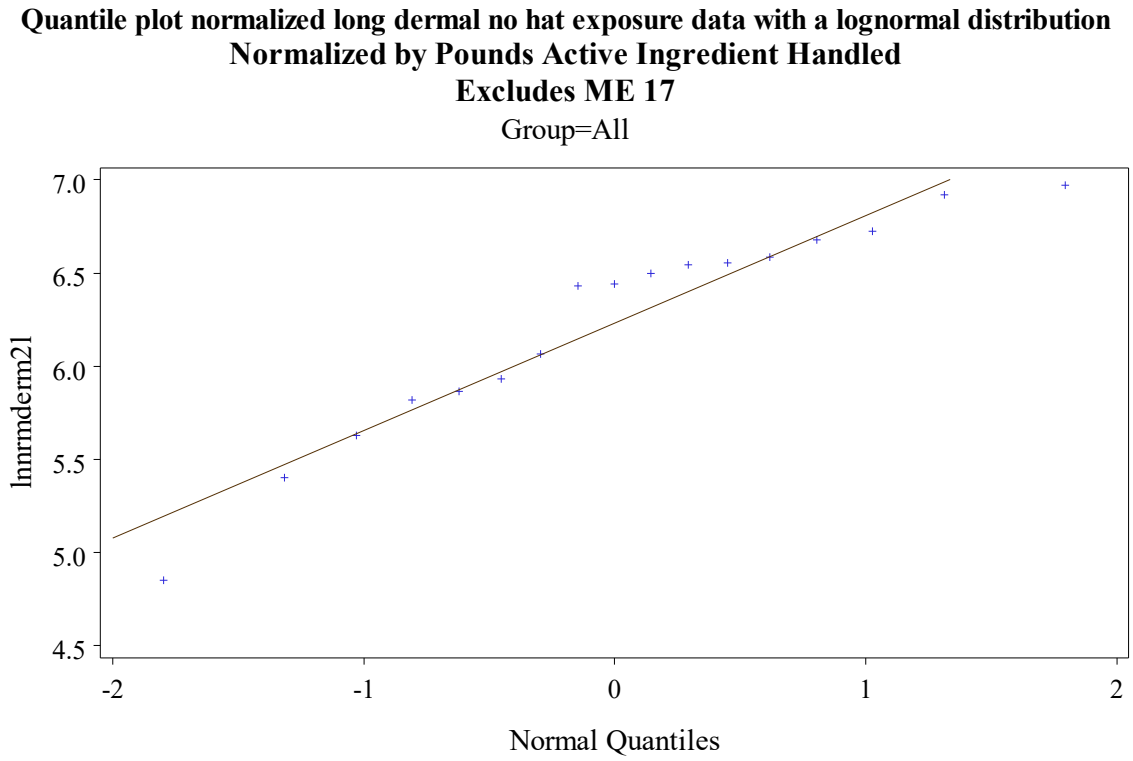


Figure B8. Empirical quantile plot for Long Dermal No Hat, with a lognormal distribution. Excludes ME 17.

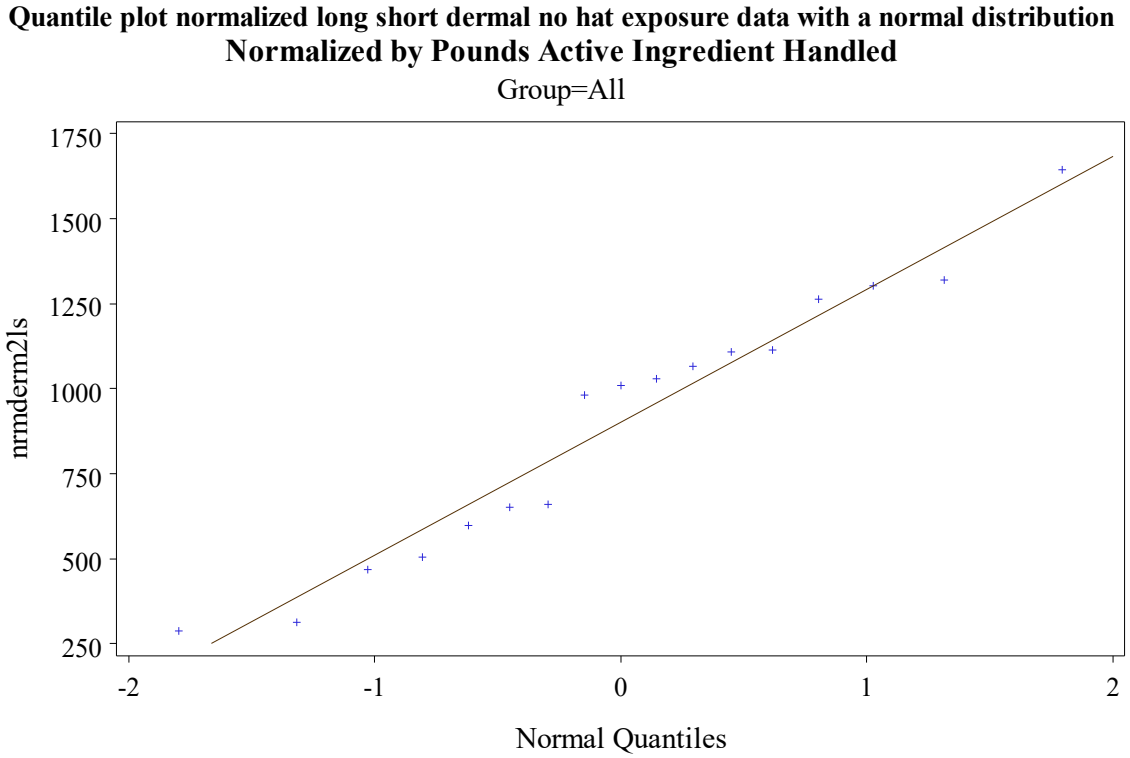


Figure B9. Empirical quantile plot for Long Short Dermal No Hat, with a normal distribution. Excludes ME 17.

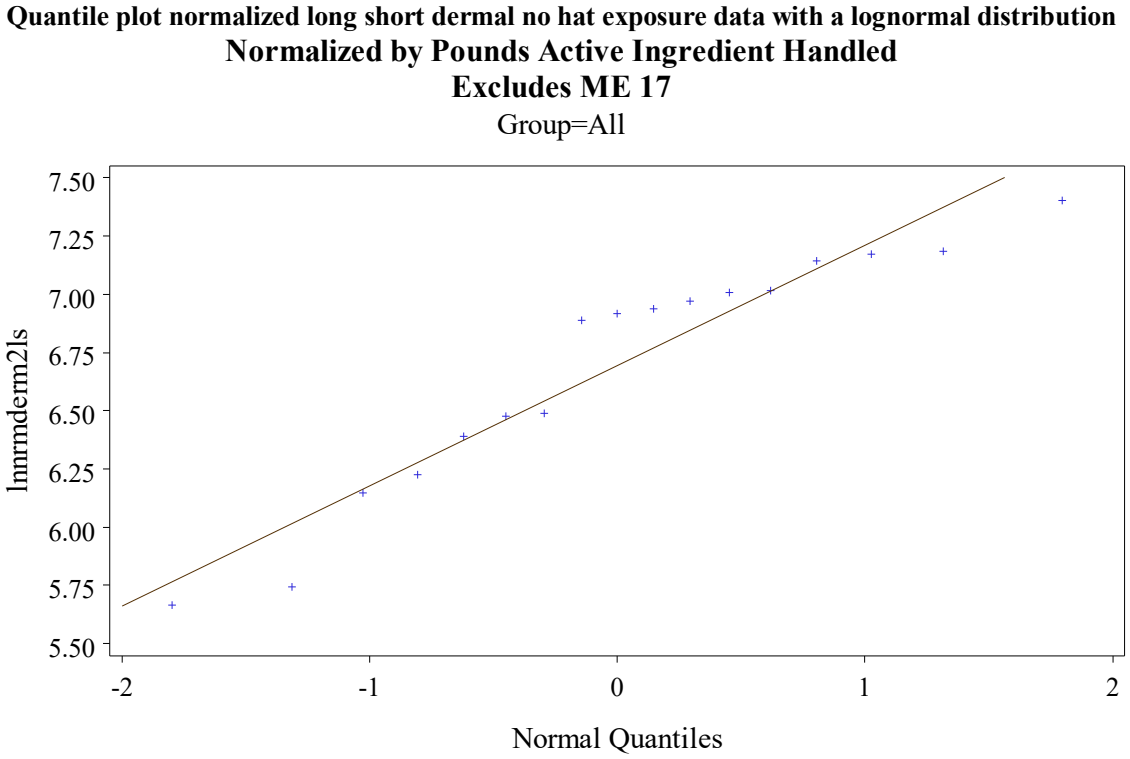


Figure B10. Empirical quantile plot for Long Short Dermal No Hat, with a lognormal distribution. Excludes ME 17.

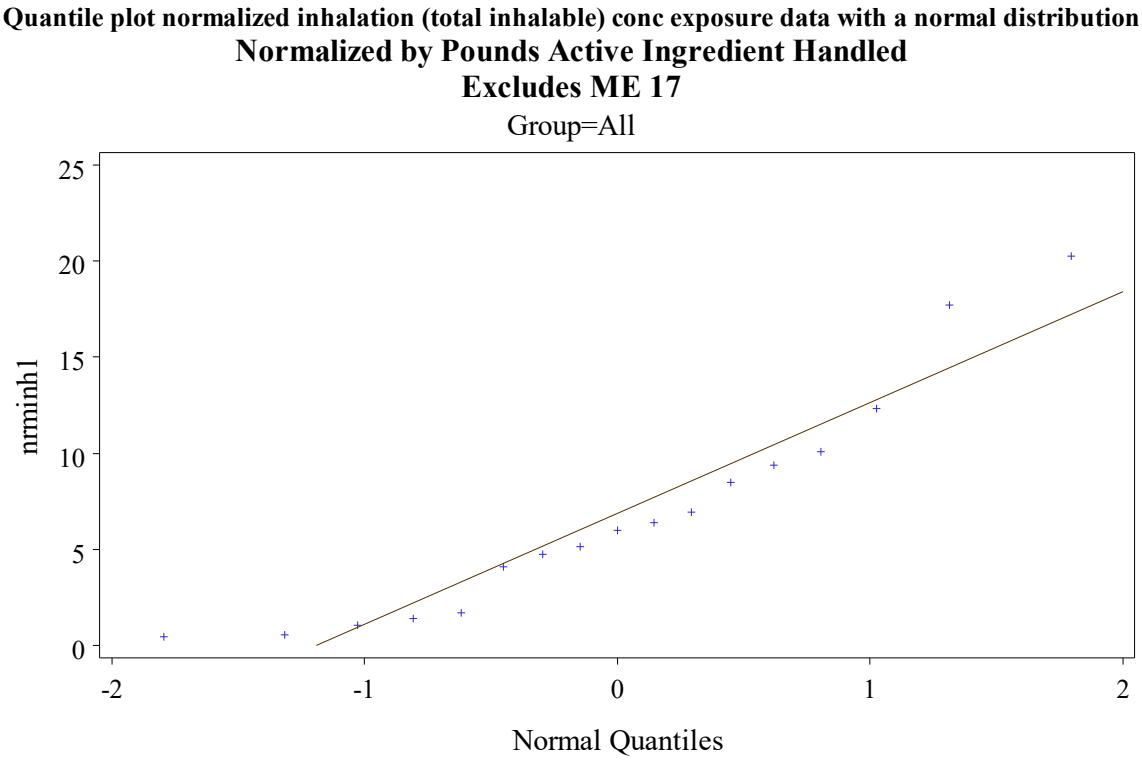


Figure B11. Empirical quantile plot for Inhalation (total inhalable) Conc, with a normal distribution. Excludes ME 17.

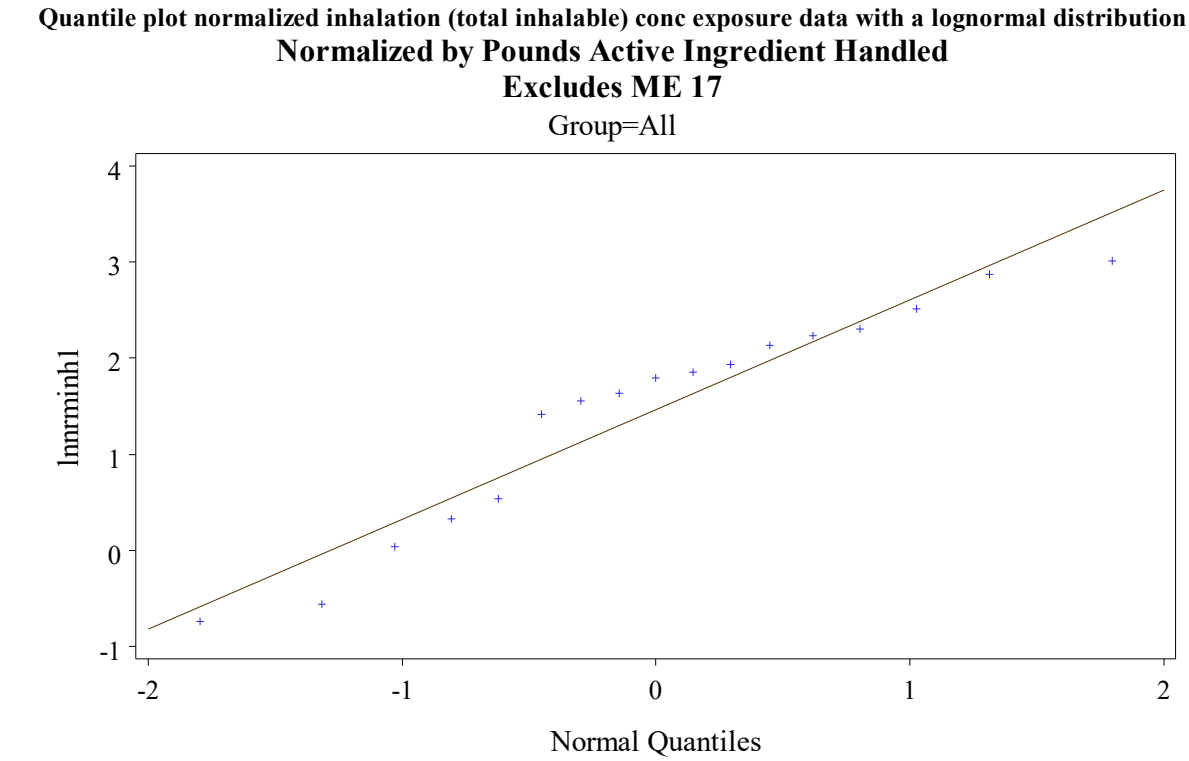


Figure B12. Empirical quantile plot for Inhalation (total inhalable) Conc, with a lognormal distribution. Excludes ME 17.

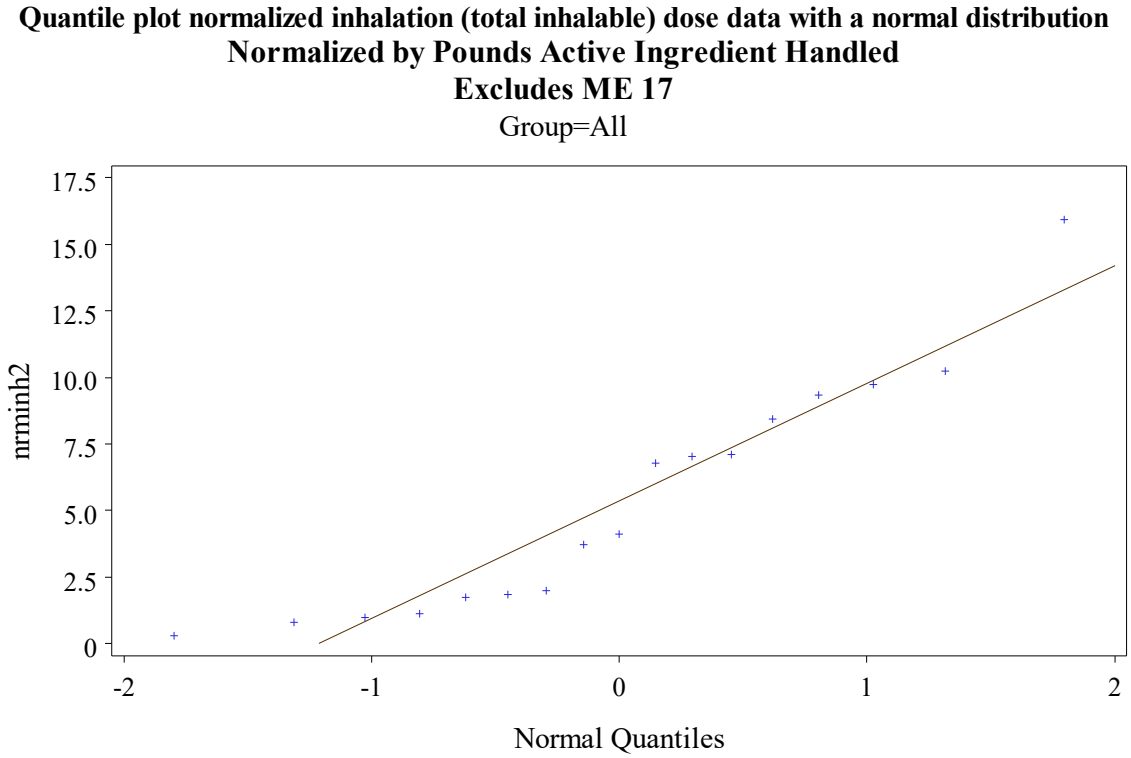


Figure B13. Empirical quantile plot for Inhalation (total inhalable) Dose, with a normal distribution. Excludes ME 17.

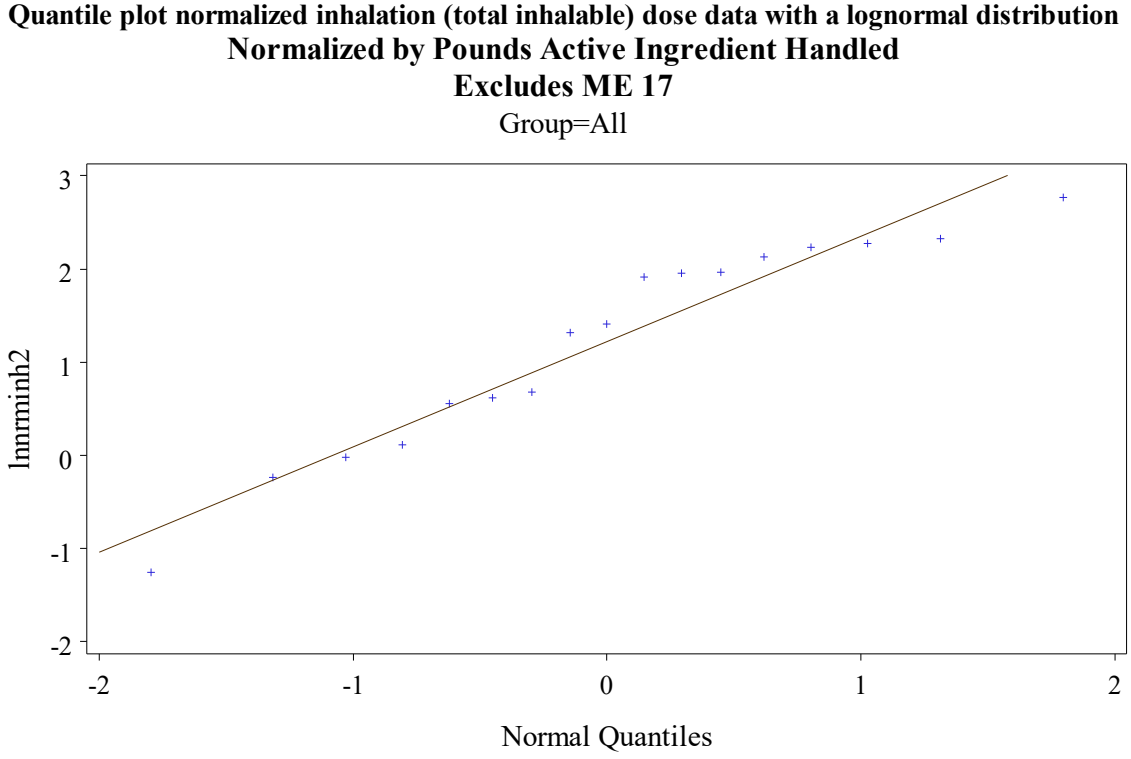


Figure B14. Empirical quantile plot for Inhalation (total inhalable) Dose, with a lognormal distribution Excludes ME 17.

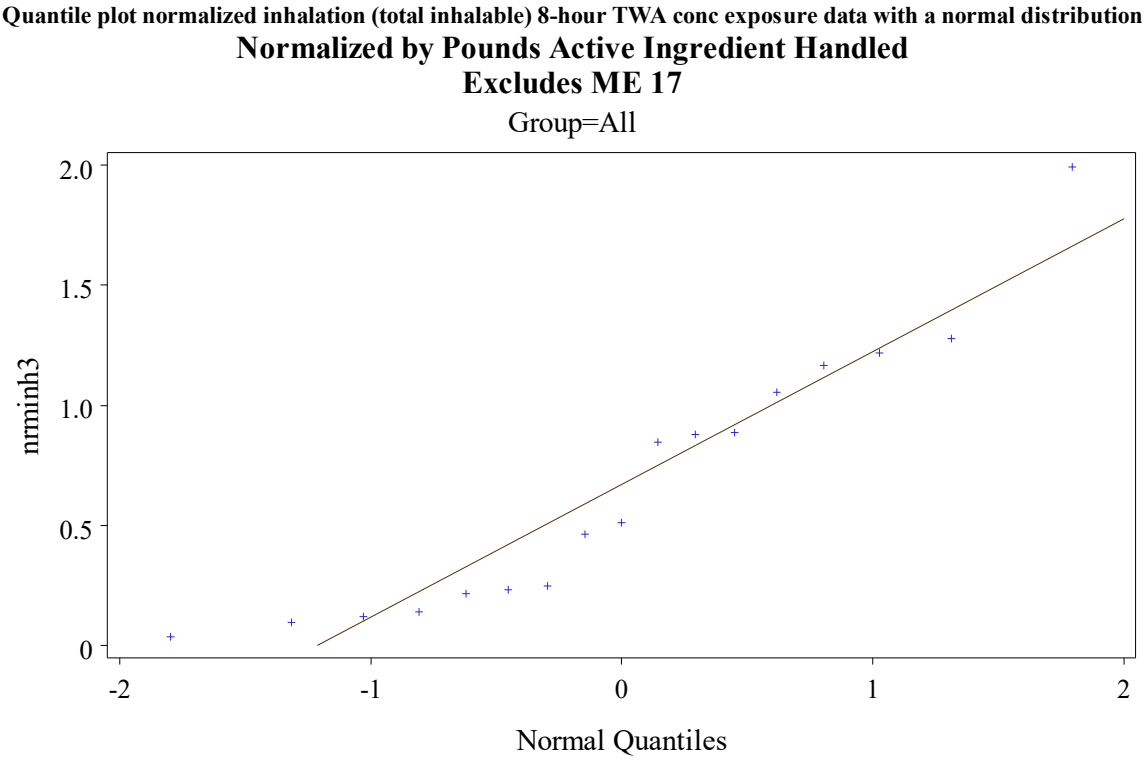


Figure B15. Empirical quantile plot for Inhalation (total inhalable) Time-Weighted Average Conc, with a normal distribution. Excludes ME 17.

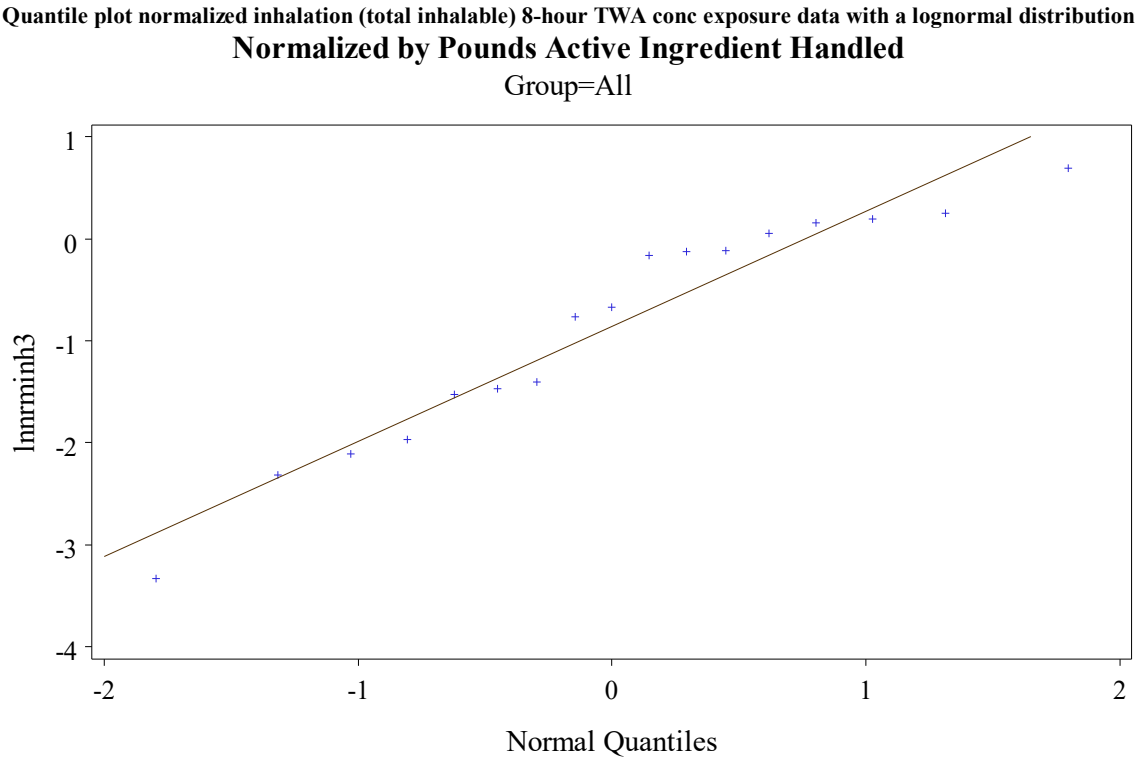


Figure B16. Empirical quantile plot for Inhalation (total inhalable) Time-Weighted Average Conc, with a lognormal distribution. Excludes ME 17.

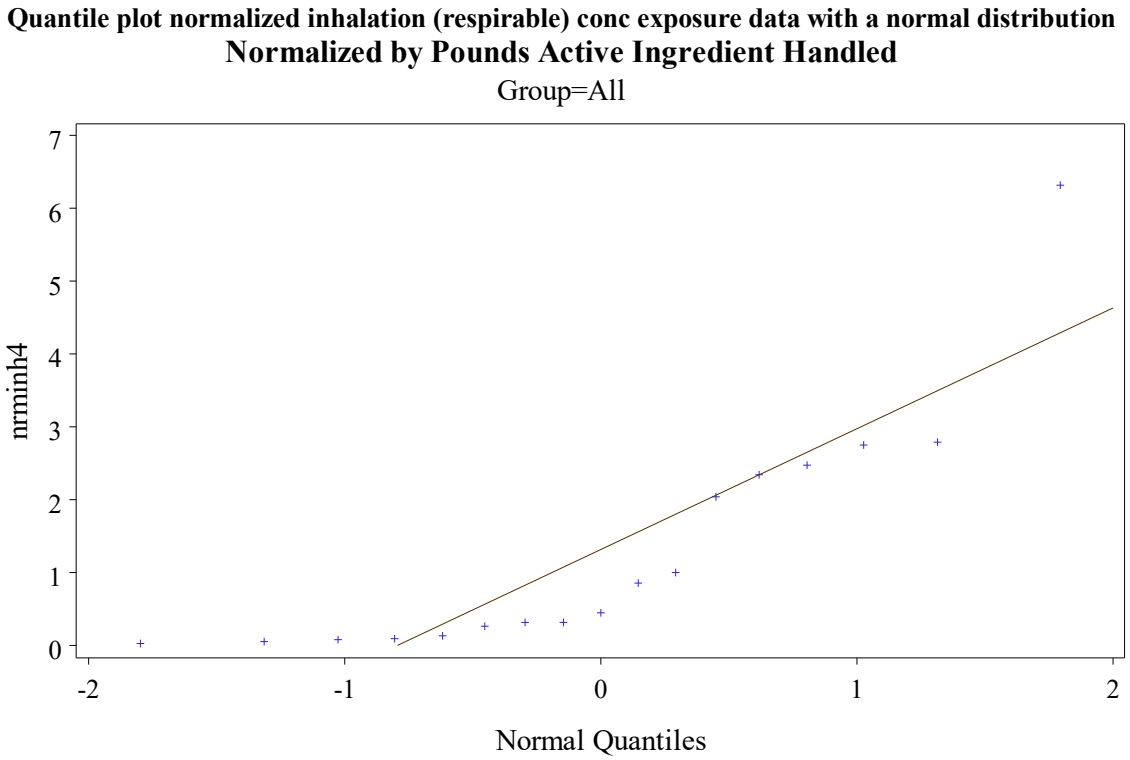


Figure B17. Empirical quantile plot for Inhalation (respirable) Conc, with a normal distribution. Excludes ME 17.

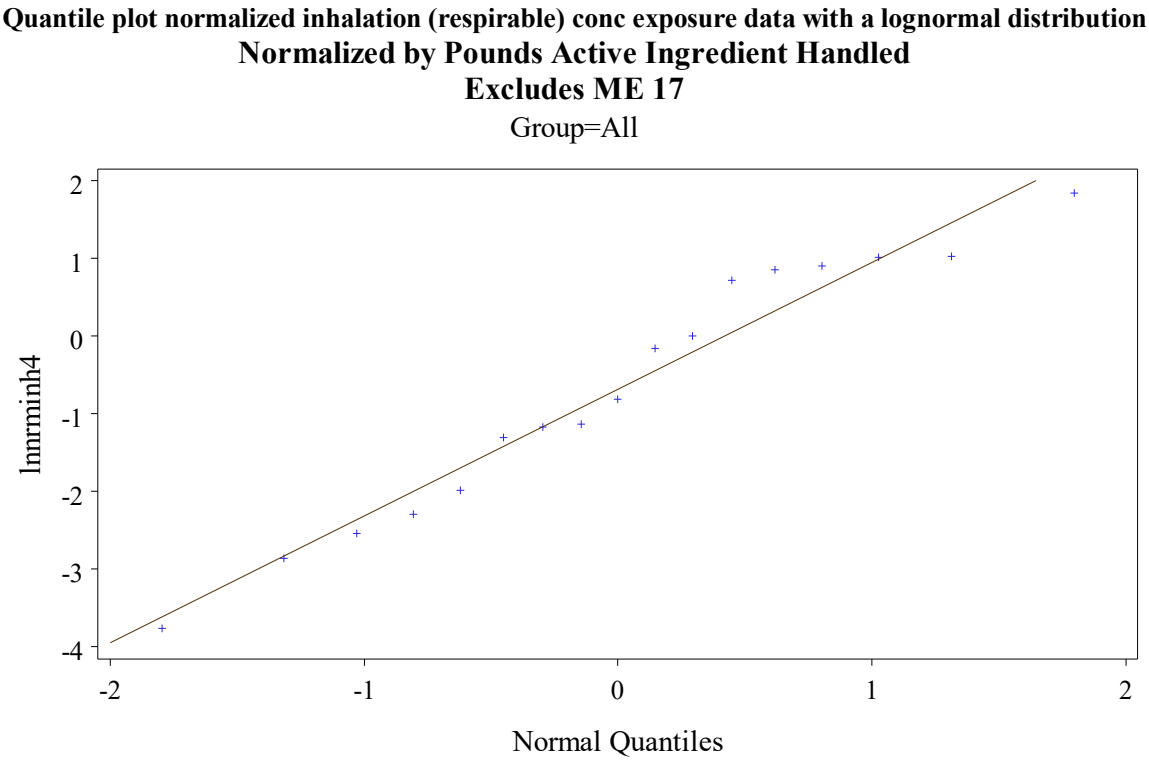


Figure B18. Empirical quantile plot for Inhalation (respirable) Conc, with a lognormal distribution. Excludes ME 17.

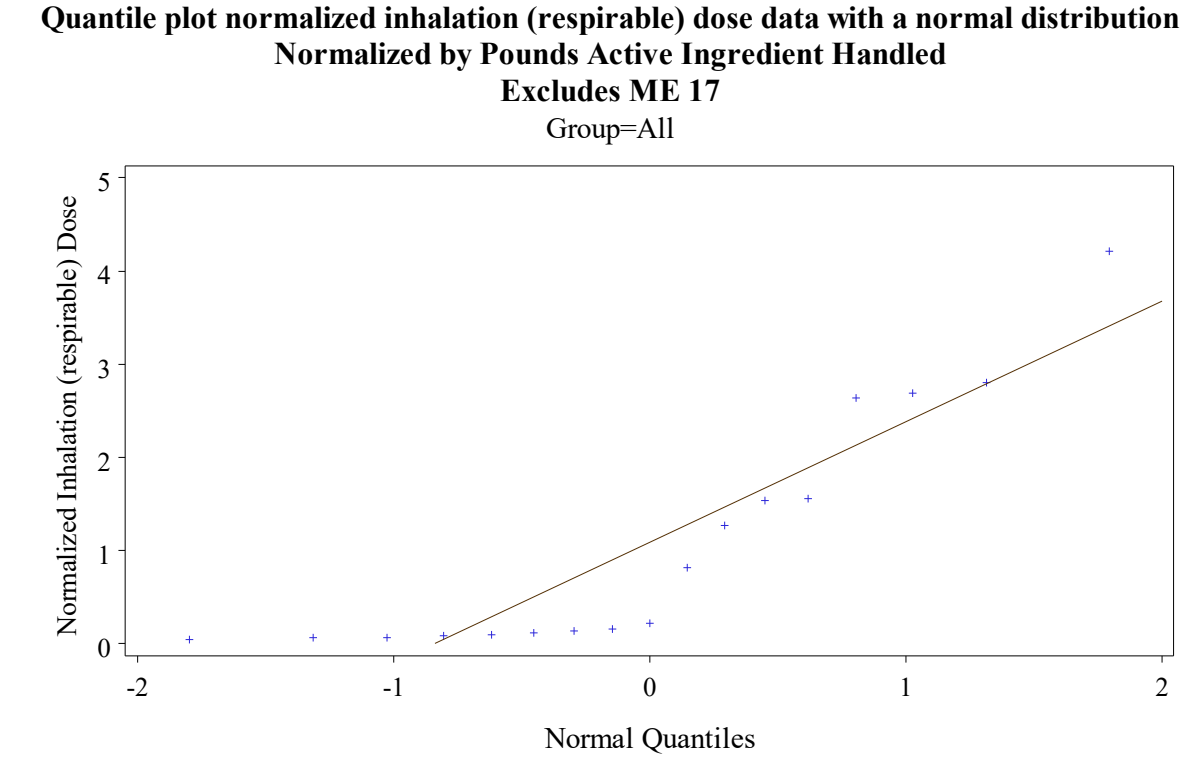


Figure B19. Empirical quantile plot for Inhalation (respirable) Dose, with a normal distribution. Excludes ME 17.

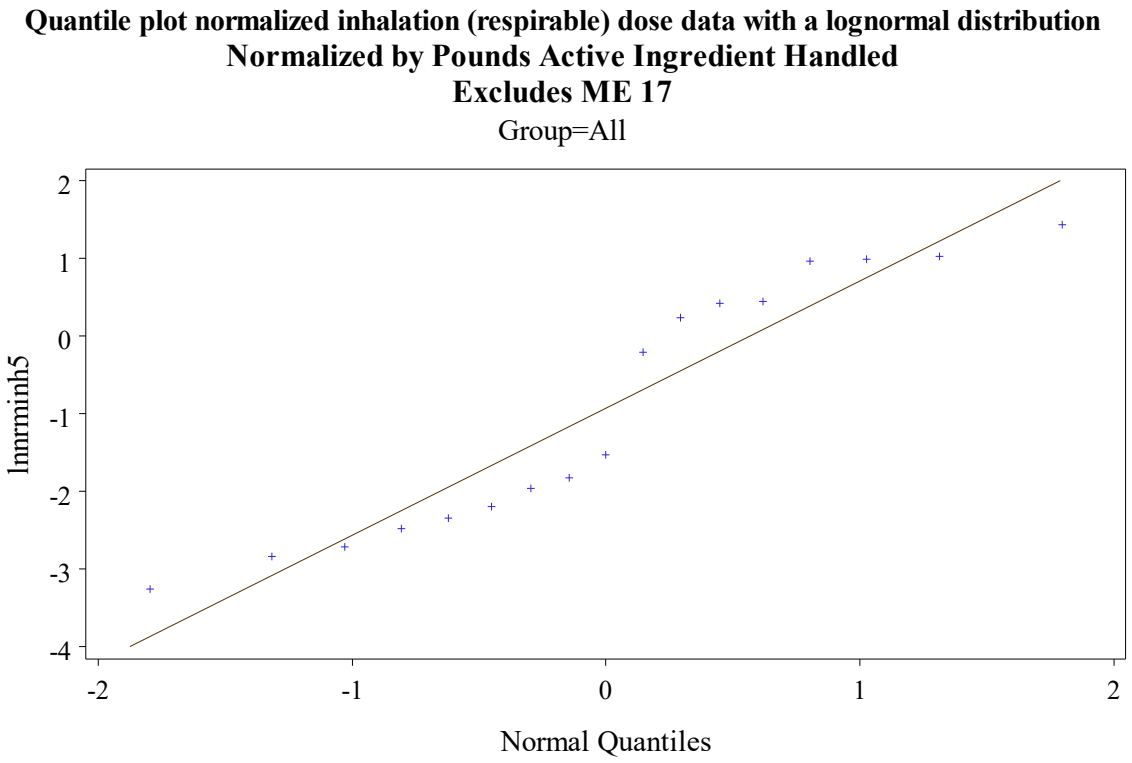


Figure B20. Empirical quantile plot for Inhalation (respirable) Dose, with a lognormal distribution. Excludes ME 17.

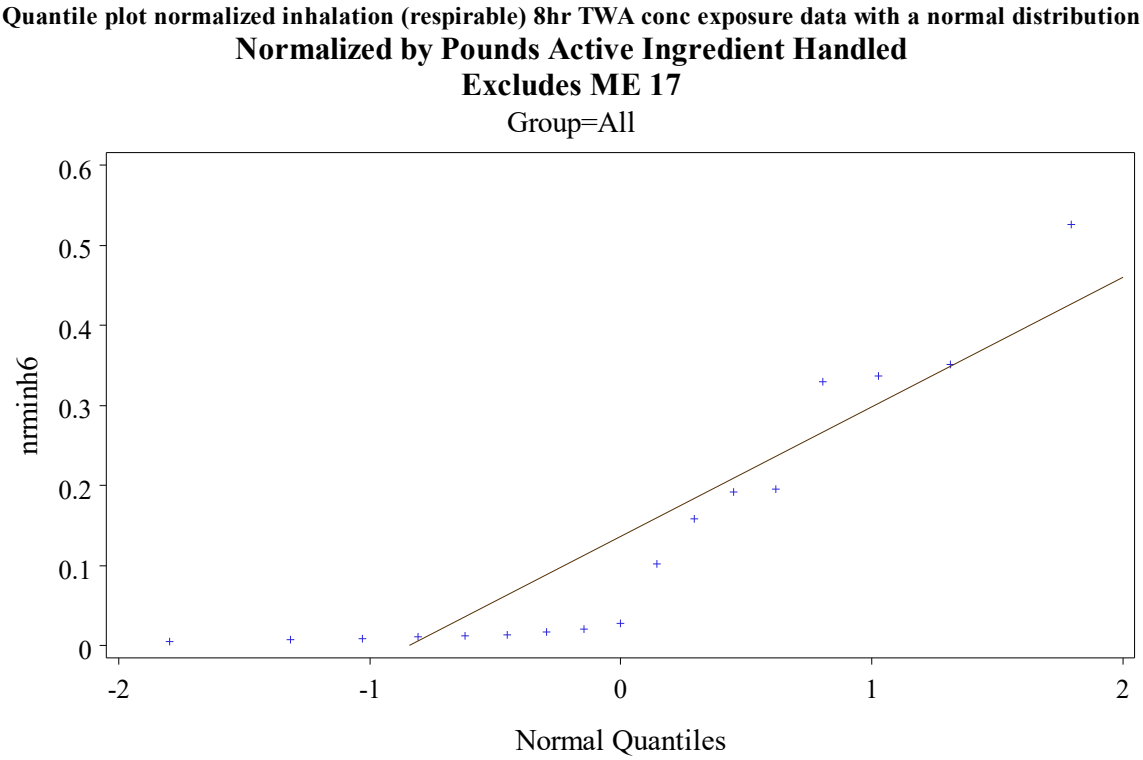


Figure B21. Empirical quantile plot for Inhalation (respirable) Time-Weighted Average Conc, with a normal distribution. Excludes ME 17.

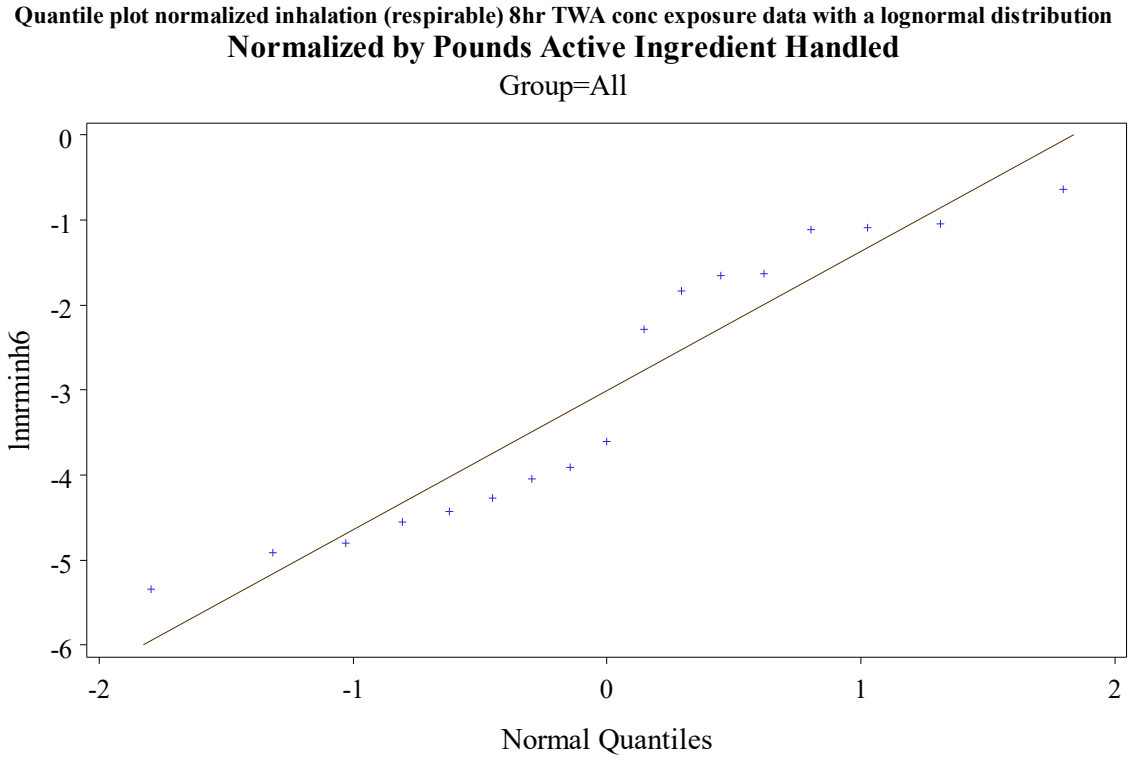


Figure B22. Empirical quantile plot for Inhalation (respirable) Time-Weighted Average Conc, with a lognormal distribution. Excludes ME 17.

Normality Tests

Since many of the statistical models used for these analyses assume that the normalized exposure has a lognormal distribution it is important to evaluate this assumption. In the previous section "Empirical Quantile Plots" we evaluated this assumption for all 17 MEs and found that for most dermal exposure modes, a normality assumption was weakly preferred over a lognormality assumption, but for most inhalation exposure modes, a lognormality assumption was preferred over a normality assumption. It should be noted that the true normalized exposure distribution cannot be normal because exposure is non-negative, but it is quite possible that a normal approximation is better than a lognormal approximation for these data.

In this section, for a more quantitative evaluation of the normality or lognormality of the normalized exposure, we also applied Shapiro-Wilk normality tests either to the normalized exposure or to its logarithm. The p-values are shown in Tables B41 to B44 for all the data and separately for each of three sprayer type groups. P-values less than 0.05 for the normalized exposure are evidence against normality of the normalized exposure at the usual 5% level. P-values less than 0.05 for the logarithm of the normalized exposure are evidence against lognormality of the normalized exposure.

For all the data, Table B41 shows the following. For Long Dermal Hat and Hands Only both p-values were above 0.15. For Long Short Dermal Hat there is stronger evidence for normality but both normality and lognormality are rejected. For Long Dermal No Hat, and Long Short Dermal No Hat, normality is not rejected, and lognormality is rejected. For inhalation (total inhalable) exposure routes, both normality and lognormality are not rejected, but there is stronger evidence for normality. For inhalation (respirable) exposure routes, normality is rejected, and lognormality is not rejected.

For the Backpack sprayer, Table B42 shows that normality is rejected for the three Inhalation (respirable) routes, and that lognormality is not rejected for all the exposure routes. For the Cart sprayer, Table B43 shows that normality is rejected for Long Short Dermal Hat, Hands Only, and Inhalation (total inhalable) conc exposure, but lognormality was not rejected for any route. For the Handheld sprayer, Table B44 shows that normality and lognormality were both not rejected for every route, but this may be due to the fact that there were only 3 Handheld sprayer MEs.

In summary, the statistical analyses based on a lognormal model are supported if the potential outlier is deleted and separate analyses are applied to each sprayer type group.

Table B41. Shapiro-Wilk Normality tests of the normalized exposure and its logarithm. All data. Excludes ME 17.

Exposure Route	Clothing	P-value for Normality Test of Normalized Exposure	P-value for Normality Test of log Normalized Exposure
Dermal (mg/lb ai)	Long Dermal Hat	> 0.15	> 0.15
	Long Short Dermal Hat	0.01	< 0.01
	Hands Only	> 0.15	> 0.15
	Long Dermal No Hat	> 0.15	0.02
	Long Short Dermal No Hat	> 0.15	0.01
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		> 0.15	0.11
Inhalation (total inhalable) Dose (mg/lb ai)		0.10	0.07
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		0.10	0.07

Exposure Route	Clothing	P-value for Normality Test of Normalized Exposure	P-value for Normality Test of log Normalized Exposure
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		0.02	> 0.15
Inhalation (respirable) Dose (mg/lb ai)		< 0.01	> 0.15
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		< 0.01	> 0.15

Table B42. Shapiro-Wilk Normality tests of the normalized exposure and its logarithm. Backpack sprayer. Excludes ME 17.

Exposure Route	Clothing	P-value for Normality Test of Normalized Exposure	P-value for Normality Test of log Normalized Exposure
Dermal (mg/lb ai)	Long Dermal Hat	> 0.15	> 0.15
	Long Short Dermal Hat	> 0.15	0.09
	Hands Only	> 0.15	> 0.15
	Long Dermal No Hat	> 0.15	> 0.15
	Long Short Dermal No Hat	> 0.15	0.14
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		> 0.15	0.10
Inhalation (total inhalable) Dose (mg/lb ai)		0.10	> 0.15
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		0.10	> 0.15
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		0.02	> 0.15
Inhalation (respirable) Dose (mg/lb ai)		< 0.01	0.09
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		< 0.01	0.09

Table B43. Shapiro-Wilk Normality tests of the normalized exposure and its logarithm. Cart sprayer.

Exposure Route	Clothing	P-value for Normality Test of Normalized Exposure	P-value for Normality Test of log Normalized Exposure
Dermal (mg/lb ai)	Long Dermal Hat	0.06	> 0.15

Exposure Route	Clothing	P-value for Normality Test of Normalized Exposure	P-value for Normality Test of log Normalized Exposure
	Long Short Dermal Hat	0.04	> 0.15
	Hands Only	0.04	> 0.15
	Long Dermal No Hat	> 0.15	> 0.15
	Long Short Dermal No Hat	0.09	> 0.15
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		> 0.15	> 0.15
Inhalation (total inhalable) Dose (mg/lb ai)		> 0.15	> 0.15
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		> 0.15	> 0.15
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		0.03	> 0.15
Inhalation (respirable) Dose (mg/lb ai)		> 0.15	> 0.15
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		> 0.15	> 0.15

Table B44. Shapiro-Wilk Normality tests of the normalized exposure and its logarithm. Handheld sprayer.

Exposure Route	Clothing	P-value for Normality Test of Normalized Exposure	P-value for Normality Test of log Normalized Exposure
Dermal (mg/lb ai)	Long Dermal Hat	> 0.15	0.11
	Long Short Dermal Hat	> 0.15	> 0.15
	Hands Only	> 0.15	0.14
	Long Dermal No Hat	0.11	0.09
	Long Short Dermal No Hat	> 0.15	0.14
Inhalation (total inhalable) Conc ((mg/m^3)/lb ai)		> 0.15	> 0.15
Inhalation (total inhalable) Dose (mg/lb ai)		0.12	0.09
Inhalation (total inhalable) 8hr TWA ((mg/m^3)/lb ai)		0.12	0.09
Inhalation (respirable) Conc ((mg/m^3)/lb ai)		0.09	0.09
Inhalation (respirable) Dose (mg/lb ai)		> 0.15	> 0.15
Inhalation (respirable) 8hr TWA((mg/m^3)/lb ai)		> 0.15	> 0.15

Log-log-Linearity Analyses and Estimated Log-log Intercepts and Slopes

The statistical analyses in this section are mainly based on the distributional assumption that the normalized exposure has a lognormal distribution. While this assumption has been generally supported for most of the previous AEATF II studies, the results of the quantile-quantile plots and normality tests presented in the last two sections for all 17 MEs after excluding ME 17 tend to support a lognormal distribution for normalized inhalation exposure but not for normalized dermal exposure. As discussed in the last section, the normality tests support the assumption of lognormality for each sprayer type group after removing the potential outlier.

Test for log-log-linearity with slope 1

Proportionality, or log-log-linearity with slope 1, of exposure to the Normalizing Factor is statistically modeled by assuming a Slope equal to 1 in the linear model.

Table B45 (all MEs) and Tables B46 to B48 (by sprayer type) show the 95% confidence intervals for the slope calculated from the above linear model. Table B49 (all MEs) and Tables B50 to B52 (by sprayer type) show the 95% confidence intervals for the intercept calculated from the above linear model. The confidence intervals for the Handheld sprayers are very wide because they were based on only 3 MEs but have been included for completeness. A confidence interval for the slope that includes one but not zero supports the use of unit exposures. A confidence interval for the slope that includes zero but not one suggests that the exposure does not depend on the normalizing factor. A confidence interval for the slope that includes both zero and one suggests that either the basic statistical model is incorrect or there are not enough data to statistically infer whether the slope is zero or one. The table also shows the values of the threshold ai and the corresponding estimated exposure, to be described and discussed below. Threshold values were not computed for the censored data models.

There were several non-detects reported in the data for both dermal and inhalation exposure. The rows marked "Substitute mid value" calculate the slope estimates after replacing each non-detect residue by the midpoint of the lowest and highest possible value for that residue. The rows marked "Censored data MLE" calculate the slope estimates for the linear model using a censored maximum likelihood statistical method and the lower and upper bounds for each non-detect. This procedure was implemented using the LIFEREG SAS procedure.

Table B45. 95 percent confidence intervals for the slope of log exposure versus the log of the normalizing factor. All data. Excludes ME 17.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Long Dermal Hat (mg)	Substitute mid value	1.28	1.00	1.55	0.000646	0.339104
	Censored data MLE	1.28	1.04	1.52		
Long Short Dermal Hat (mg)	Substitute mid value	1.18	0.94	1.42	0.000604	0.508300
	Censored data MLE	1.18	0.97	1.38		
Hands Only (mg)	Substitute mid value	1.33	0.98	1.69	0.000662	0.347356
	Censored data MLE	1.33	1.03	1.64		

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Long Dermal No Hat (mg)	Substitute mid value	1.23	0.99	1.48	0.000630	0.377560
	Censored data MLE	1.23	1.02	1.45		
Long Short Dermal No Hat (mg)	Substitute mid value	1.16	0.93	1.40	0.000595	0.548606
	Censored data MLE	1.16	0.96	1.36		
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	0.71	0.18	1.24	0.000532	0.004414
	Censored data MLE	0.69	0.25	1.14		
Inhalation (total inhalable) Dose (mg)	Substitute mid value	1.14	0.61	1.68	0.000462	0.002955
	Censored data MLE	1.13	0.67	1.59		
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	1.14	0.61	1.68	0.000462	0.000369
	Censored data MLE	1.13	0.67	1.59		
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	0.59	–0.16	1.34	0.000523	0.000997
	Censored data MLE	0.59	–0.06	1.24		
Inhalation (respirable) Dose (mg)	Substitute mid value	1.02	0.24	1.81	0.000014	0.000022
	Censored data MLE	1.02	0.34	1.71		
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	1.02	0.24	1.81	0.000014	0.000022
	Censored data MLE	1.02	0.34	1.71		

Table B46. 95 percent confidence intervals for the slope of log exposure versus the log of the normalizing factor. Type Backpack. Excludes ME 17.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Long Dermal Hat (mg)	Substitute mid value	1.16	1.03	1.28	0.000999	0.743098
	Censored data MLE	1.16	1.08	1.24		
Long Short Dermal Hat (mg)	Substitute mid value	1.00	0.85	1.15	0.814333	908.283
	Censored data MLE	1.00	0.90	1.09		

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Hands Only (mg)	Substitute mid value	1.17	1.06	1.29	0.001009	0.713858
	Censored data MLE	1.17	1.10	1.25		
Long Dermal No Hat (mg)	Substitute mid value	1.13	0.97	1.29	0.000976	0.803633
	Censored data MLE	1.13	1.03	1.23		
Long Short Dermal No Hat (mg)	Substitute mid value	0.99	0.77	1.20	0.001183	1.414093
	Censored data MLE	0.99	0.85	1.12		
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	0.47	–0.64	1.57	0.000840	0.004457
	Censored data MLE	0.47	–0.24	1.18		
Inhalation (total inhalable) Dose (mg)	Substitute mid value	1.02	–0.01	2.05	0.000022	0.000072
	Censored data MLE	1.02	0.36	1.69		
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	1.02	–0.01	2.05	0.000022	0.000009
	Censored data MLE	1.02	0.36	1.69		
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	0.69	–0.90	2.28	0.001510	0.000811
	Censored data MLE	0.69	–0.34	1.71		
Inhalation (respirable) Dose (mg)	Substitute mid value	1.24	–0.30	2.78	0.000478	0.000182
	Censored data MLE	1.24	0.25	2.23		
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	1.24	–0.30	2.78	0.000478	0.000023
	Censored data MLE	1.24	0.25	2.23		

Table B47. 95 percent confidence intervals for the slope of log exposure versus the log of the normalizing factor. Type Cart.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Long Dermal Hat (mg)	Substitute mid value	1.03	0.73	1.34	0.00037	0.11748
	Censored data MLE	1.03	0.84	1.23		
Long Short Dermal Hat (mg)	Substitute mid value	1.10	0.75	1.45	0.00046	0.25113

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
	Censored data MLE	1.09	0.87	1.31		
Hands Only (mg)	Substitute mid value	1.00	0.70	1.31	0.00002	0.00604
	Censored data MLE	1.00	0.81	1.20		
Long Dermal No Hat (mg)	Substitute mid value	1.06	0.73	1.39	0.00042	0.16072
	Censored data MLE	1.06	0.85	1.27		
Long Short Dermal No Hat (mg)	Substitute mid value	1.11	0.75	1.47	0.00046	0.28617
	Censored data MLE	1.10	0.87	1.33		
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	0.66	0.36	0.96	0.00086	0.00394
	Censored data MLE	0.66	0.46	0.86		
Inhalation (total inhalable) Dose (mg)	Substitute mid value	1.14	0.91	1.37	0.00052	0.00485
	Censored data MLE	1.14	0.99	1.29		
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	1.14	0.91	1.37	0.00052	0.00061
	Censored data MLE	1.14	0.99	1.29		
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	0.69	0.17	1.22	0.00043	0.00116
	Censored data MLE	0.69	0.36	1.03		
Inhalation (respirable) Dose (mg)	Substitute mid value	1.17	0.69	1.65	0.00048	0.00104
	Censored data MLE	1.17	0.86	1.48		
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	1.17	0.69	1.65	0.00048	0.00013
	Censored data MLE	1.17	0.86	1.48		

Table B48. 95 percent confidence intervals for the slope of log exposure versus the log of the normalizing factor. Type Handheld.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Long Dermal Hat (mg)	Substitute mid value	1.78	−12.50	16.05	0.00018	0.08719
	Censored data MLE	1.78	0.50	3.05		

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper	Threshold	Exposure
Long Short Dermal Hat (mg)	Substitute mid value	1.61	−8.48	11.70	0.00021	0.18650
	Censored data MLE	1.61	0.71	2.50		
Hands Only (mg)	Substitute mid value	2.15	−17.74	22.05	0.00017	0.10742
	Censored data MLE	2.15	0.38	3.93		
Long Dermal No Hat (mg)	Substitute mid value	1.63	−10.65	13.90	0.00018	0.10403
	Censored data MLE	1.63	0.53	2.72		
Long Short Dermal No Hat (mg)	Substitute mid value	1.56	−8.26	11.38	0.00020	0.20621
	Censored data MLE	1.56	0.69	2.43		
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	1.11	−14.31	16.52	0.00000	0.00001
	Censored data MLE	1.03	−0.32	2.37		
Inhalation (total inhalable) Dose (mg)	Substitute mid value	1.74	−12.68	16.15	0.00017	0.00031
	Censored data MLE	1.64	0.43	2.85		
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	1.74	−12.68	16.15	0.00017	0.00004
	Censored data MLE	1.64	0.43	2.85		
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	−0.22	−0.33	−0.11	0.00016	0.00005
	Censored data MLE	−0.22	−0.23	−0.21		
Inhalation (respirable) Dose (mg)	Substitute mid value	0.41	−0.48	1.30	0.00020	0.00003
	Censored data MLE	0.41	0.33	0.49		
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	0.41	−0.48	1.30	0.00020	0.00000
	Censored data MLE	0.41	0.33	0.49		

Table B48. 95 percent confidence intervals for the intercept of the regression model for log exposure versus the log of the normalizing factor. All data. Excludes ME 17.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper
Long Dermal Hat (mg)	Substitute mid value	8.12	6.03	10.22
	Censored data MLE	8.12	6.31	9.94
Long Short Dermal Hat (mg)	Substitute mid value	7.95	6.16	9.74
	Censored data MLE	7.93	6.39	9.47
Hands Only (mg)	Substitute mid value	8.43	5.78	11.08
	Censored data MLE	8.43	6.14	10.72
Long Dermal No Hat (mg)	Substitute mid value	7.98	6.12	9.84
	Censored data MLE	7.98	6.37	9.59
Long Short Dermal No Hat (mg)	Substitute mid value	7.91	6.16	9.67
	Censored data MLE	7.90	6.39	9.41
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	−0.72	−4.70	3.27
	Censored data MLE	−0.83	−4.19	2.52
Inhalation (total inhalable) Dose (mg)	Substitute mid value	2.30	−1.77	6.37
	Censored data MLE	2.20	−1.26	5.66
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	0.22	−3.85	4.29
	Censored data MLE	0.12	−3.33	3.58
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	−3.76	−9.46	1.93
	Censored data MLE	−3.76	−8.68	1.15
Inhalation (respirable) Dose (mg)	Substitute mid value	−0.75	−6.71	5.22
	Censored data MLE	−0.75	−5.90	4.40
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	−2.83	−8.79	3.14
	Censored data MLE	−2.83	−7.98	2.32

Table B49. 95 percent confidence intervals for the intercept of the regression model for log exposure versus the log of the normalizing factor. Type Backpack. Excludes ME 17.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper
Long Dermal Hat (mg)	Substitute mid value	7.70	6.82	8.57
	Censored data MLE	7.70	7.13	8.26
Long Short Dermal Hat (mg)	Substitute mid value	7.01	5.96	8.05
	Censored data MLE	7.01	6.33	7.68
Hands Only (mg)	Substitute mid value	7.75	6.93	8.58
	Censored data MLE	7.75	7.22	8.29
Long Dermal No Hat (mg)	Substitute mid value	7.59	6.47	8.72
	Censored data MLE	7.59	6.87	8.32
Long Short Dermal No Hat (mg)	Substitute mid value	6.97	5.47	8.46
	Censored data MLE	6.97	6.00	7.93
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	−2.68	−10.47	5.12
	Censored data MLE	−2.68	−7.70	2.35
Inhalation (total inhalable) Dose (mg)	Substitute mid value	0.93	−6.33	8.19
	Censored data MLE	0.93	−3.75	5.61
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	−1.15	−8.41	6.11
	Censored data MLE	−1.15	−5.83	3.53
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	−3.87	−15.09	7.36
	Censored data MLE	−3.87	−11.10	3.37
Inhalation (respirable) Dose (mg)	Substitute mid value	−0.26	−11.12	10.60
	Censored data MLE	−0.26	−7.26	6.74
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	−2.34	−13.20	8.52
	Censored data MLE	−2.34	−9.34	4.66

Table B50. 95 percent confidence intervals for the intercept of the regression model for log exposure versus the log of the normalizing factor. Type Cart.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper
Long Dermal Hat (mg)	Substitute mid value	5.96	3.64	8.28
	Censored data MLE	5.97	4.47	7.46
Long Short Dermal Hat (mg)	Substitute mid value	6.98	4.27	9.68
	Censored data MLE	6.92	5.22	8.62
Hands Only (mg)	Substitute mid value	5.65	3.31	8.00
	Censored data MLE	5.65	4.14	7.16
Long Dermal No Hat (mg)	Substitute mid value	6.34	3.82	8.85
	Censored data MLE	6.34	4.71	7.96
Long Short Dermal No Hat (mg)	Substitute mid value	7.15	4.37	9.93
	Censored data MLE	7.11	5.35	8.87
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	−0.26	−2.60	2.08
	Censored data MLE	−0.26	−1.77	1.25
Inhalation (total inhalable) Dose (mg)	Substitute mid value	3.24	1.45	5.02
	Censored data MLE	3.24	2.09	4.39
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	1.16	-0.63	2.94
	Censored data MLE	1.16	0.01	2.31
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	−1.57	−5.60	2.46
	Censored data MLE	−1.57	−4.17	1.02
Inhalation (respirable) Dose (mg)	Substitute mid value	1.93	−1.76	5.62
	Censored data MLE	1.93	−0.45	4.30
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	−0.15	−3.84	3.54

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper
	Censored data MLE	−0.15	−2.53	2.22

Table B52. 95 percent confidence intervals for the intercept of the regression model for log exposure versus the log of the normalizing factor. Type Handheld.

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper
Long Dermal Hat (mg)	Substitute mid value	12.05	−07.46	131.55
	Censored data MLE	12.05	1.41	22.69
Long Short Dermal Hat (mg)	Substitute mid value	11.54	−72.92	96.00
	Censored data MLE	11.54	4.02	19.06
Hands Only (mg)	Substitute mid value	14.82	−151.69	181.33
	Censored data MLE	14.82	−0.01	29.65
Long Dermal No Hat (mg)	Substitute mid value	11.15	−91.58	113.87
	Censored data MLE	11.15	2.00	20.30
Long Short Dermal No Hat (mg)	Substitute mid value	11.30	−70.87	93.47
	Censored data MLE	11.30	3.98	18.62
Inhalation (total inhalable) Conc (mg/m^3)	Substitute mid value	1.36	−127.70	130.41
	Censored data MLE	0.76	−10.39	11.92
Inhalation (total inhalable) Dose (mg)	Substitute mid value	6.15	−114.54	126.84
	Censored data MLE	5.43	−4.62	15.47
Inhalation (total inhalable) 8hr TWA (mg/m^3)	Substitute mid value	4.07	−116.62	124.76
	Censored data MLE	3.35	−6.70	13.40
Inhalation (respirable) Conc (mg/m^3)	Substitute mid value	−11.87	−12.79	−10.95
	Censored data MLE	−11.87	−11.95	−11.79
Inhalation (respirable) Dose (mg)	Substitute mid value	−7.08	−14.53	0.37
	Censored data MLE	−7.08	−7.74	−6.41

Exposure Route	Treatment of Non-detects	Estimate	Lower	Upper
Inhalation respirable) 8hr TWA (mg/m^3)	Substitute mid value	−9.16	−16.61	−1.70
	Censored data MLE	−9.16	−9.82	−8.49

For all 17 MEs, the slopes ranged from 0.59 to 1.38, and the confidence intervals for the slope excluded 0 and included 1, except for the censored data MLE for Long Dermal Hat, Hands Only, and Long Dermal No Hat that excluded 1 (barely) and excluded 0, and for the inhalation (respirable) concentration where the interval included both 0 and 1. Thus in all but five cases, the assumption of log-log-linearity with slope 1 was supported.

For the Backpack sprayer, the slopes ranged from 0.69 to 1.24 and the confidence intervals included 1 except for Long Dermal Hat, Hands Only, and Long Dermal No Hat (censored data MLE only) where the lower bound was a little larger than 1. The confidence intervals excluded zero for dermal exposures and 4 of the 12 cases for inhalation exposures. Thus, the assumption of log-log-linearity was generally either supported or not rejected.

For the Cart sprayer, the slopes ranged from 0.69 to 1.17 and in all cases but one the confidence intervals included 1 but not 0, supporting the assumption of log-log-linearity. As an exception, for inhalation (total inhalable) concentration the confidence interval excluded both 0 and 1, supporting neither proportionality nor independence.

For the Handheld sprayer the small sample size of only 3 MEs led to a mixture of results, with slopes that ranged from −0.22 (for the inhalation (total inhalable) concentration) to 1.74 and confidence intervals that sometimes supported and sometimes rejected the proportionality or independence assumptions.

Quantile plots for residuals

To evaluate the fitted linear regression models we created quantile-quantile[1] plots of the studentized residuals for each fitted model. To avoid a voluminous report, these plots are only presented for the models fitted to all the data. These quantile-quantile plots are for the Linear Model. Quantile-quantile plots for the Lognormal Model were presented in the even-numbered Figures B1 to B22 above, since in that case both the predicted values and the standard errors are the same for every ME. The quantile-quantile plots of the studentized residuals for the models fitted to all the data for each exposure route are shown below in Figures B23 to B33.

[1] These quantile plots compare the distribution of the studentized residuals to a standard normal distribution. Some authors prefer a more exact approach where the distribution of the studentized residuals is compared to a t distribution. That method is not easily available using current SAS software.

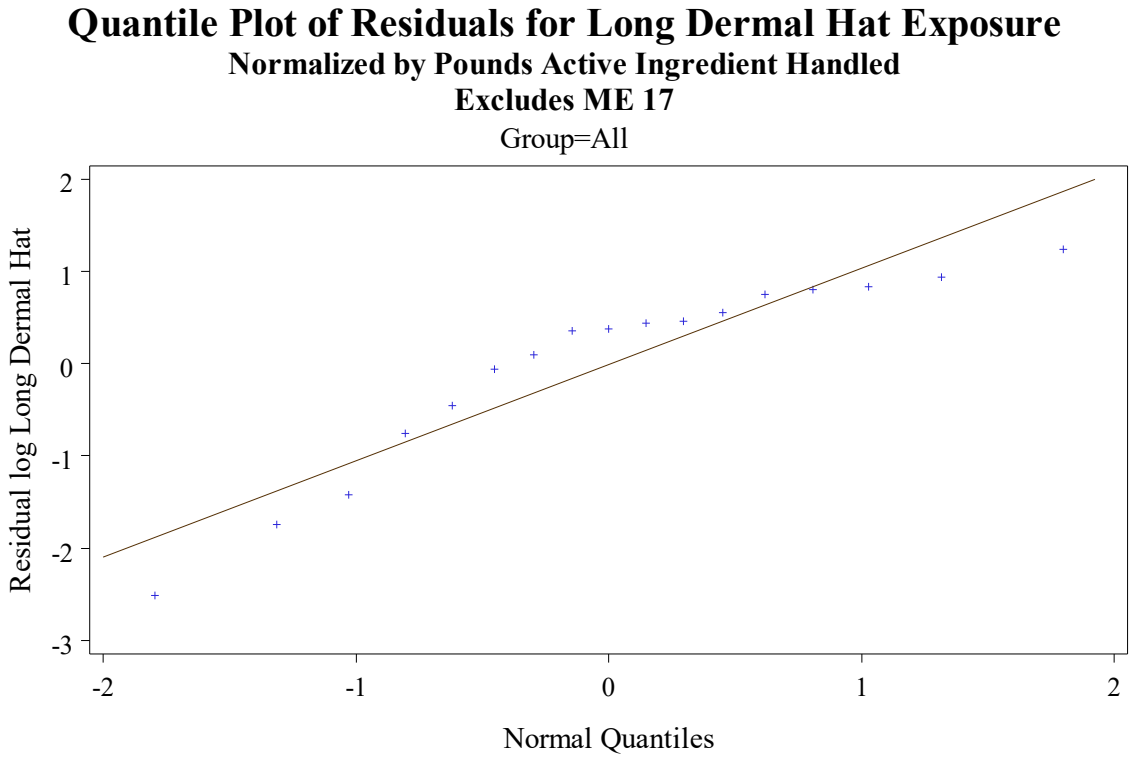


Figure B23. Quantile plot of residuals from linear model for Long Dermal Hat. Excludes ME 17.

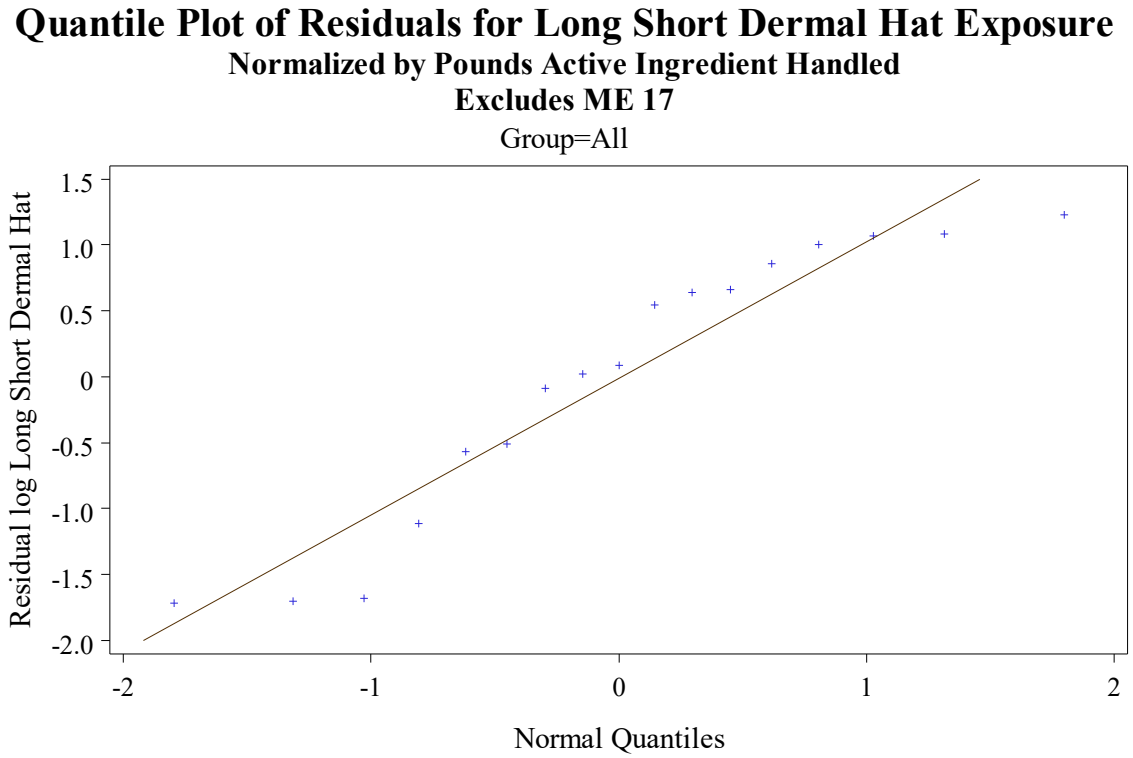


Figure B24. Quantile plot of residuals from linear model for Long Short Dermal Hat. Excludes ME 17.

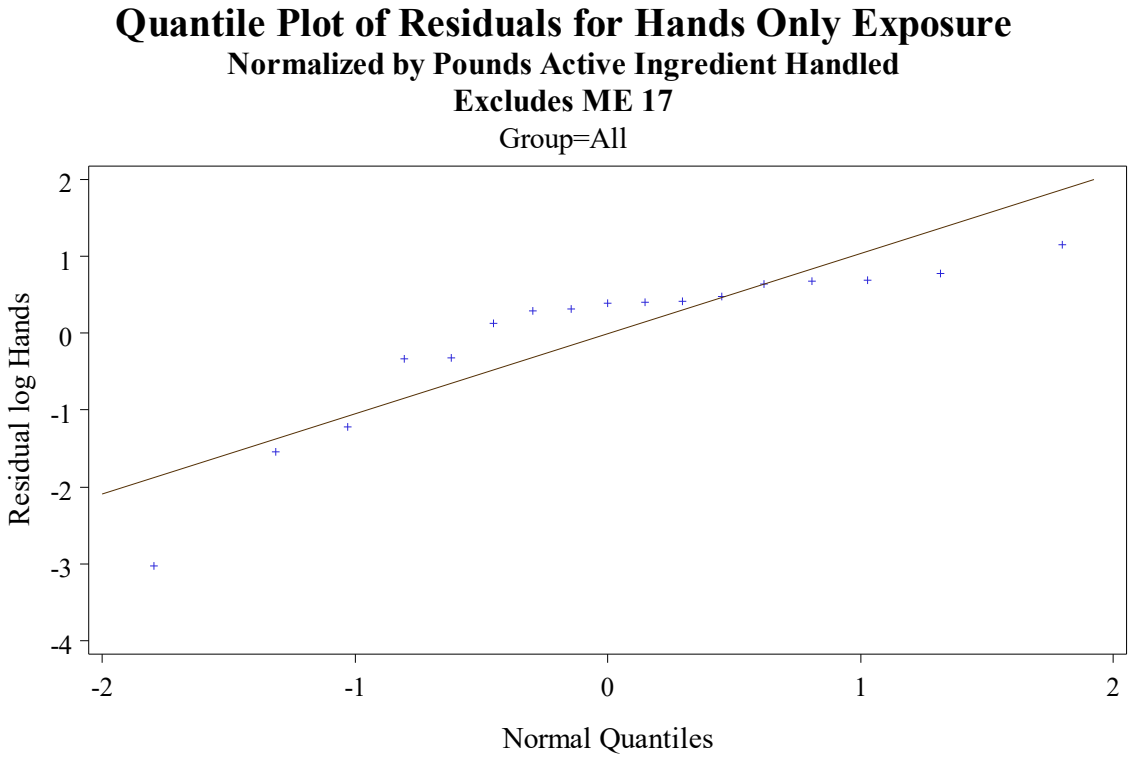


Figure B25. Quantile plot of residuals from linear model for Hands Only. Excludes ME 17.

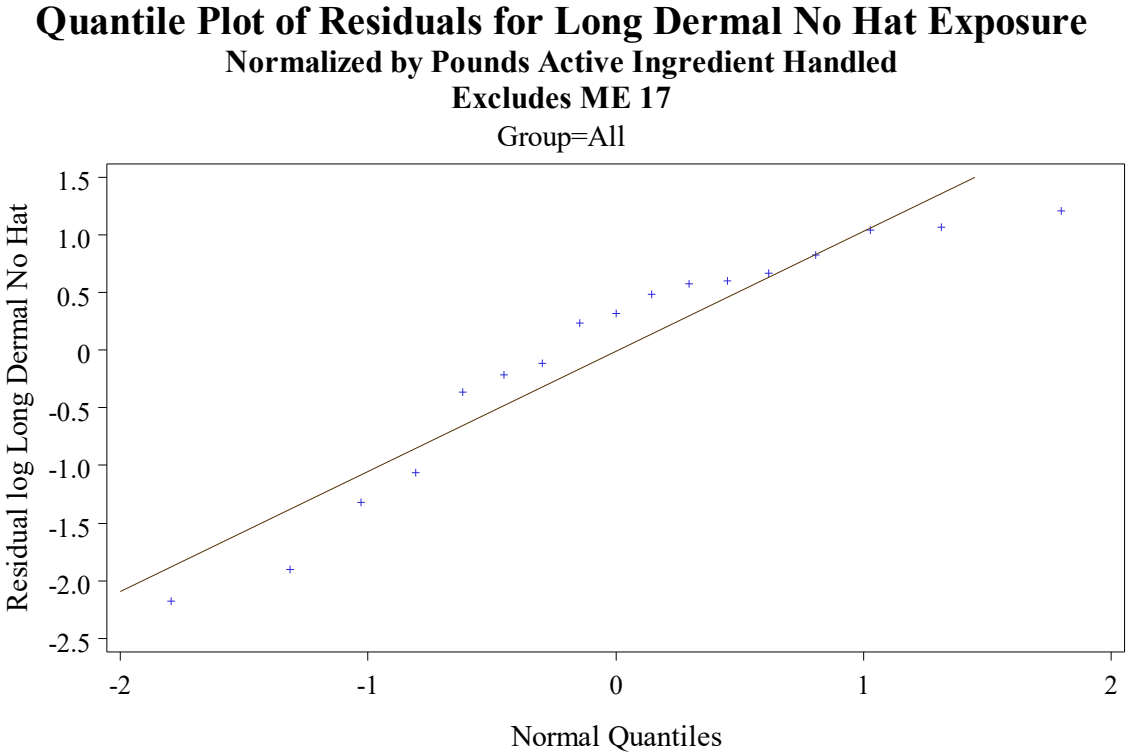


Figure B26. Quantile plot of residuals from linear model for Long Dermal No Hat. Excludes ME 17.

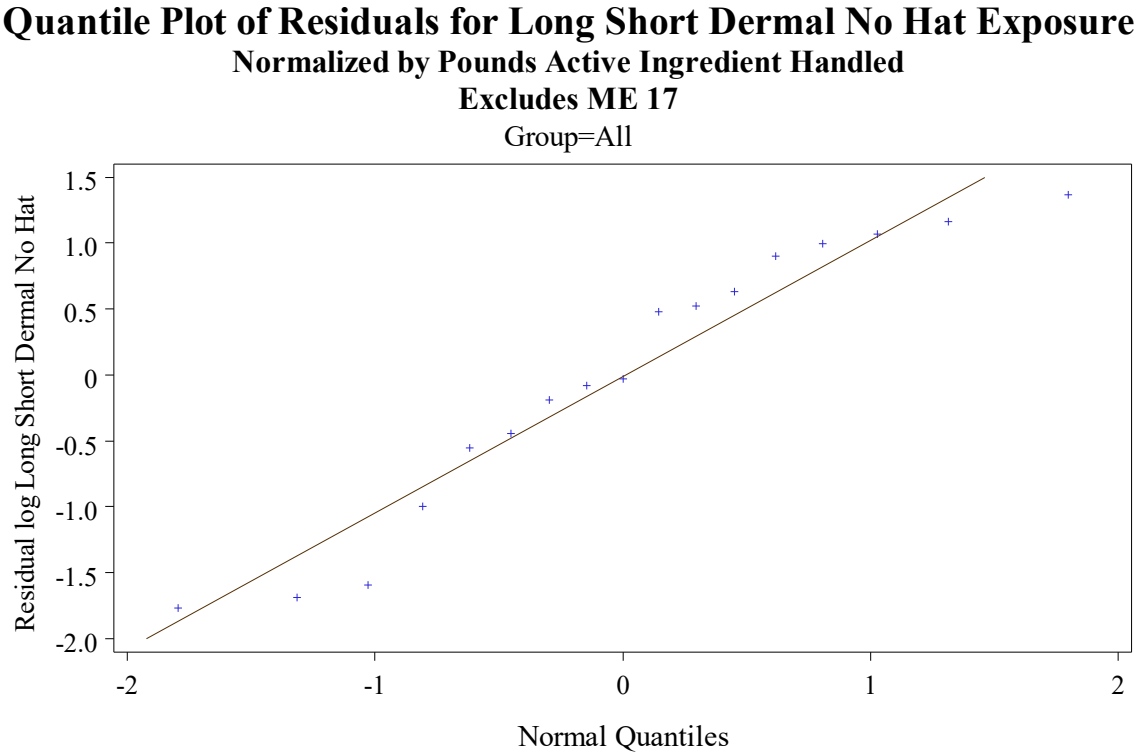


Figure B27. Quantile plot of residuals from linear model for Long Short Dermal No Hat. Excludes ME 17.

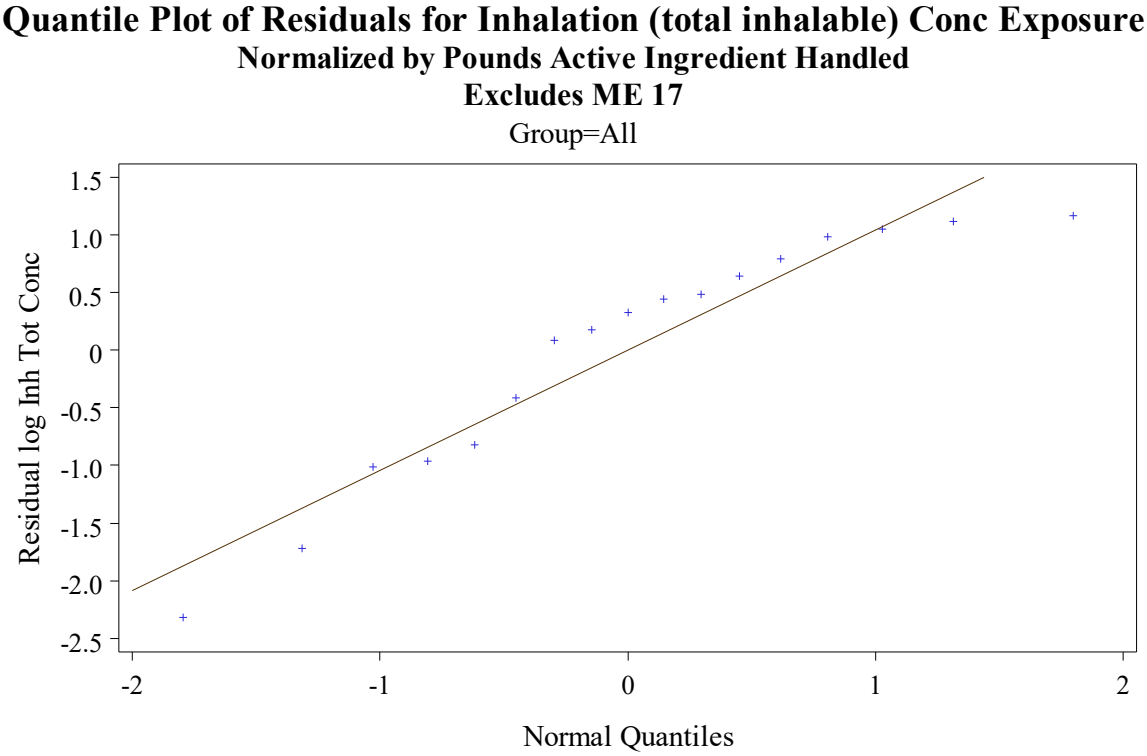


Figure B28. Quantile plot of residuals from linear model for Inhalation (total inhalable) Conc. Excludes ME 17.

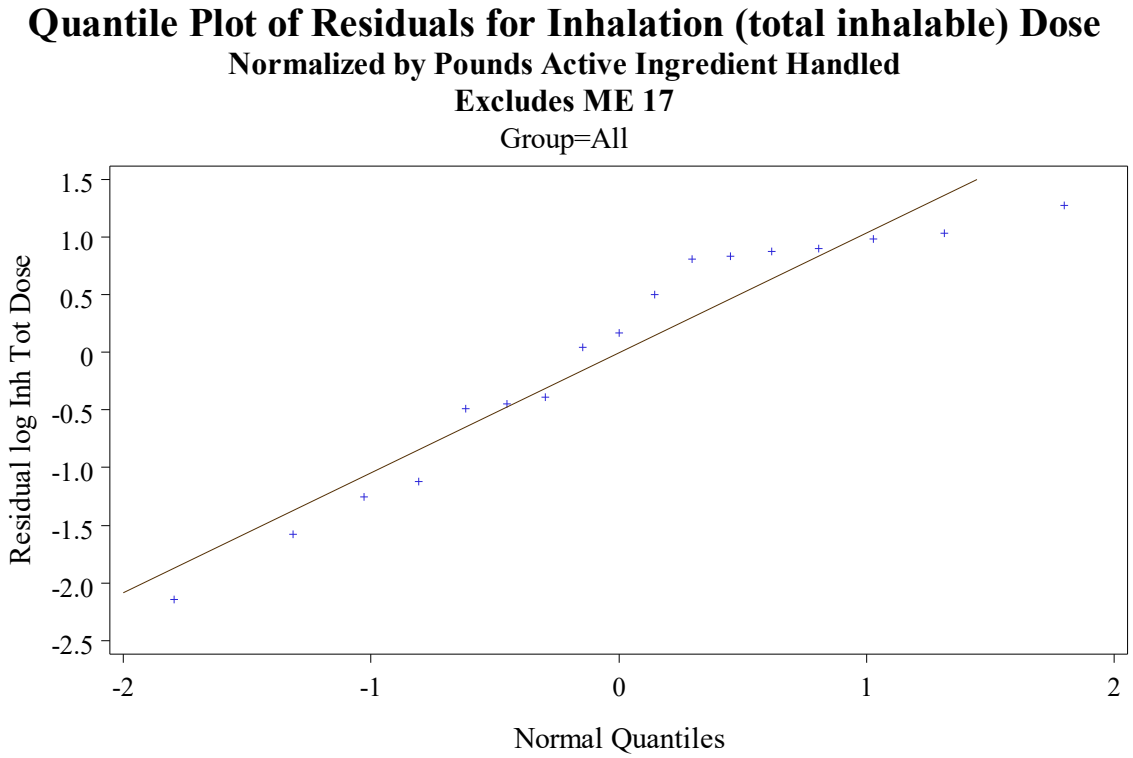


Figure B29. Quantile plot of residuals from linear model for Inhalation (total inhalable) Dose. Excludes ME 17.

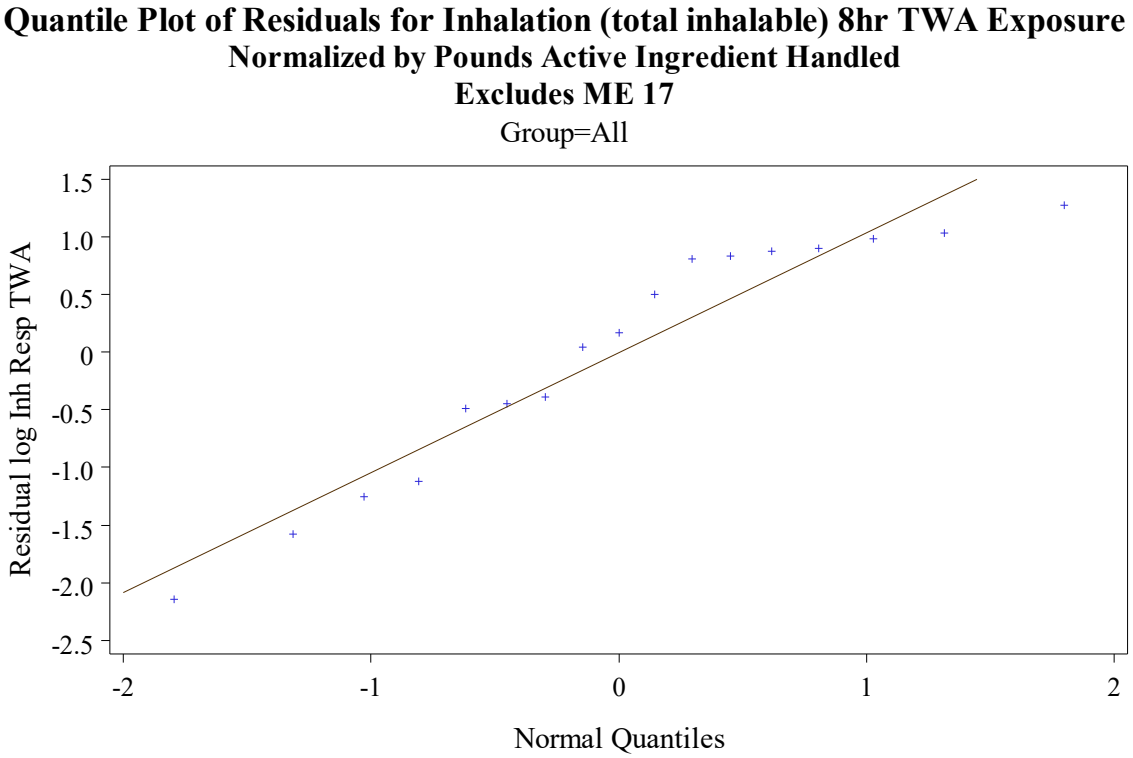


Figure B30. Quantile plot of residuals from linear model for Inhalation (total inhalable) Time-Weighted Average Conc. Excludes ME 17.

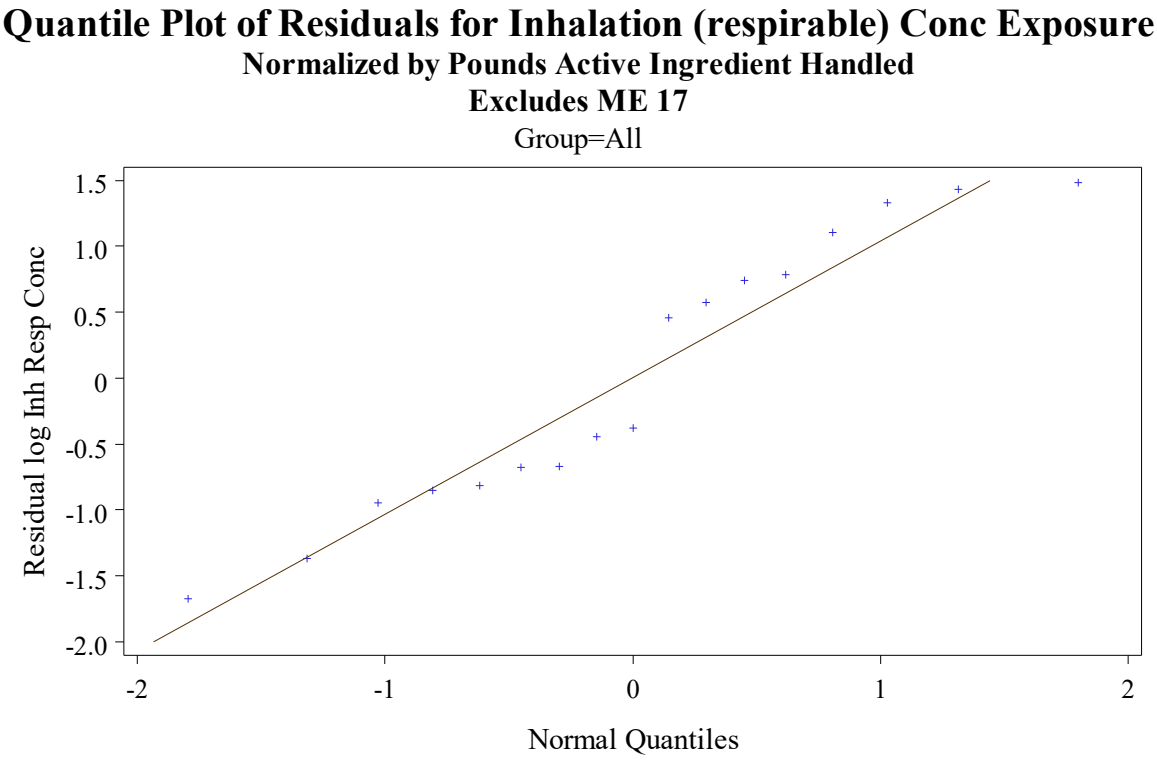


Figure B31. Quantile plot of residuals from linear model for Inhalation (respirable) Conc. Excludes ME 17.

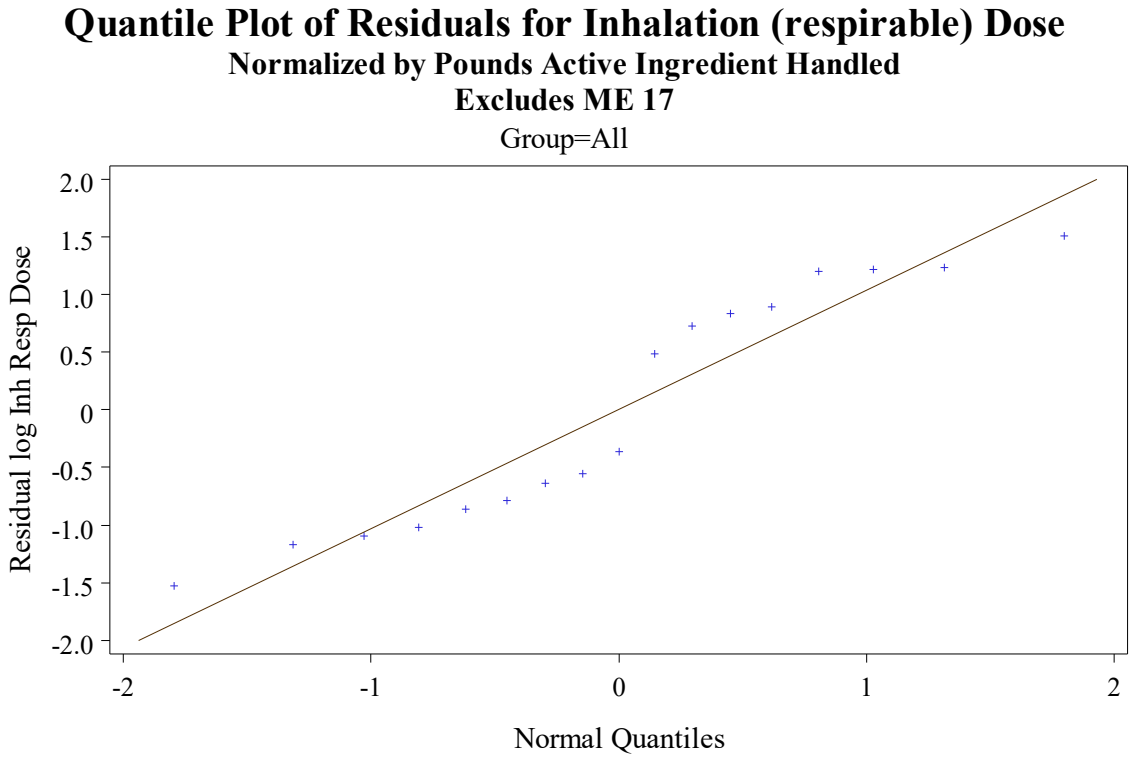


Figure B32. Quantile plot of residuals from linear model for Inhalation (respirable) Dose. Excludes ME 17.

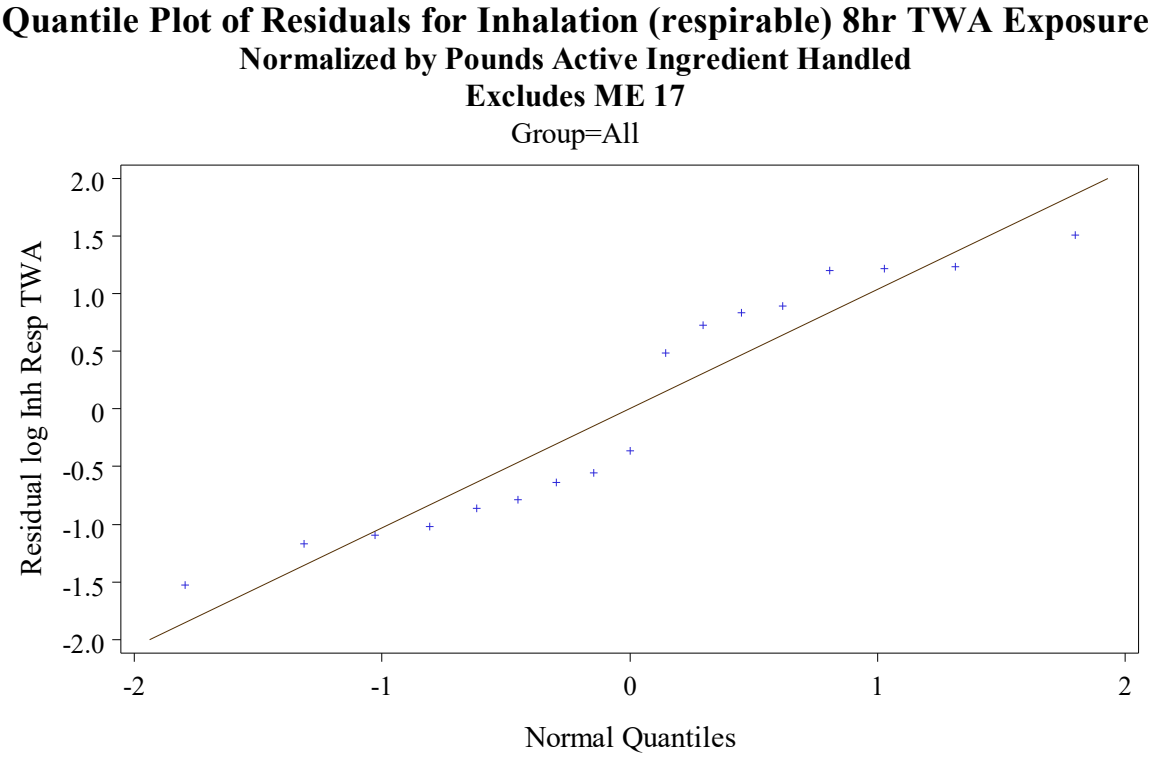
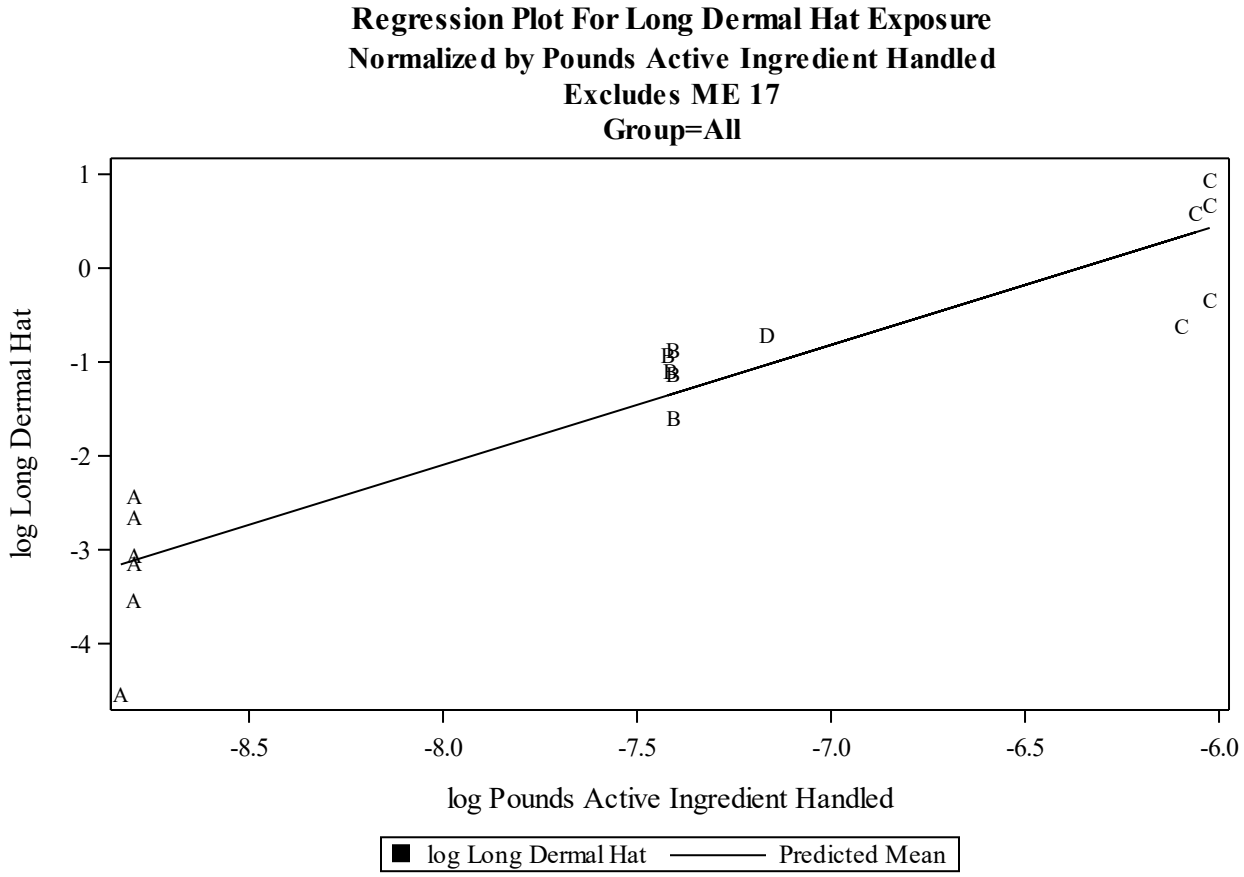


Figure B33. Quantile plot of residuals from linear model for Inhalation (respirable) Time-Weighted Average Conc. Excludes ME 17.

The quantile-quantile plots of the studentized residuals for dermal and inhalation exposure are all reasonably close to the straight line with studentized residuals between −3 and +3, with the exception of Hands Only that had a low exposure value for ME 1 with a studentized residual of −3.03.

Regression plots

The lognormal linear regression results for all the exposure routes are shown below in Figures B34 to B66 using the mid value substitution method for non-detect values. In this case we present the results for the Backpack and Cart sprayer type groups as well as the models fitted to all the data. The data points are labeled to show the targeted volumes and concentrations for the four volume / concentration groups. (As an exception, we show the volume for ME14 in group D as (approximately) 0.75 gallons although the initial target volume for that ME was 2 gallons). For the Cart sprayer type, the plot subtitle says “Excludes ME 17” although ME 17 did not use the Cart sprayer.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B34. Regression plot for Long Dermal Hat Exposure (mg). Group = All. Excludes ME 17.

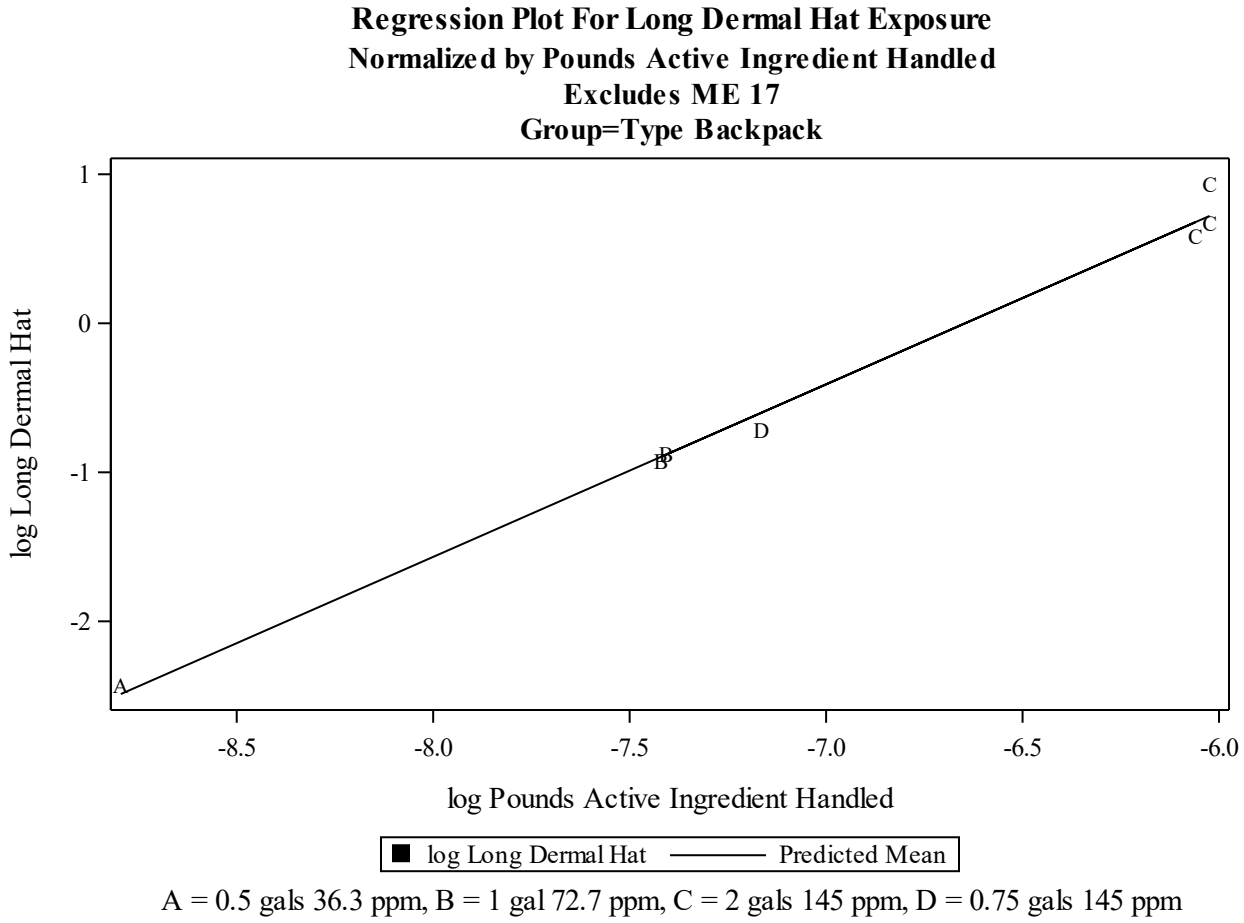
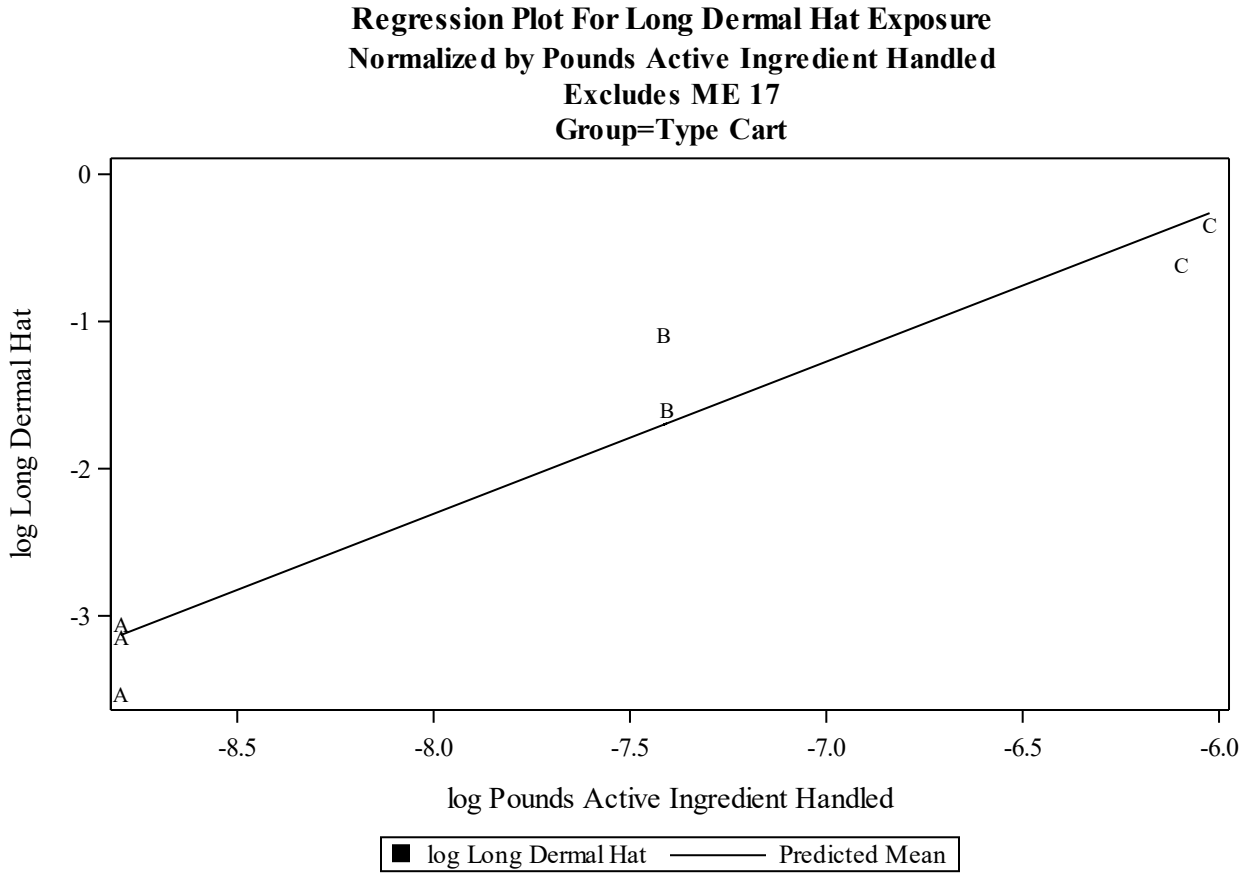


Figure B35. Regression plot for Long Dermal Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B36. Regression plot for Long Dermal Hat Exposure (mg). Group = Type Cart.

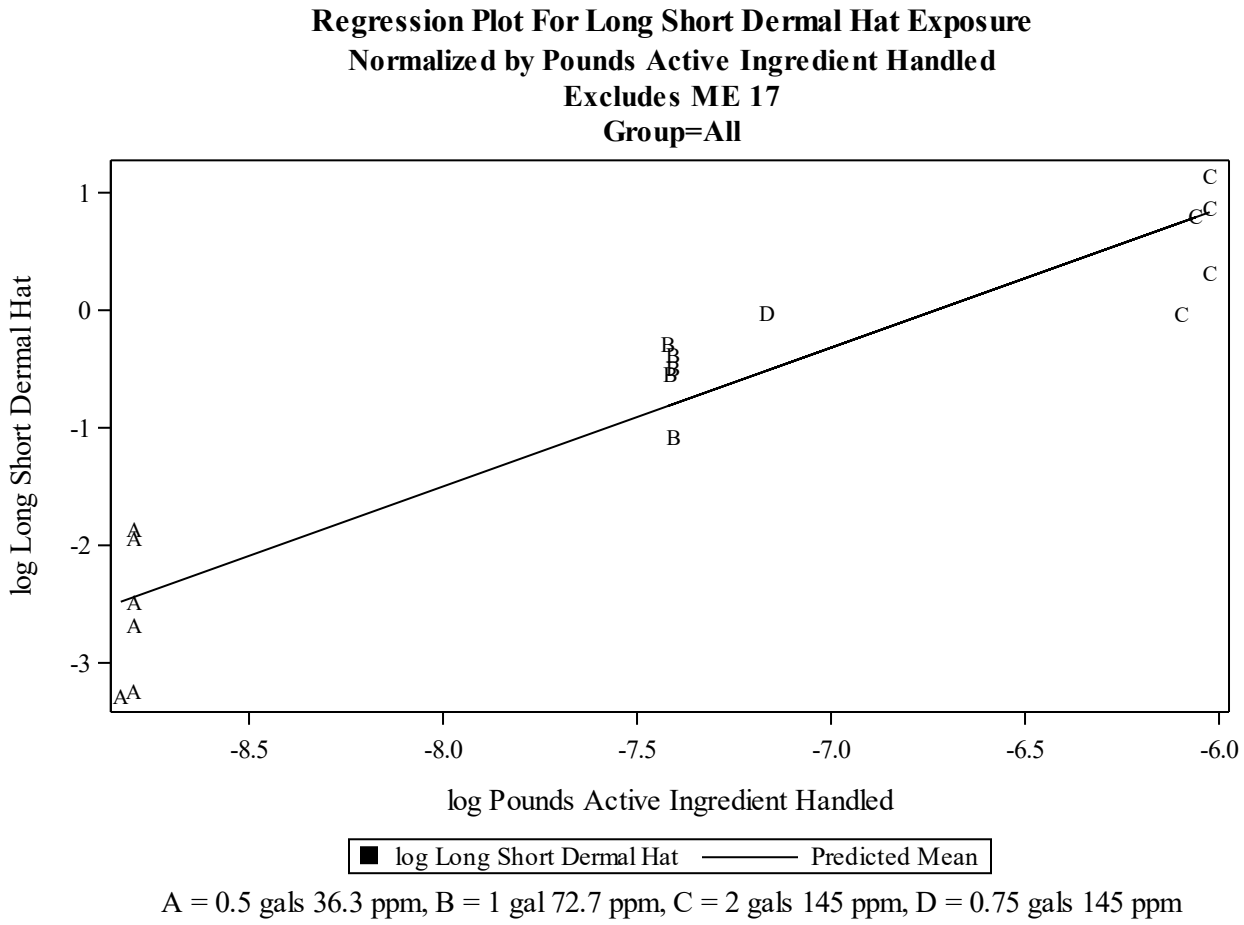


Figure B37. Regression plot for Long Short Dermal Hat Exposure (mg). Group = All. Excludes ME 17.

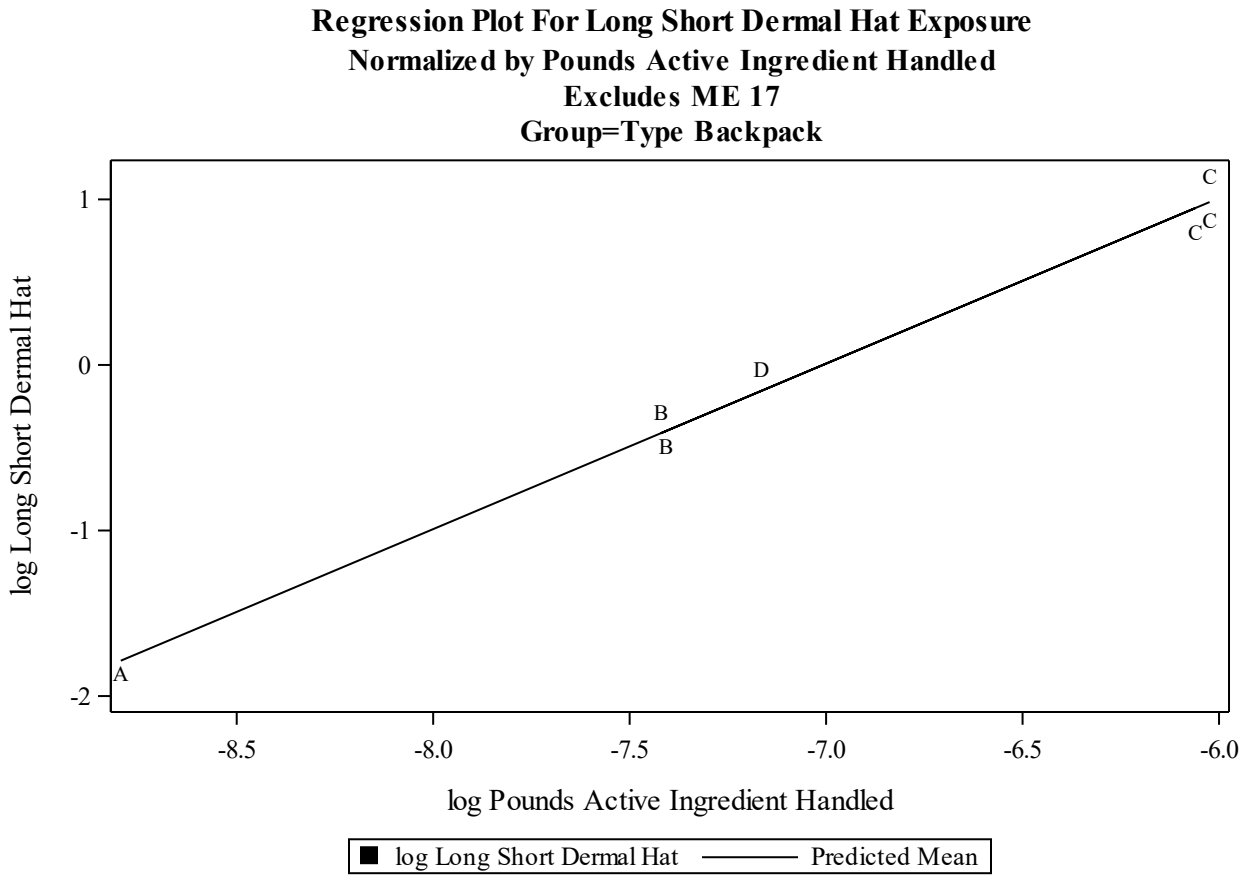
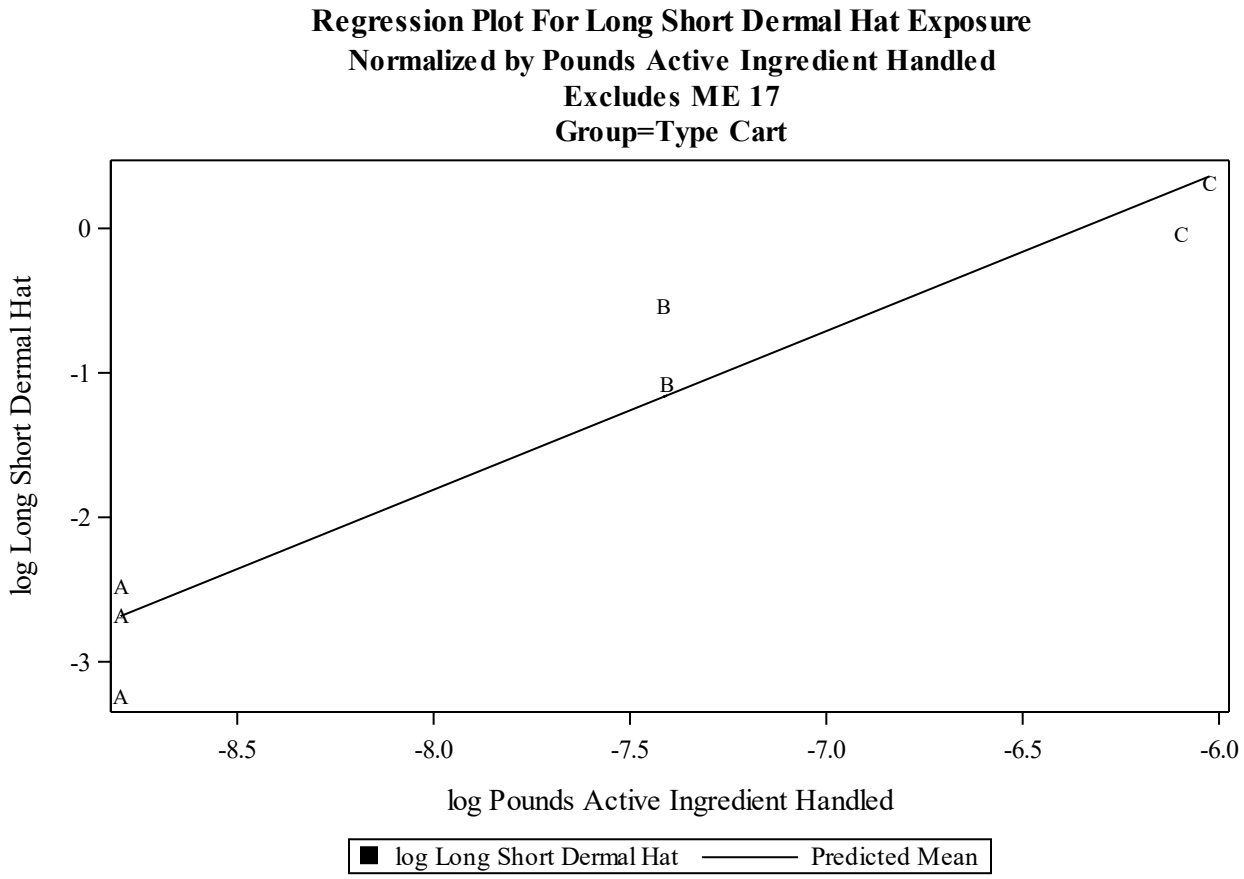
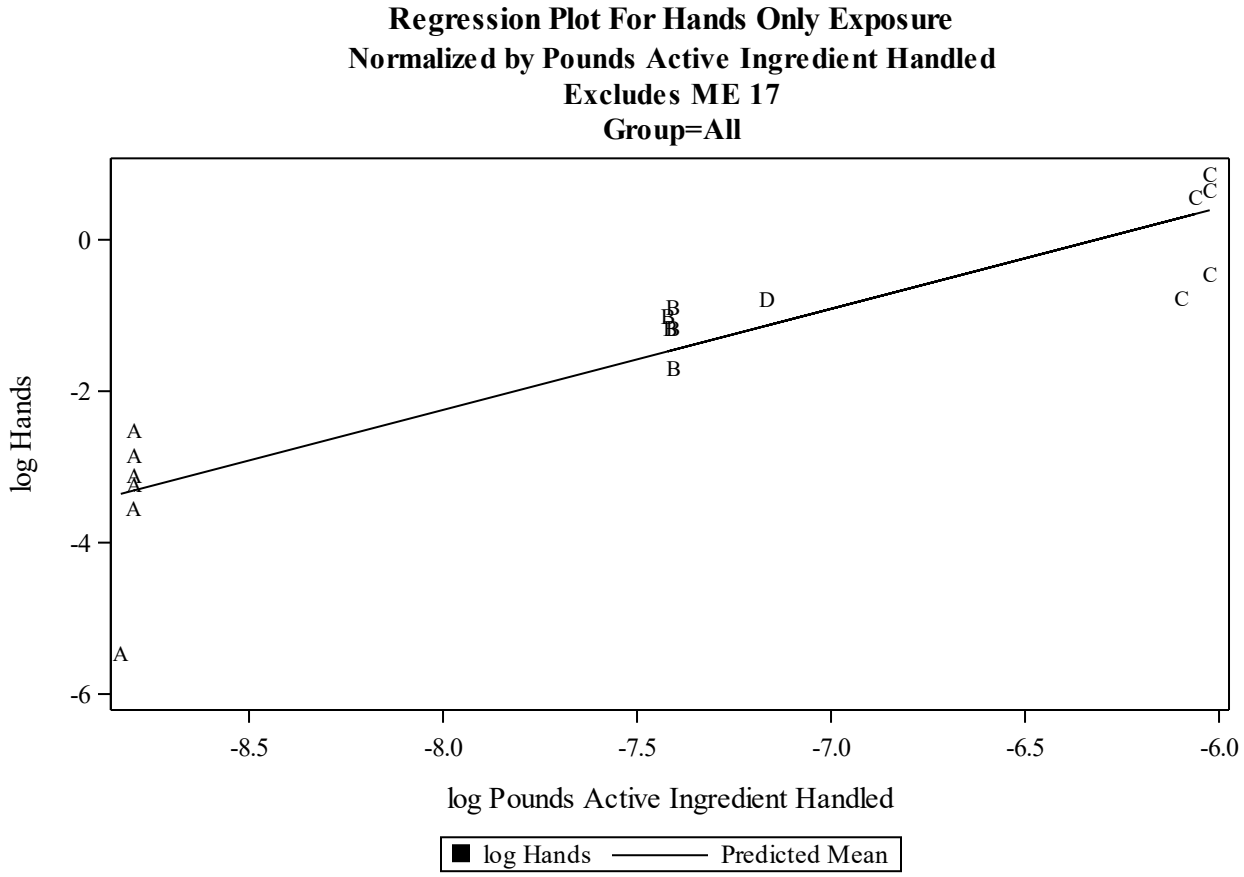


Figure B38. Regression plot for Long Short Dermal Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



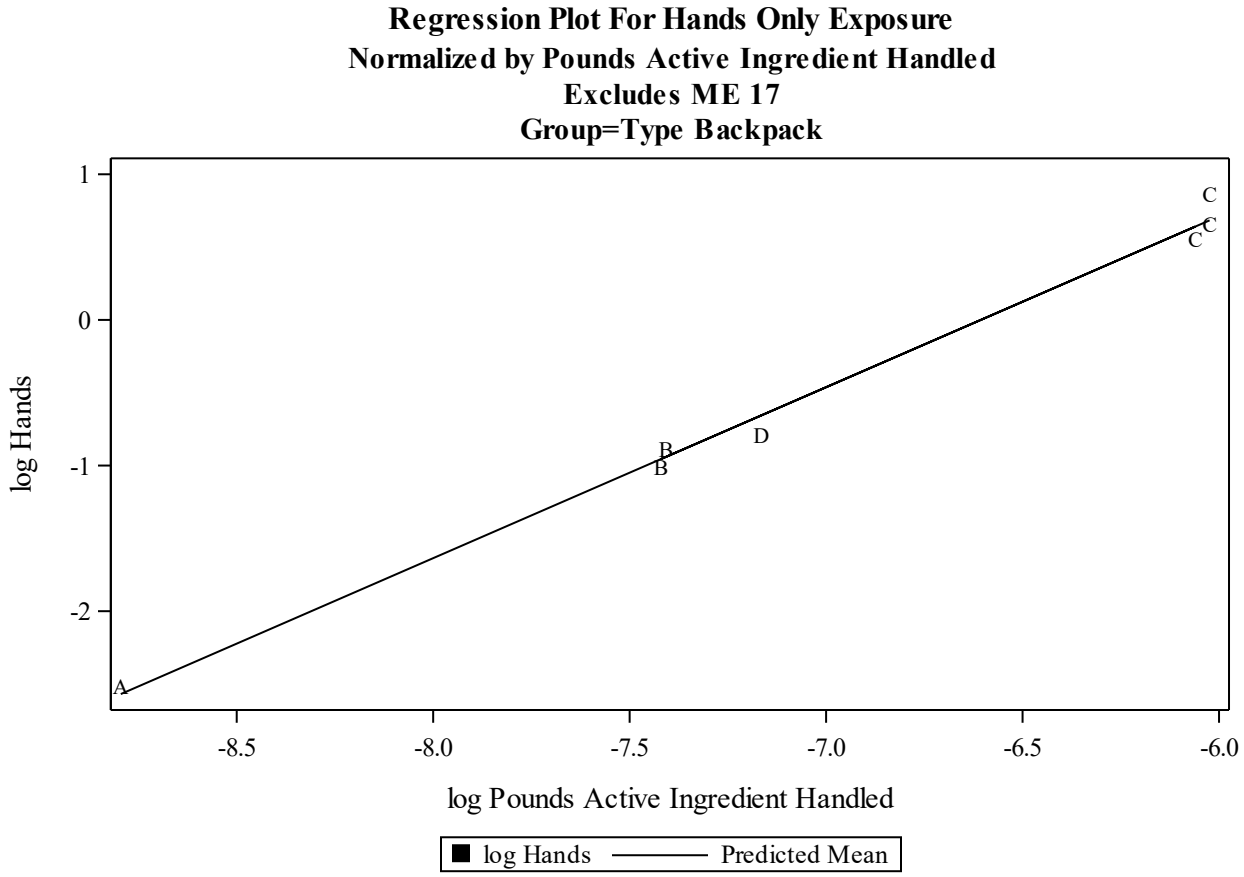
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B39. Regression plot for Long Short Dermal Hat Exposure (mg). Group = Type Cart.



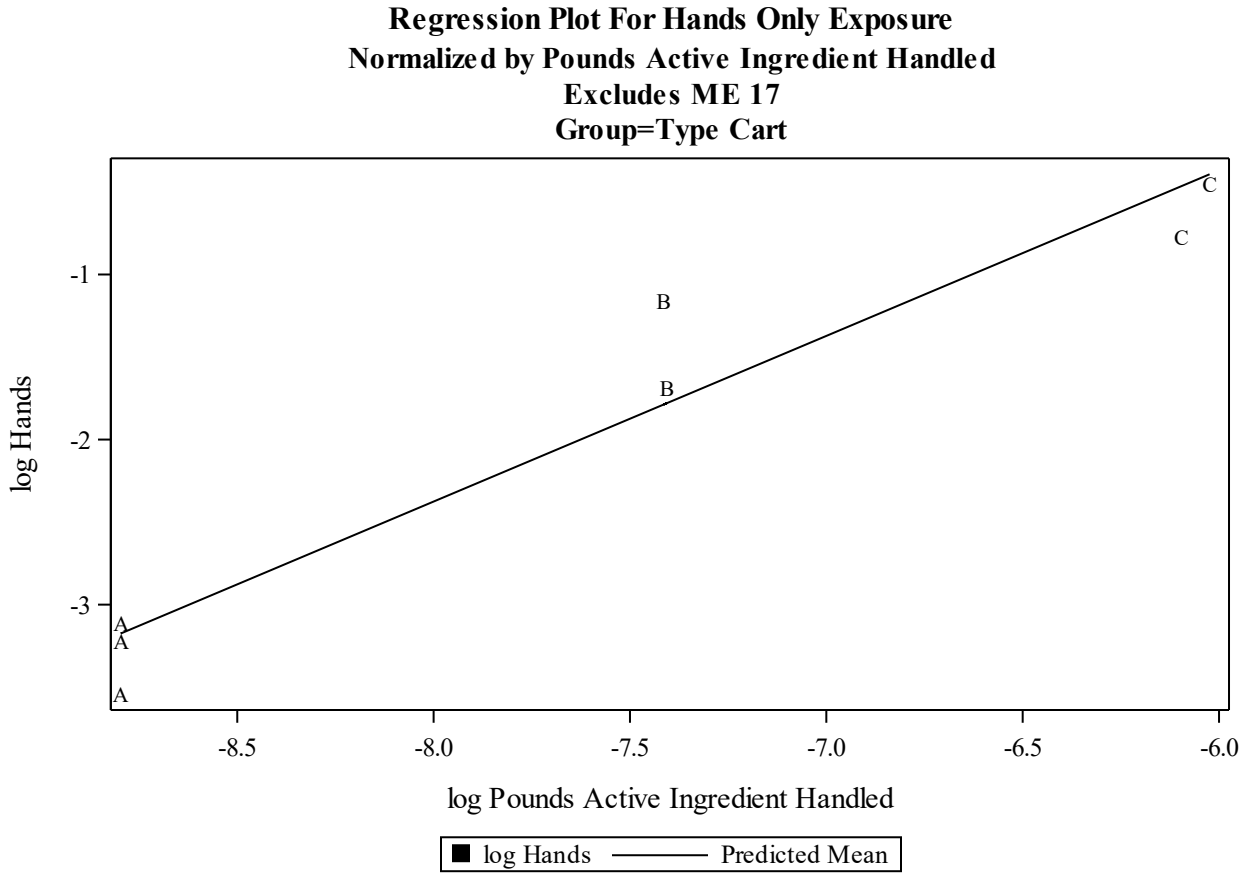
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B40. Regression plot for Hands Only Exposure (mg). Group = All. Excludes ME 17.



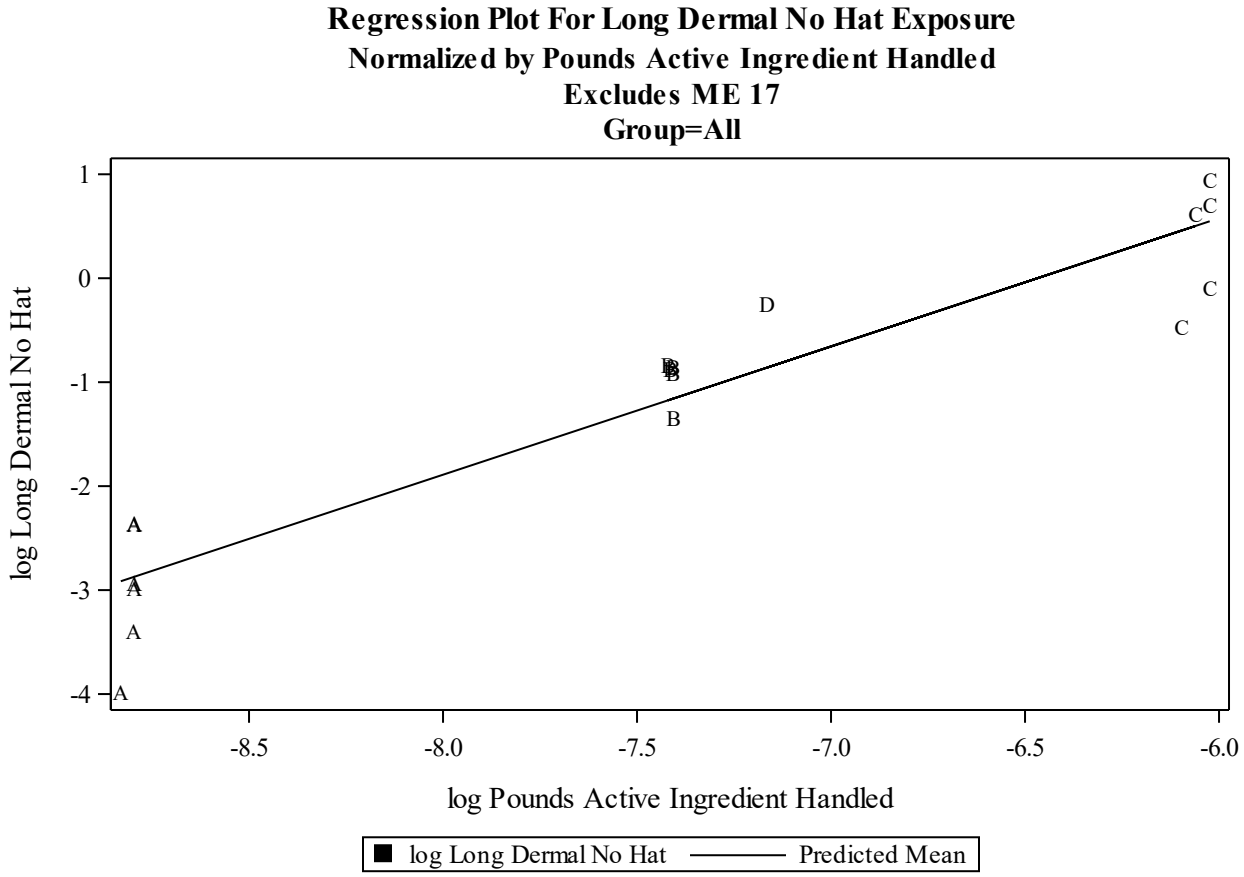
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B41. Regression plot for Hands Only Exposure (mg). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B42. Regression plot for Hands Only Exposure (mg). Group = Type Cart.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B43. Regression plot for Long Dermal No Hat Exposure (mg). Group = All. Excludes ME 17.

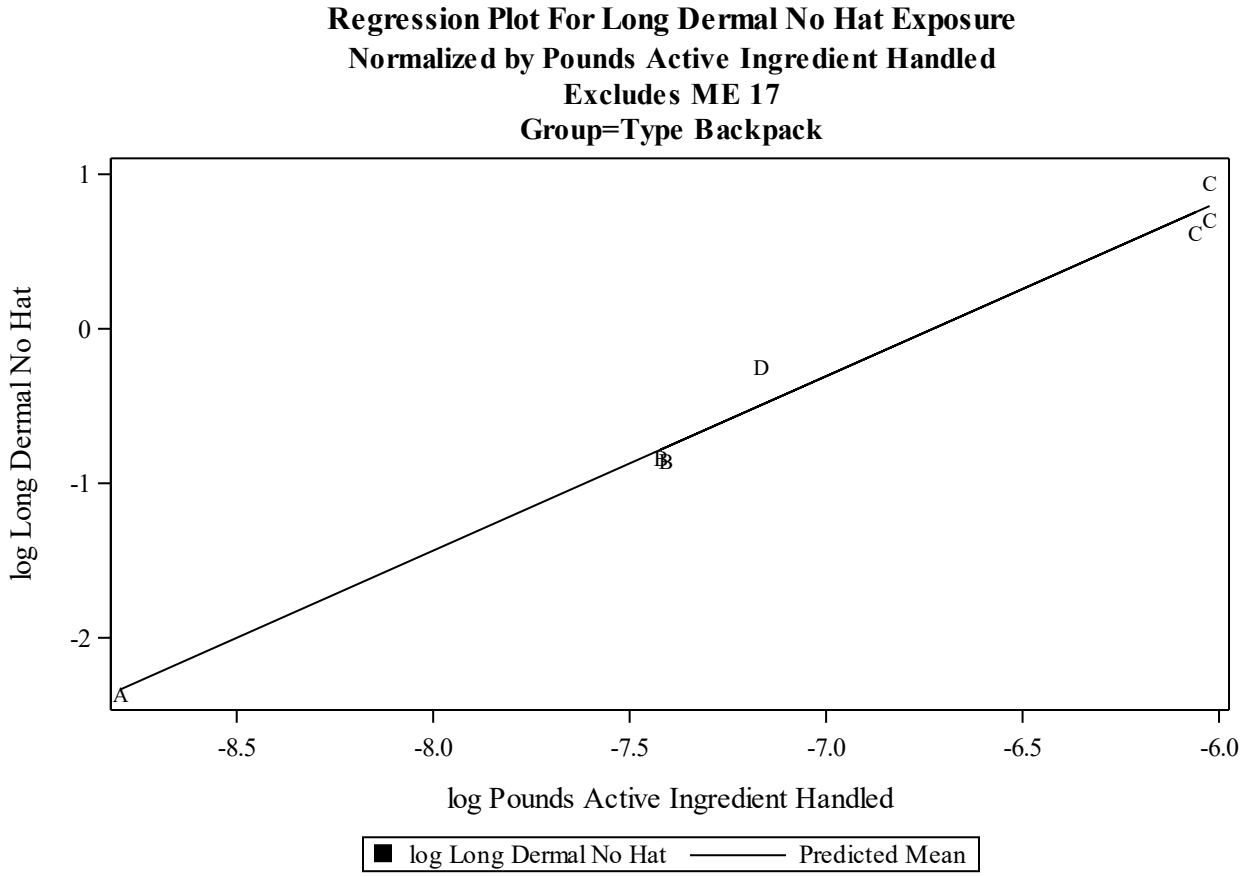
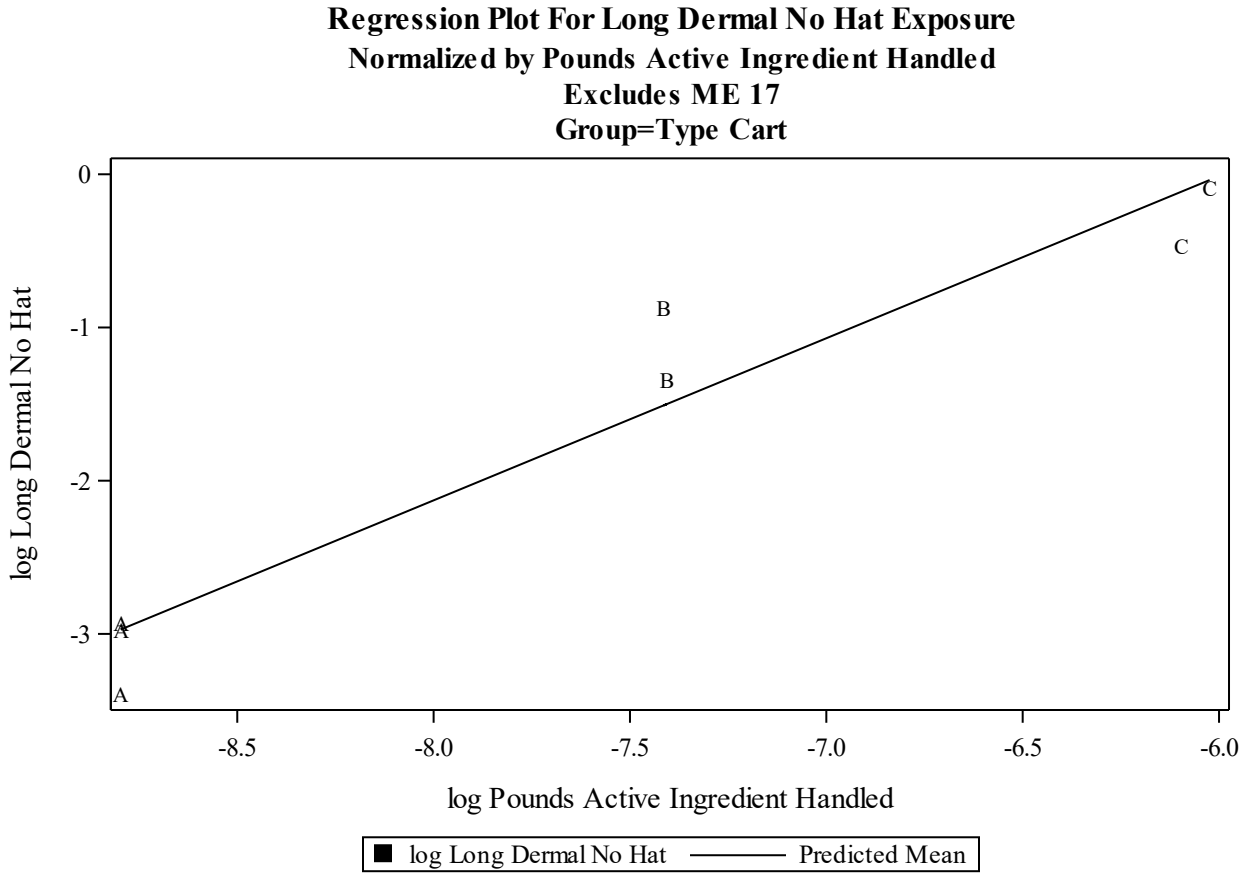


Figure B44. Regression plot for Long Dermal No Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B45. Regression plot for Long Dermal No Hat Exposure (mg). Group = Type Cart.

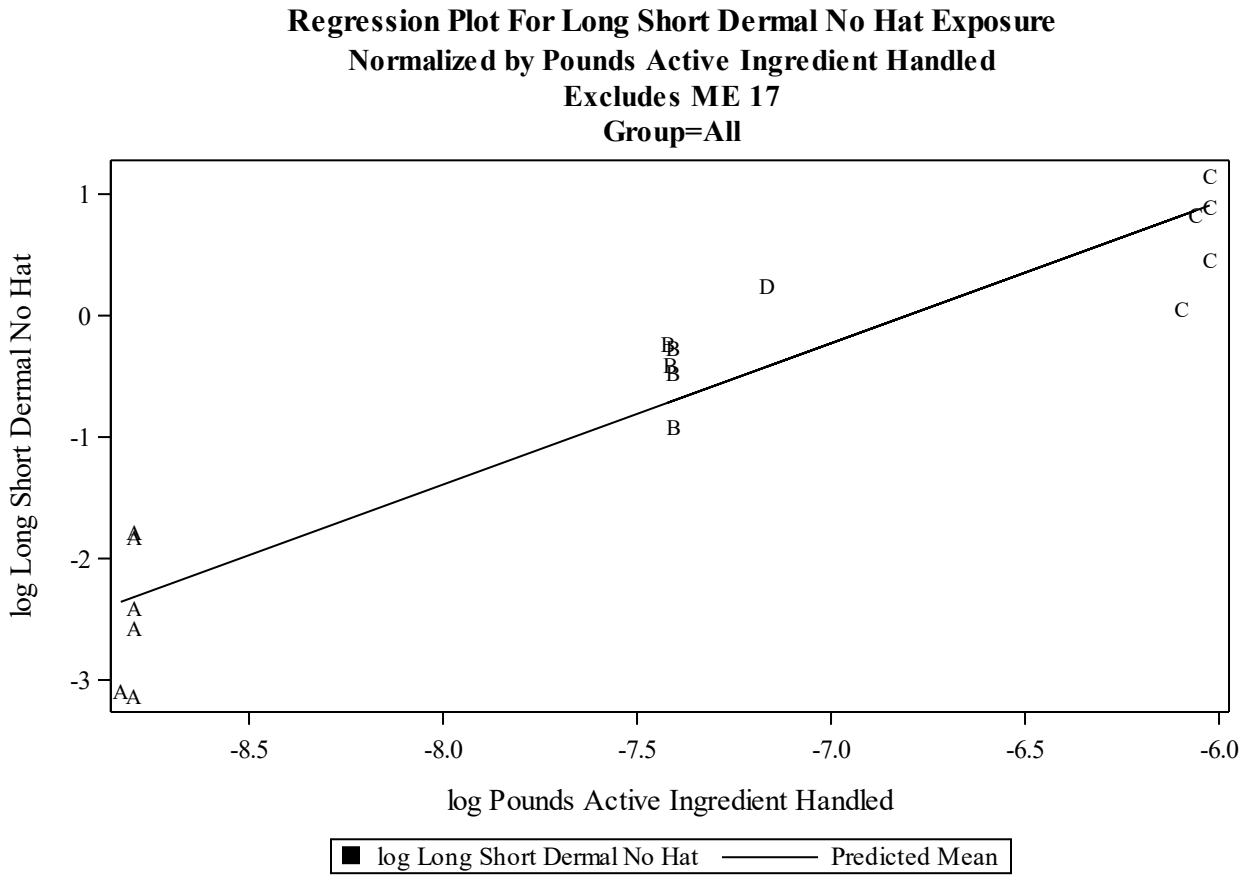


Figure B46. Regression plot for Long Short Dermal No Hat Exposure (mg). Group = All. Excludes ME 17.

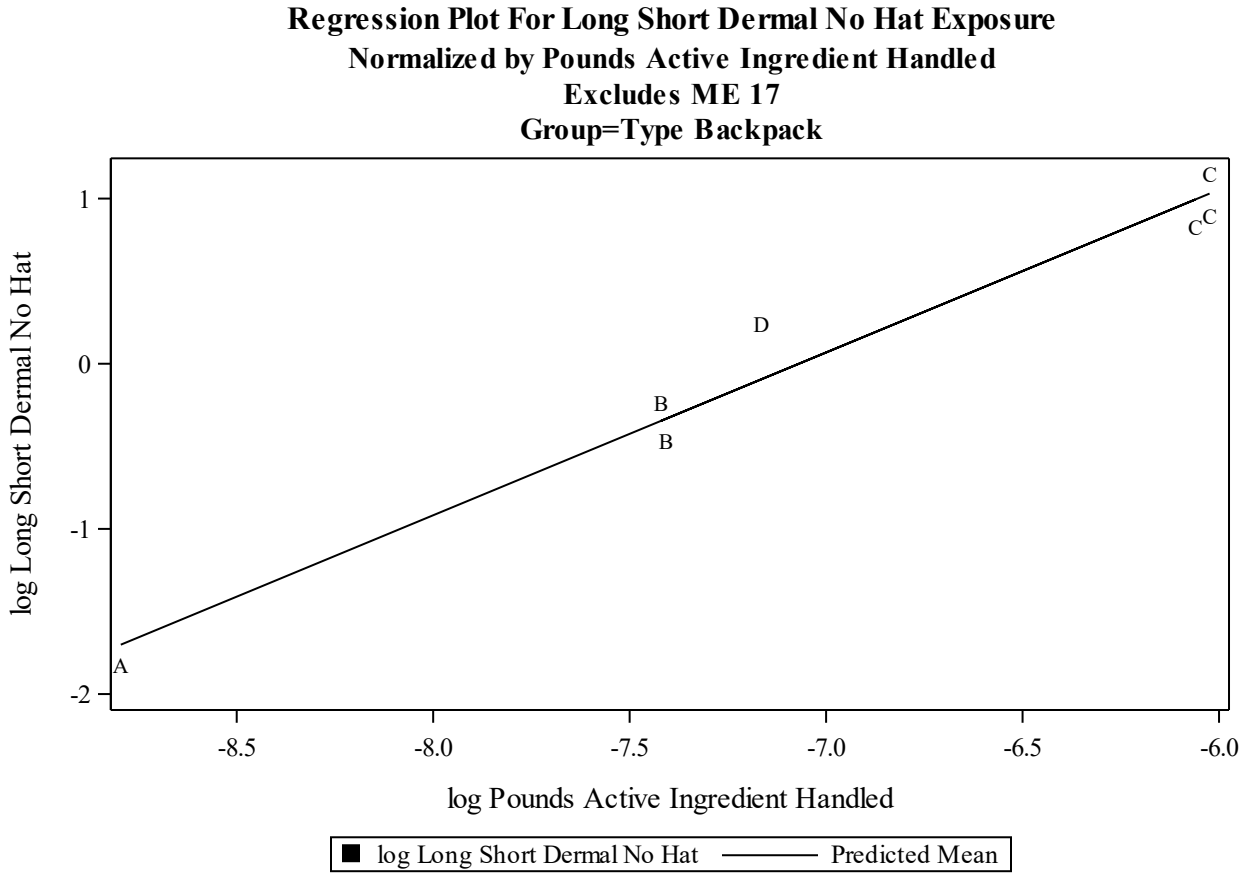
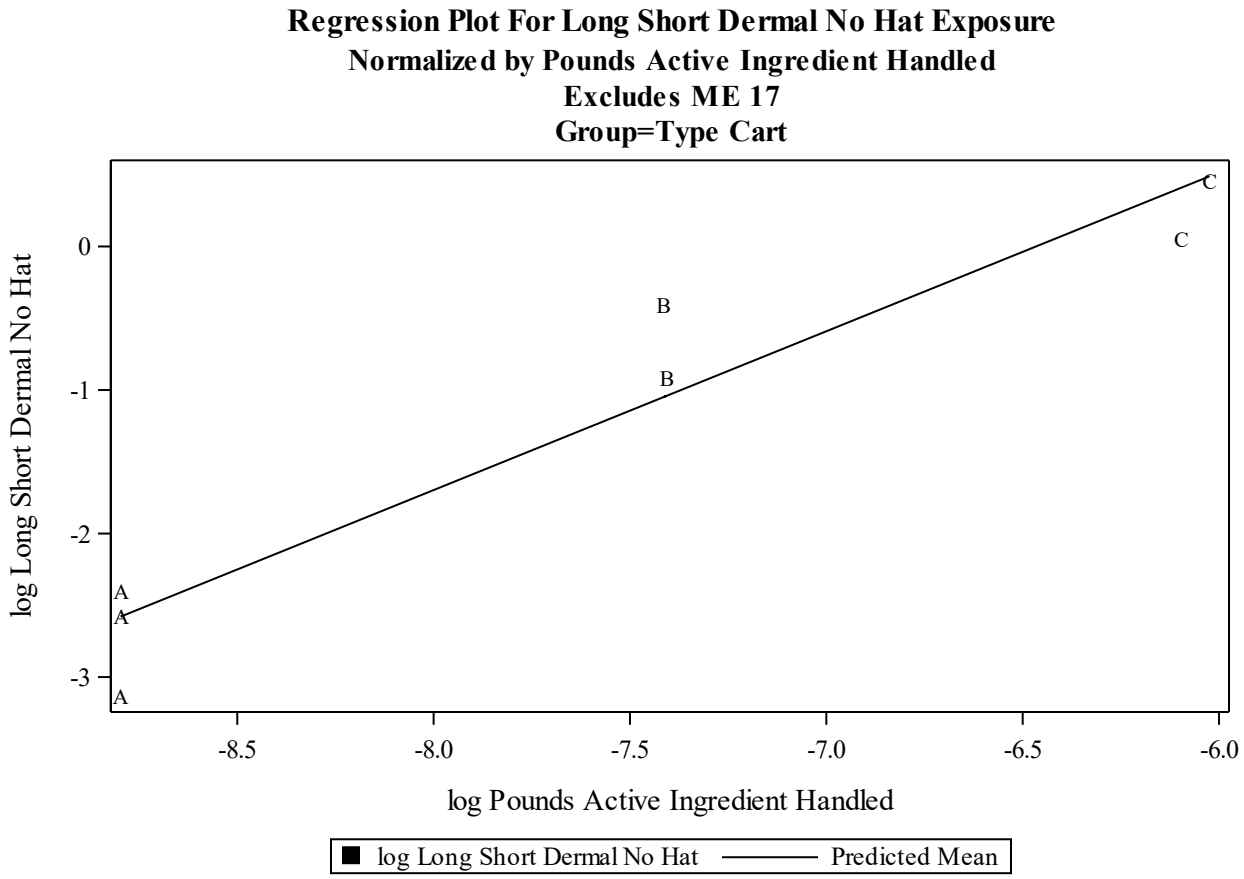
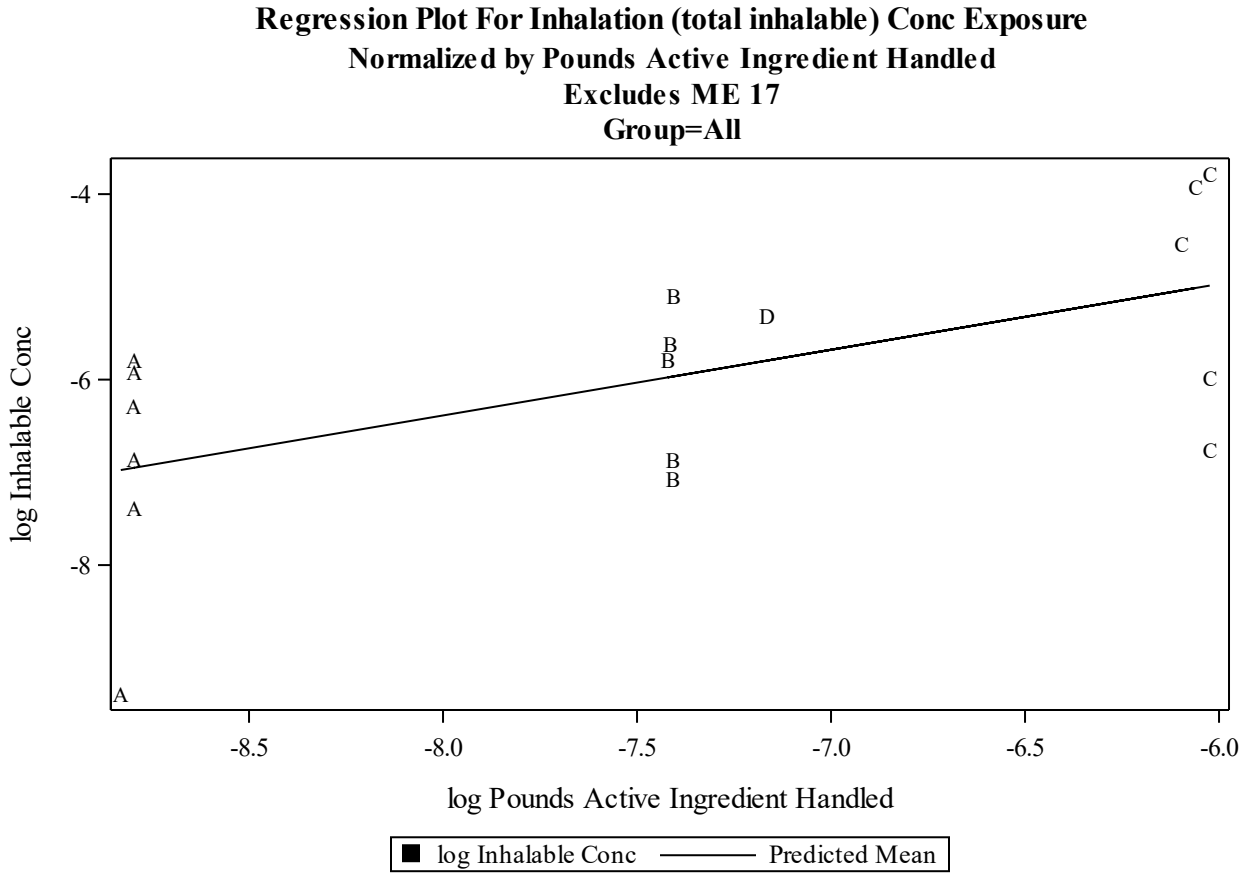


Figure B47. Regression plot for Long Short Dermal No Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



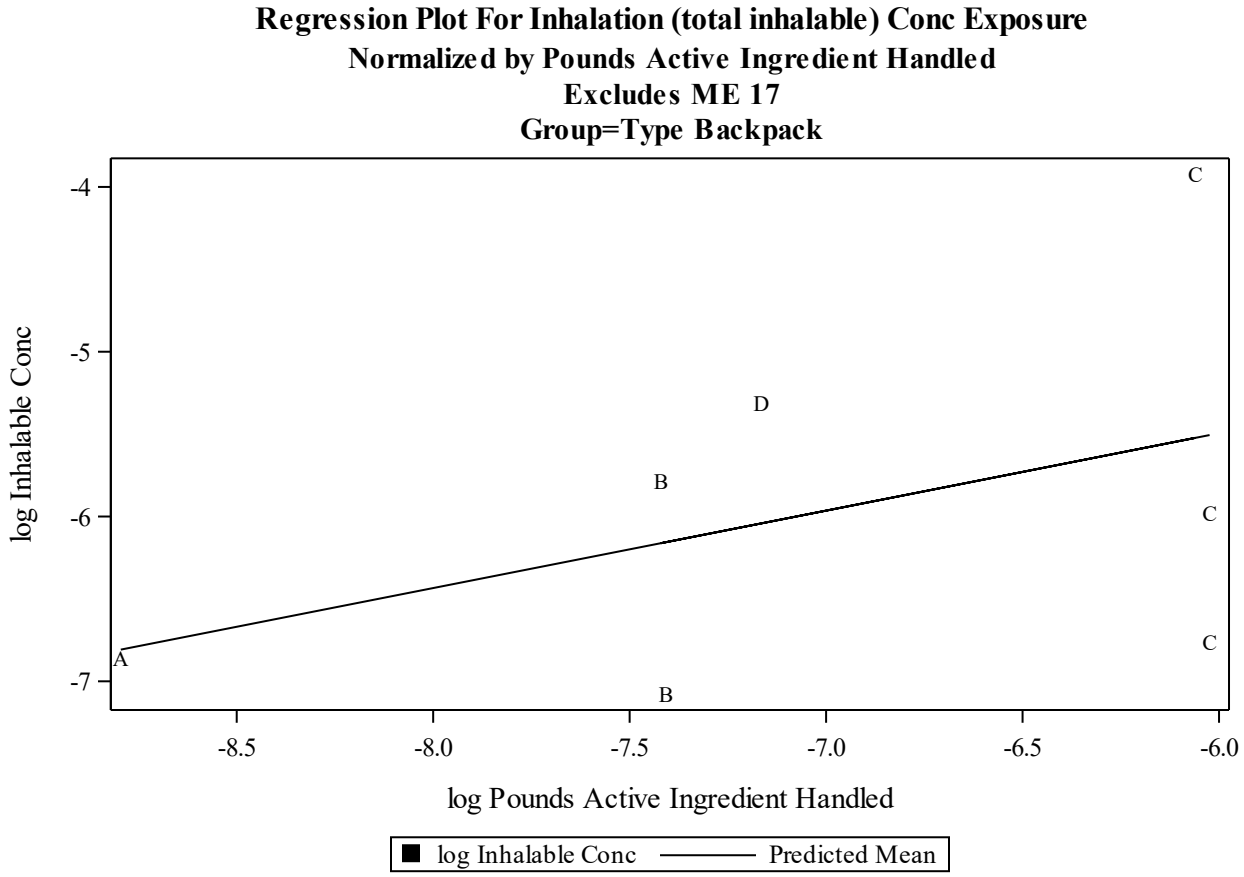
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B48. Regression plot for Long Short Dermal No Hat Exposure (mg). Group = Type Cart.



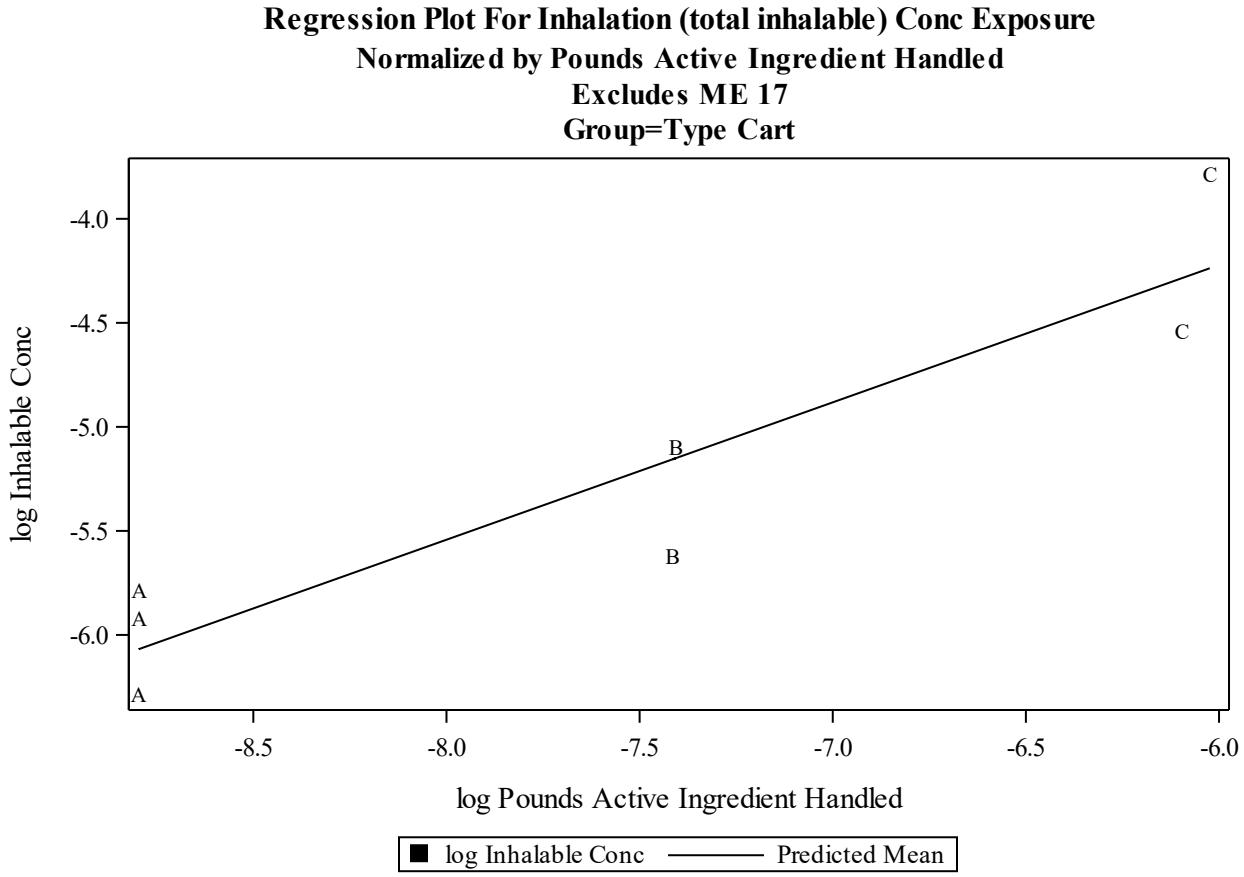
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B49. Regression plot for Inhalation (total inhalable) Conc Exposure (mg/m³). Group = All. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B50. Regression plot for Inhalation (total inhalable) Conc Exposure (mg/m^3). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B51. Regression plot for Inhalation (total inhalable) Conc Exposure (mg/m^3). Group = Type Cart.

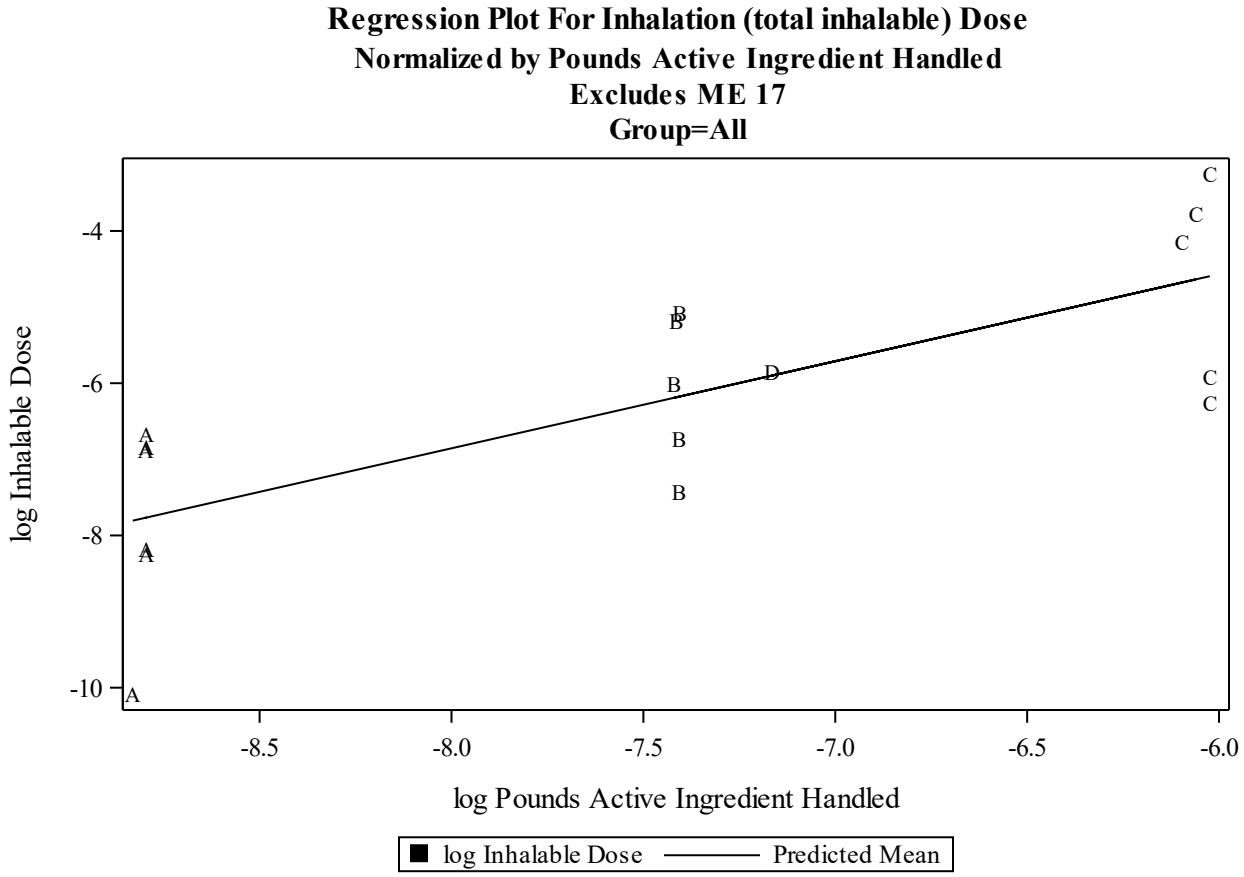


Figure B52. Regression plot for Inhalation (total inhalable) Dose Exposure (mg). Group = All. Excludes ME 17.

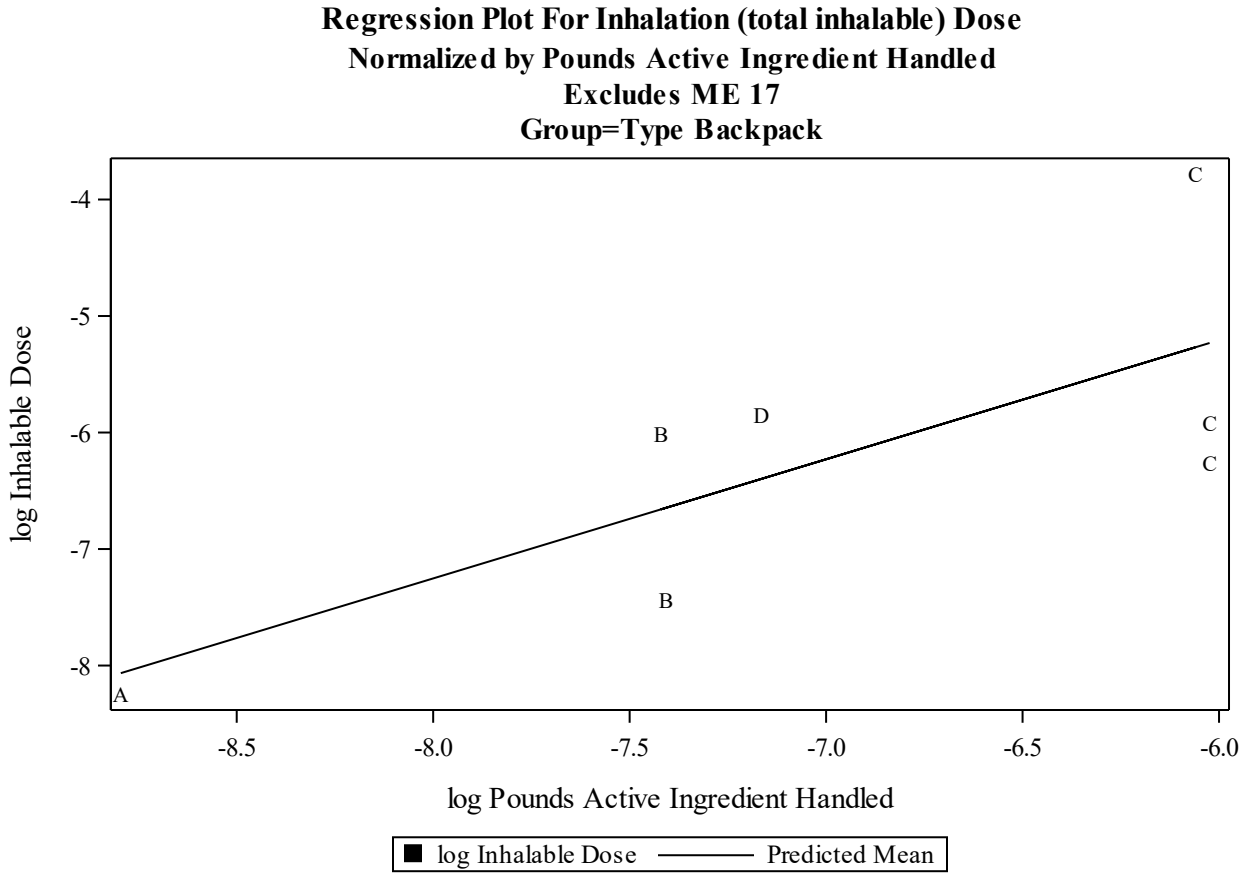
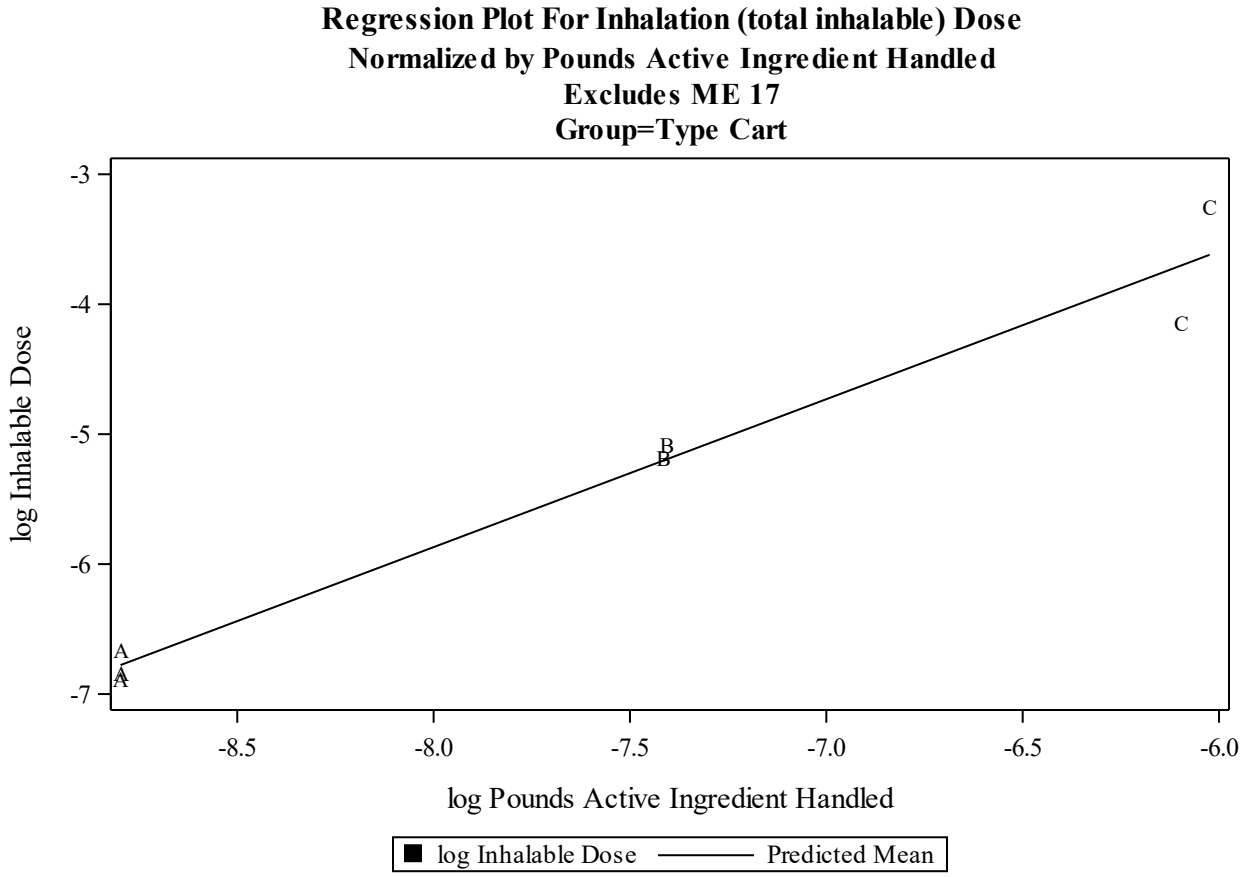


Figure B53. Regression plot for Inhalation (total inhalable) Dose Exposure (mg). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B54. Regression plot for Inhalation (total inhalable) Dose Exposure (mg). Group = Type Cart.

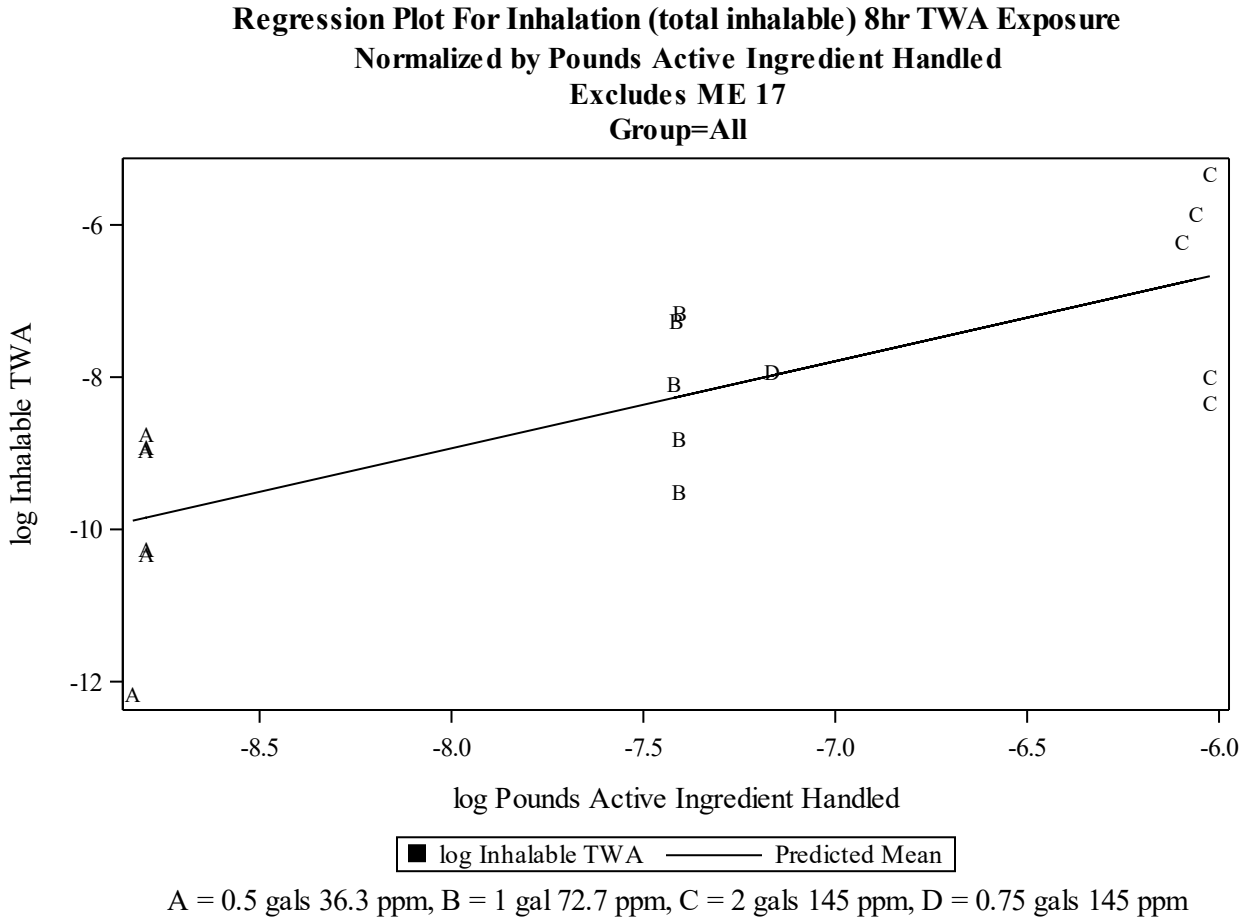


Figure B55. Regression plot for Inhalation (total inhalable) Time-Weighted Average Conc Exposure (mg). Group = All. Excludes ME 17.

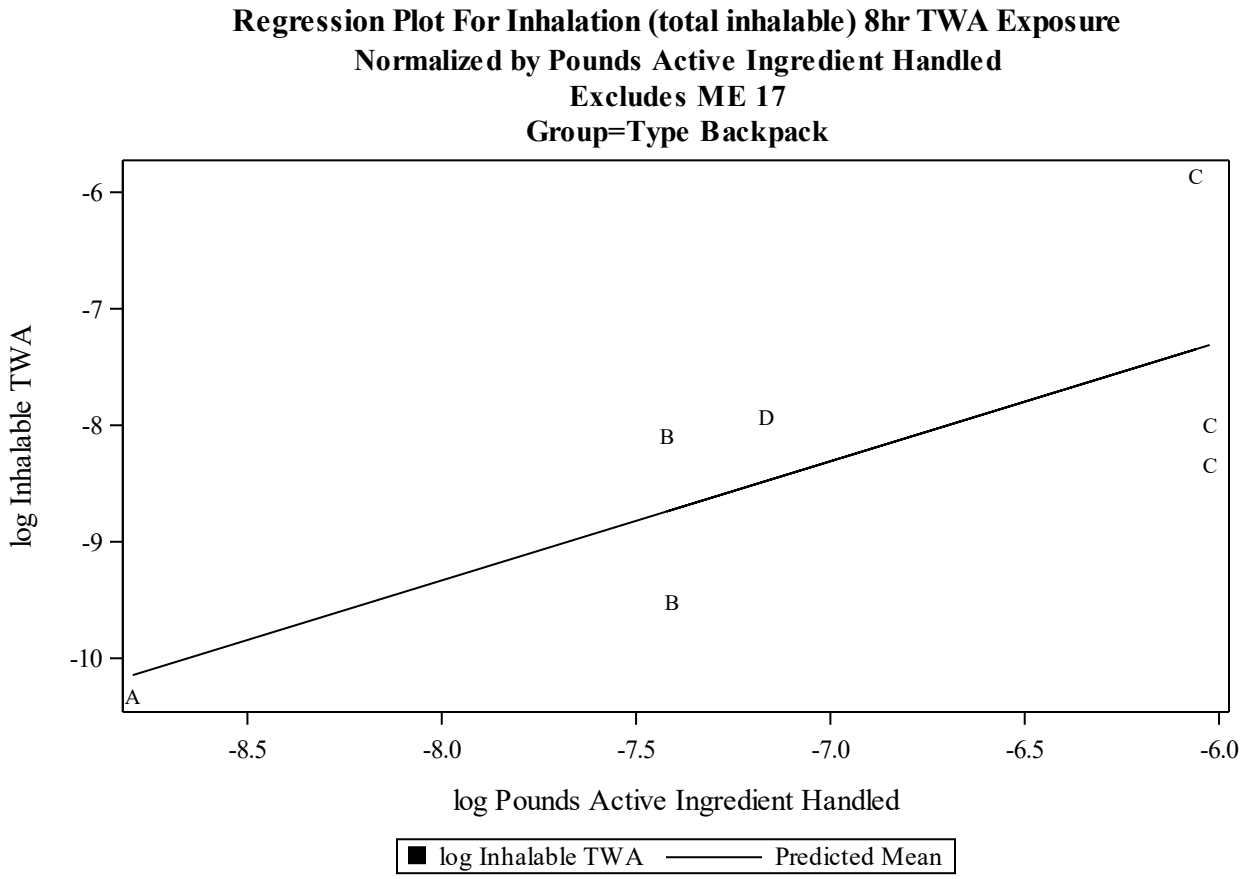


Figure B56. Regression plot for Inhalation (total inhalable) Time-Weighted Average Conc Exposure (mg). Group = Type Backpack. Excludes ME 17.

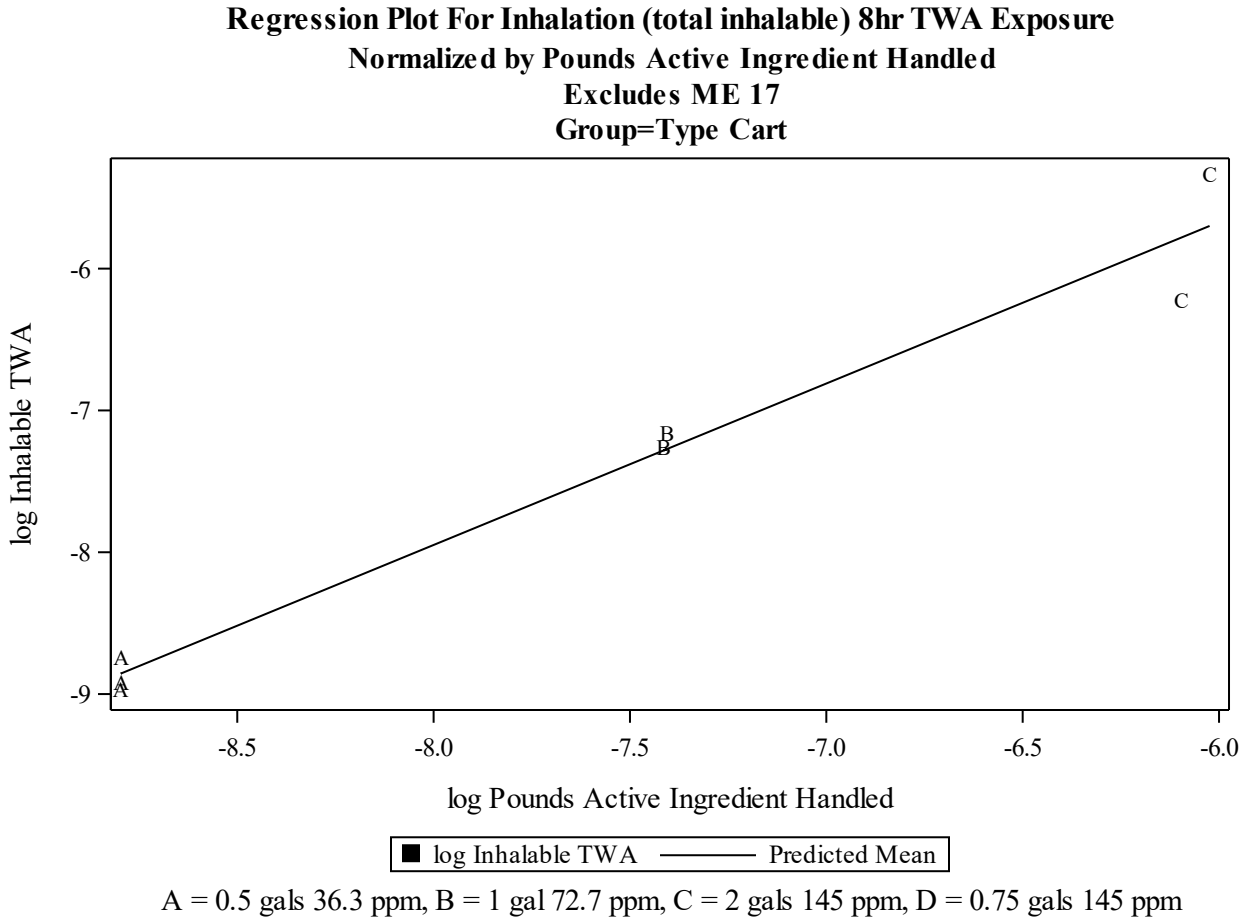
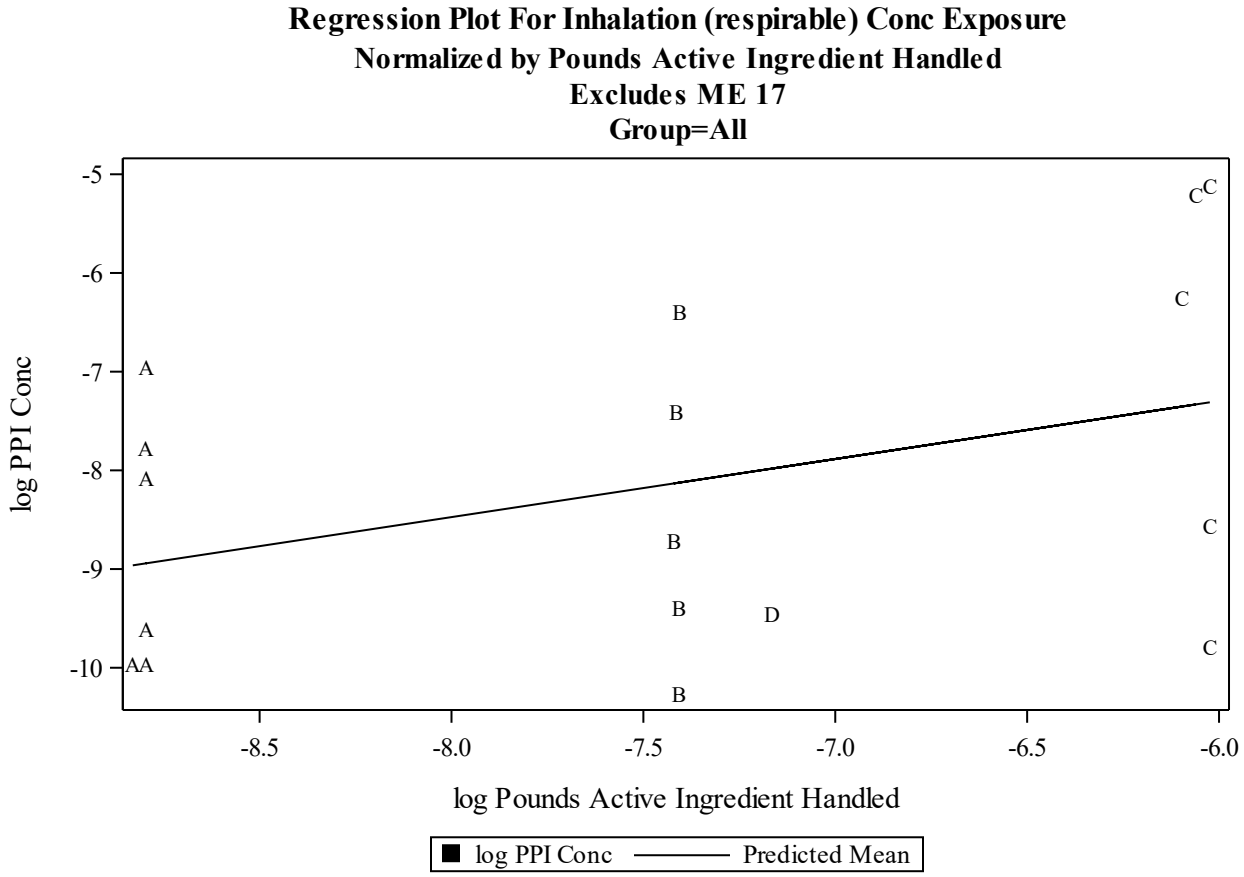


Figure B57. Regression plot for Inhalation (total inhalable) Time-Weighted Average Conc Exposure (mg). Group = Type Cart.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B58. Regression plot for Inhalation (respirable) Conc Exposure (mg/m^3). Group = All. Excludes ME 17.

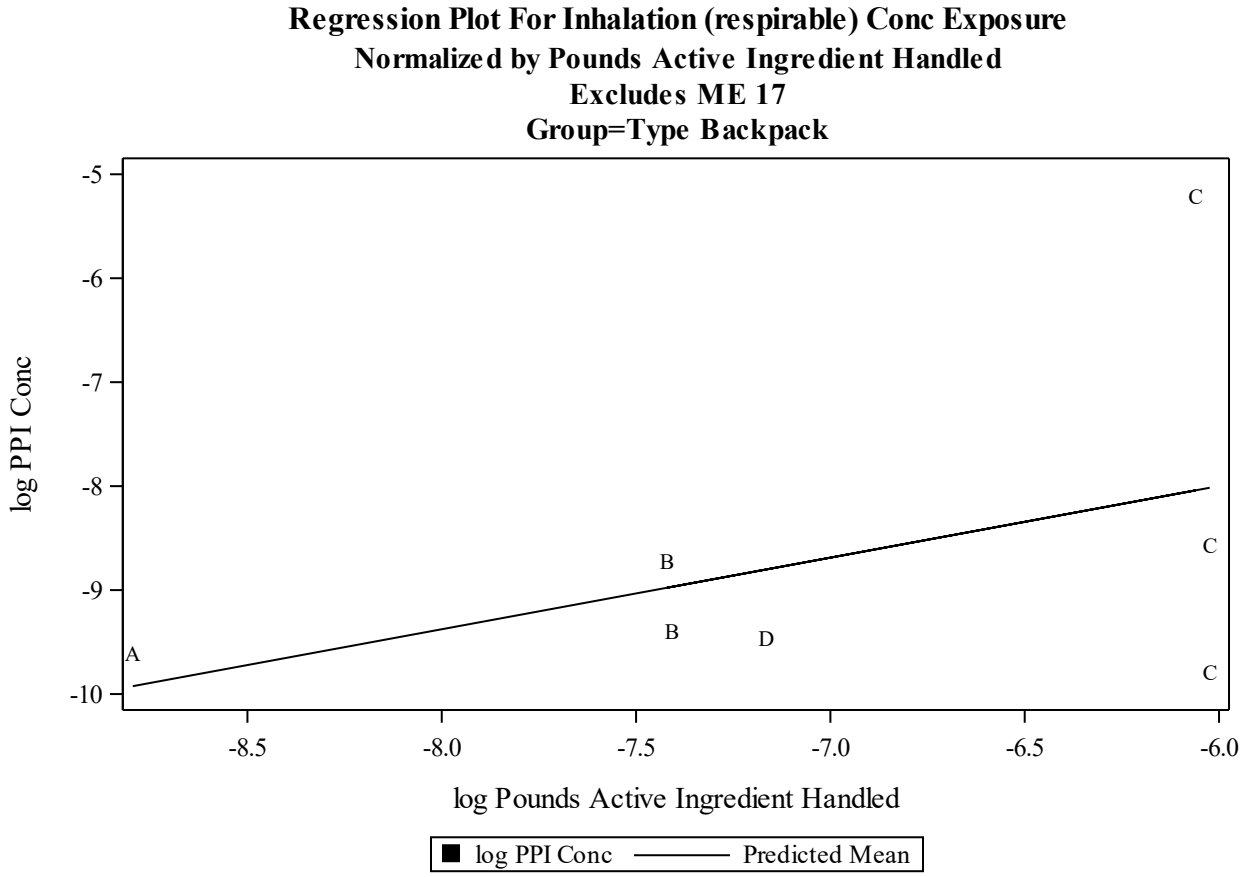
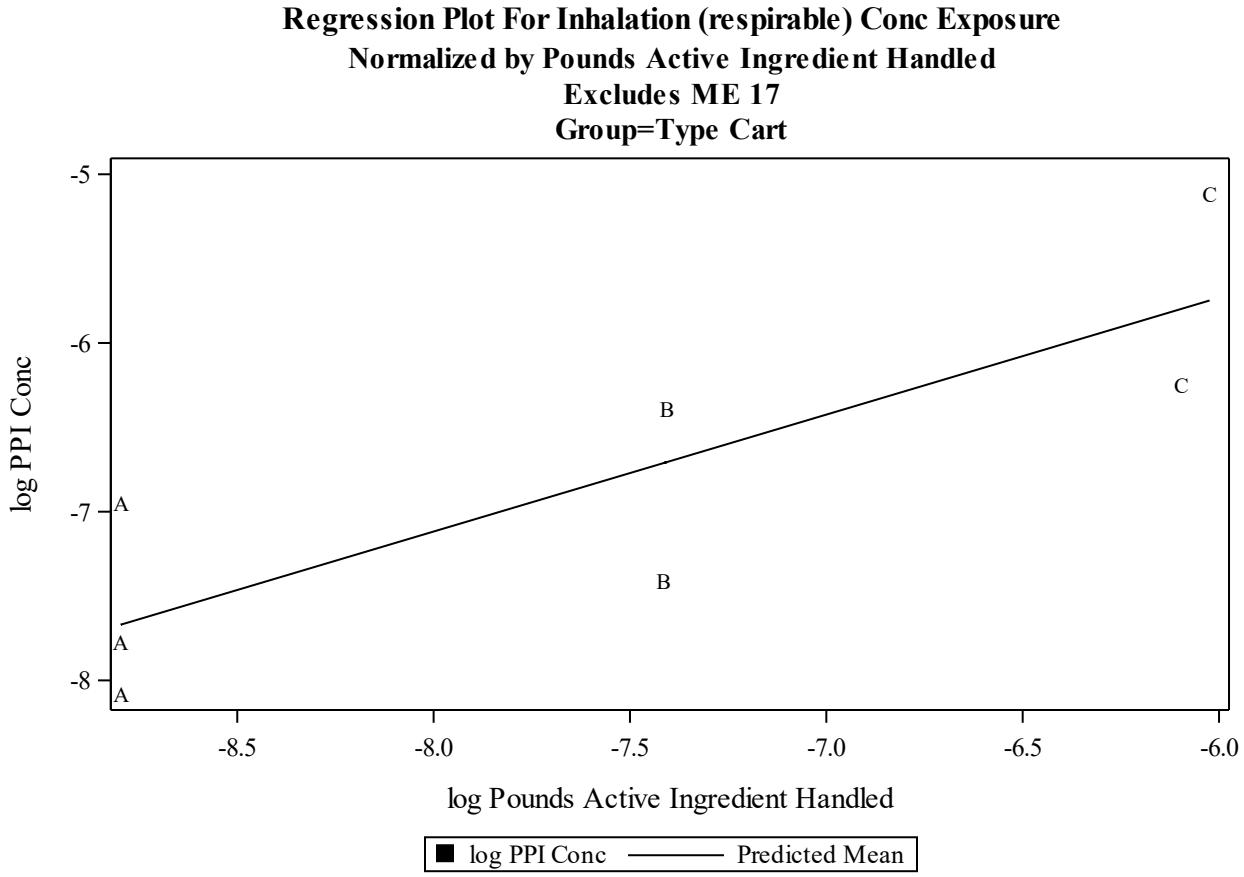


Figure B59. Regression plot for Inhalation (respirable) Conc Exposure (mg/m^3). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B60. Regression plot for Inhalation (respirable) Conc Exposure (mg/m^3). Group = Type Cart.

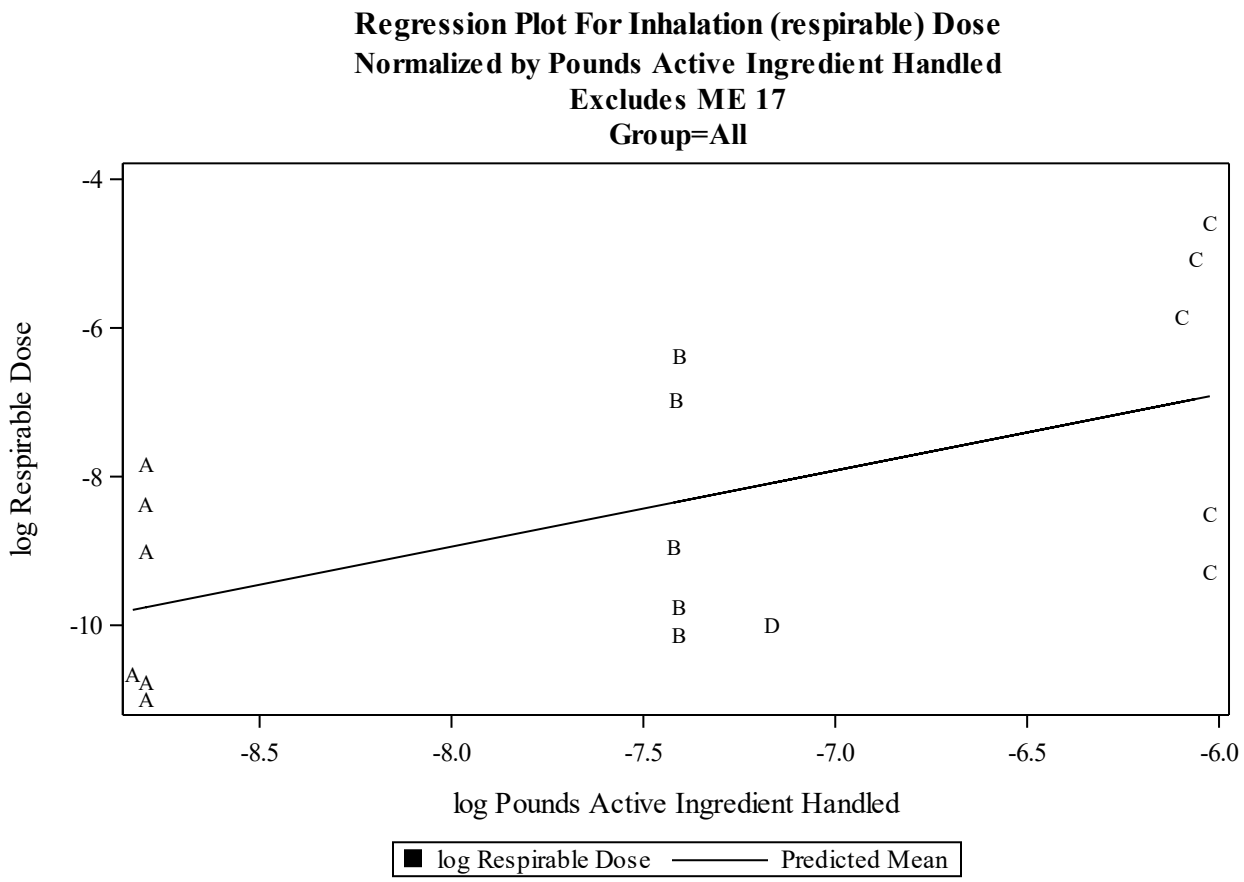
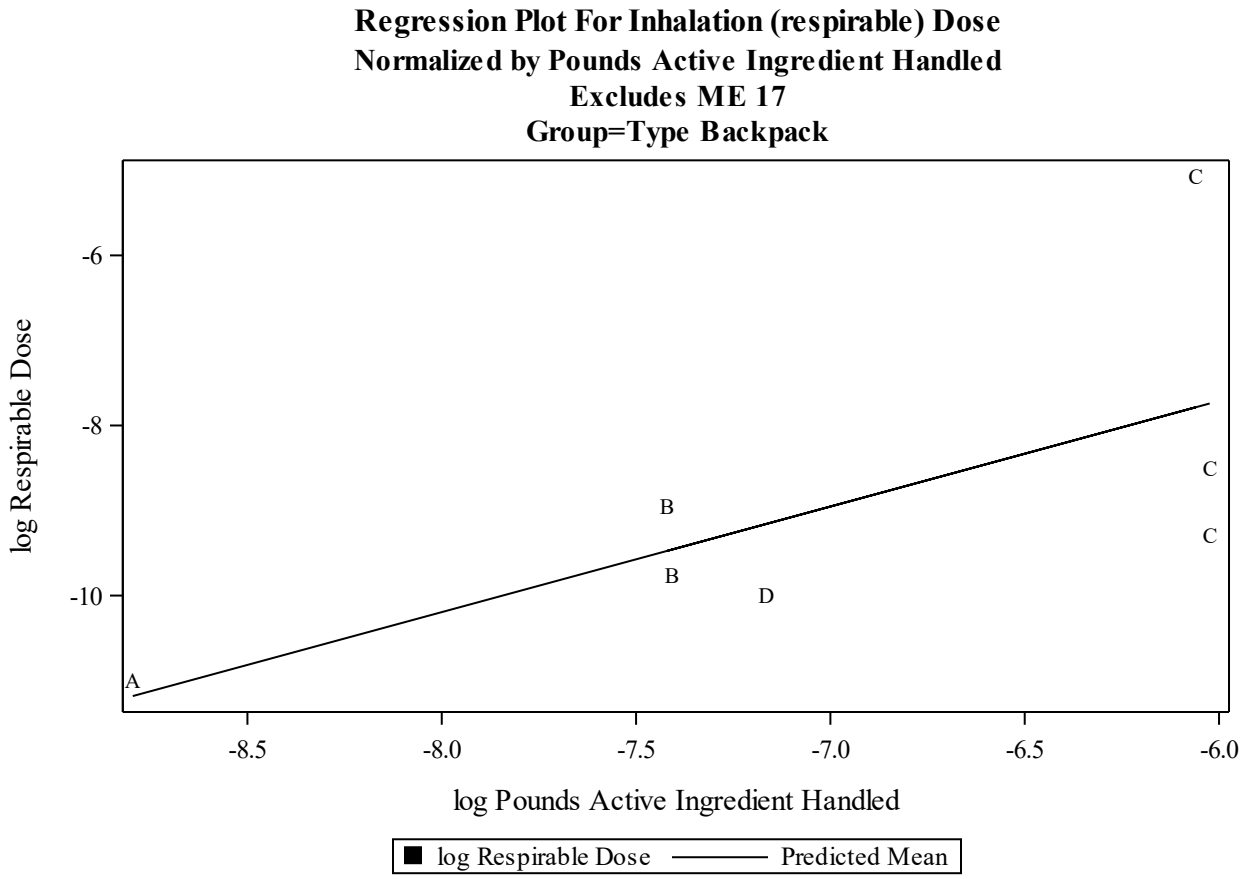
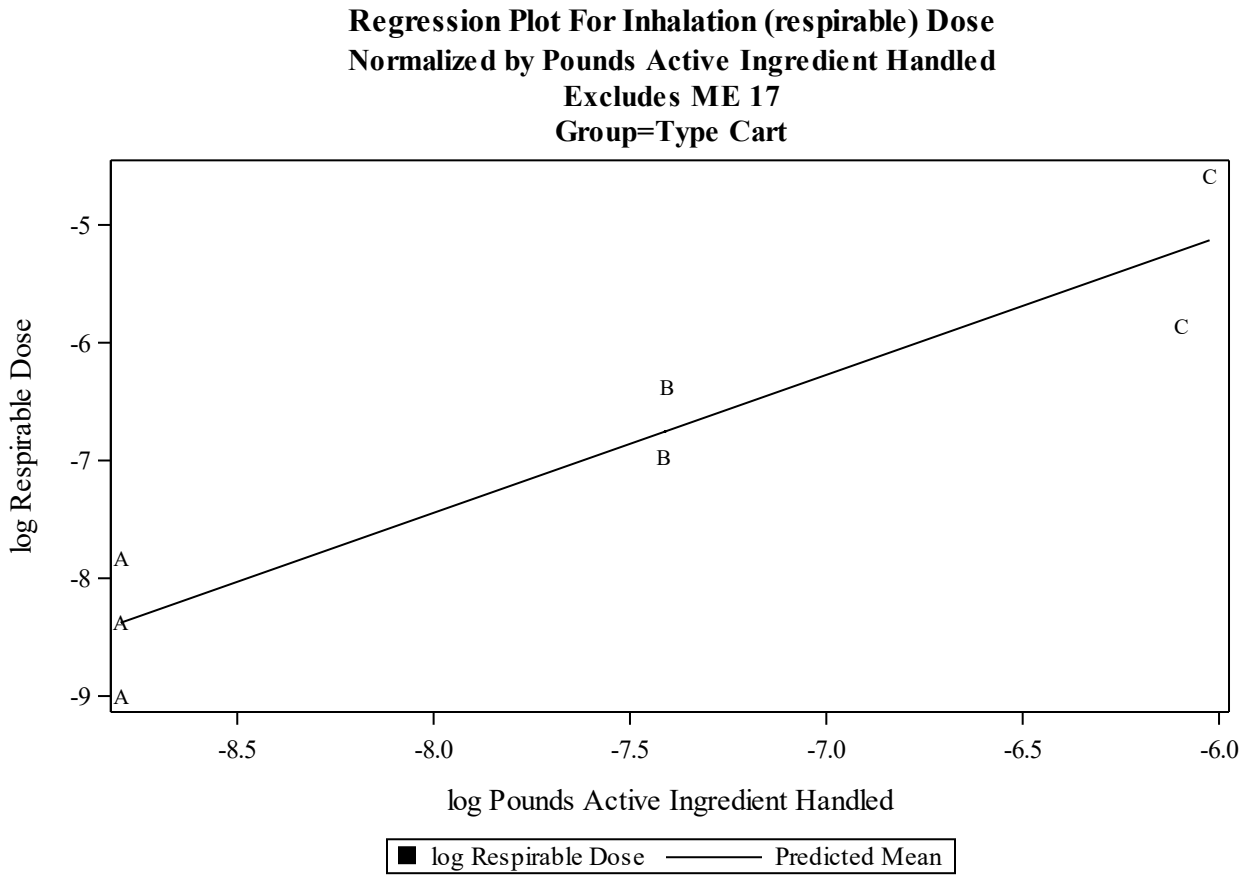


Figure B61. Regression plot for Inhalation (respirable) Dose Exposure (mg). Group = All. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B62. Regression plot for Inhalation (respirable) Dose Exposure (mg). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B63. Regression plot for Inhalation (respirable) Dose Exposure (mg). Group = Type Cart.

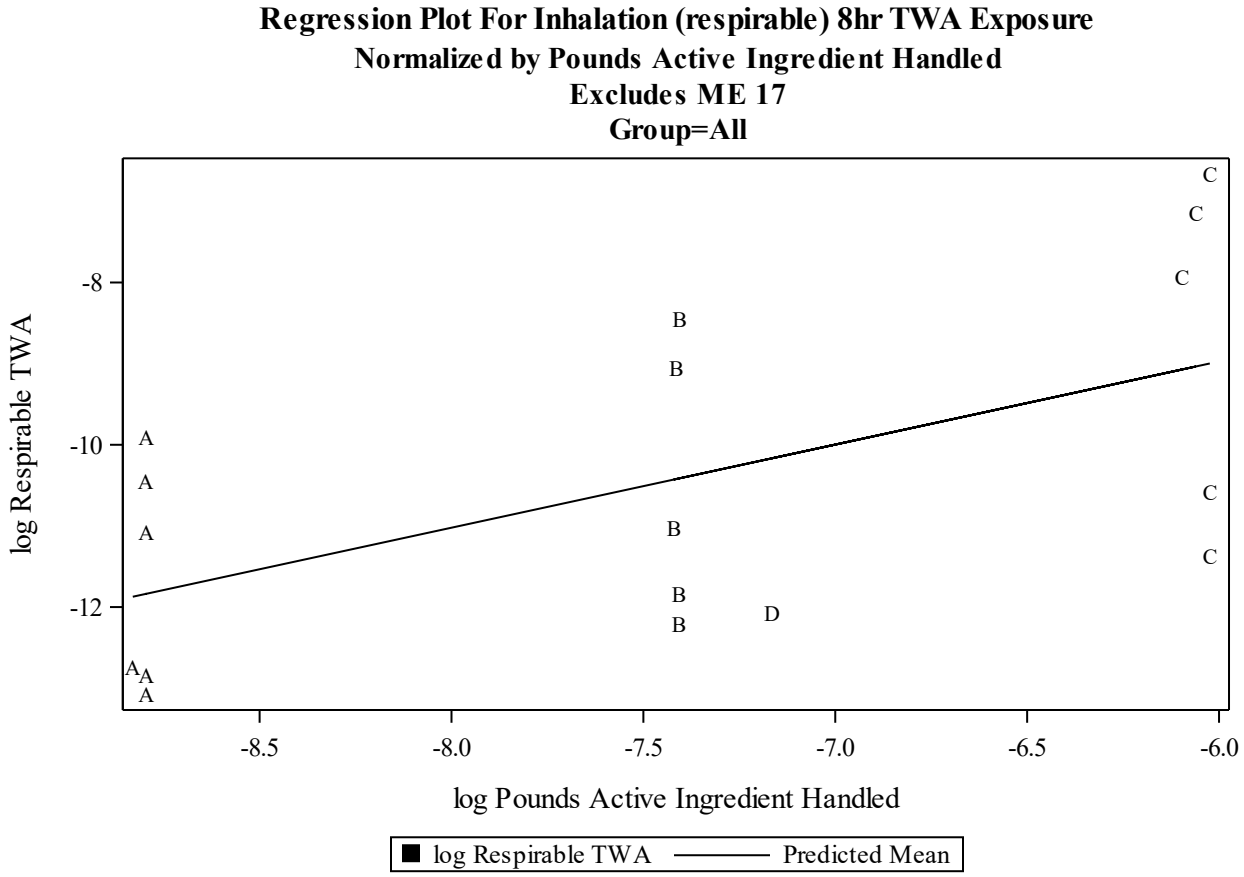
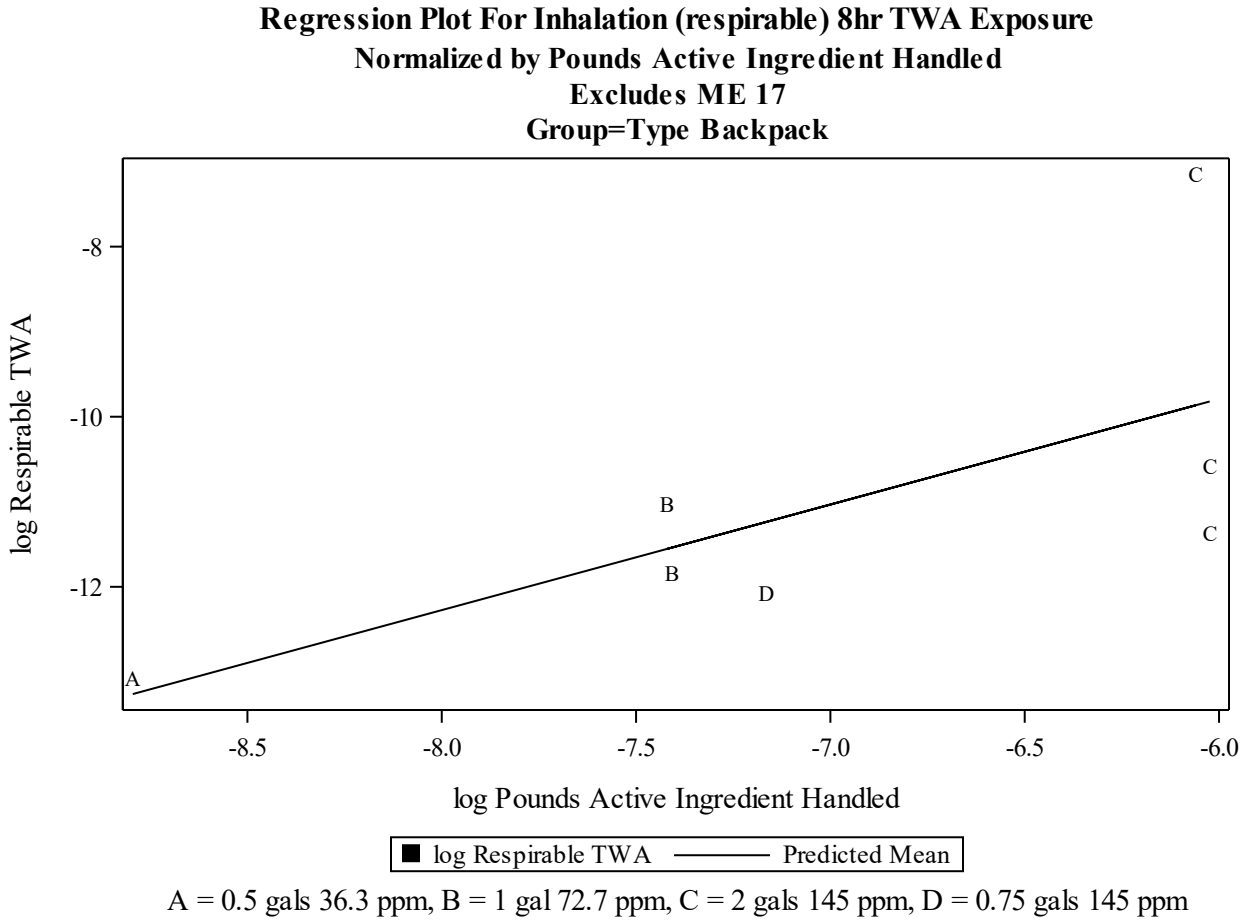


Figure B64. Regression plot for Inhalation (respirable) Time-Weighted Average Conc Exposure (mg). Group = All. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B65. Regression plot for Inhalation (respirable) Time-Weighted Average Conc Exposure (mg). Group = Type Backpack. Excludes ME 17.

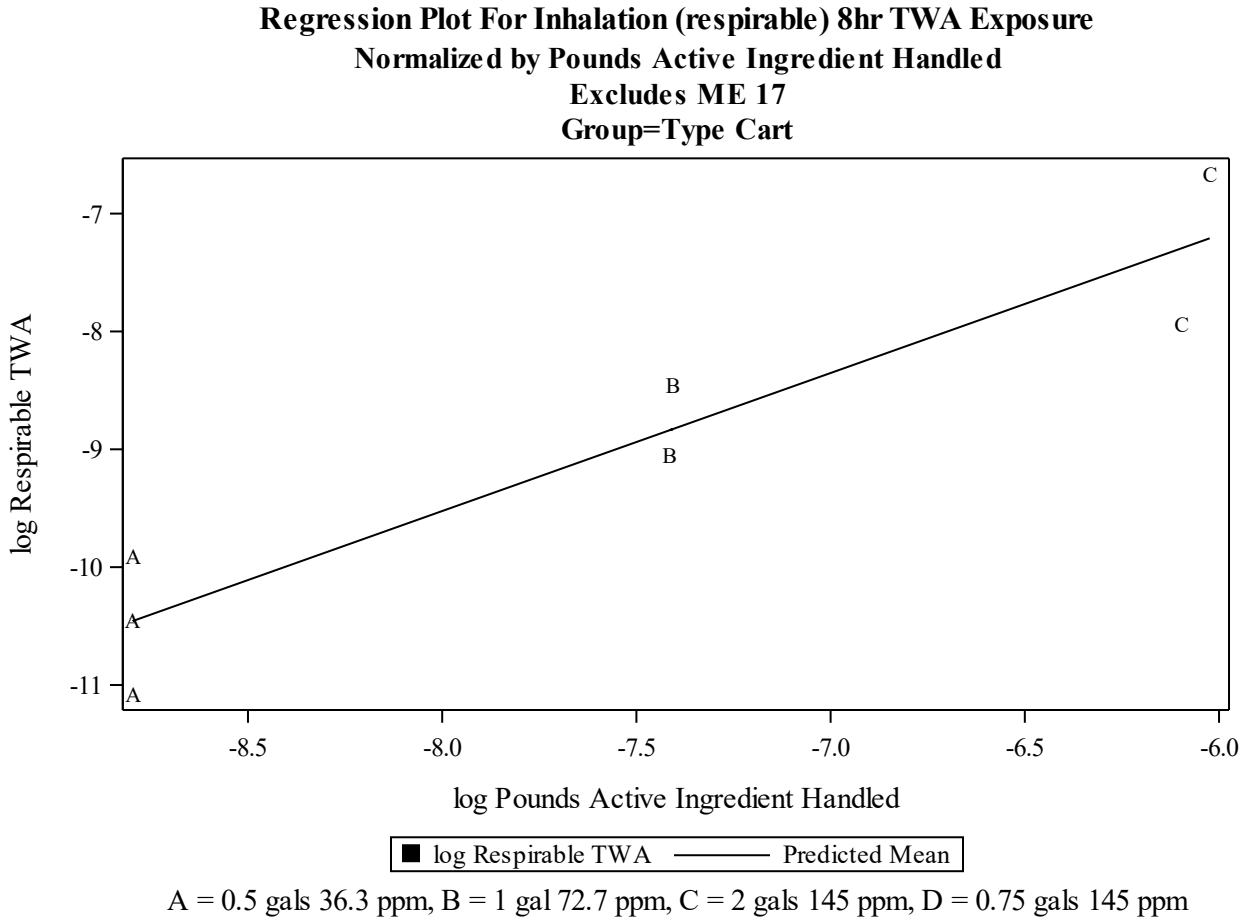


Figure B66. Regression plot for Inhalation (respirable) Time-Weighted Average Conc Exposure (mg). Group = Type Cart. Excludes ME 17.

Quadratic models

The log-log-linearity test was based on a linear model for log exposure versus log (Normalizing Factor). The normalizing factor for Scenario 2b is the amount of active ingredient handled. The HSRB has suggested that a quadratic model should also be considered.

The parsimony principle suggests that the appropriate statistical procedure for this study is to first fit the quadratic regression model for the logarithm of the exposure

$$\text{Log (Exposure)} = \text{Intercept} + \text{Slope} \times \text{Log (Normalizing Factor)} + \text{Quad} \times \{\text{Log (Normalizing Factor)}\}^2 + \text{Error Terms.}$$

If the coefficient Quad is statistically significant at the 5% level, which is equivalent to requiring that the 95% confidence interval does not include zero, then the quadratic model is supported. Otherwise, the linear model should be used.

Table B53 presents the quadratic coefficient Quad from the fitted quadratic regression models for all the exposure routes using All data. Results for the sprayer type groups are not presented here. Coefficients for the Intercept and Slope are shown under model 2 in Tables B54 to B64 below.

Table B53. Quadratic coefficients with 95% confidence intervals for quadratic regression models for the log exposure versus log (Normalizing Factor). All data. Excludes ME 17.

Exposure Route	Estimate	Lower Bound	Upper Bound
Long Dermal Hat	−0.192	−0.530	0.146
Long Short Dermal Hat	−0.236	−0.507	0.035
Hands Only	−0.241	−0.668	0.186
Long Dermal No Hat	−0.218	−0.508	0.071
Long Short Dermal No Hat	−0.255	−0.514	0.003
Inhalation (total inhalable) Concentration	−0.013	−0.688	0.661
Inhalation (total inhalable) Dose	−0.102	−0.789	0.584
Inhalation (total inhalable) Time Weighted Average Concentration	−0.102	−0.789	0.584
Inhalation (respirable) Concentration	0.377	−0.563	1.317
Inhalation (respirable) Dose	0.288	−0.709	1.285
Inhalation (respirable) Time Weighted Average Concentration	0.288	−0.709	1.285

Since all the 95% confidence intervals for Quad include zero, the quadratic coefficient is not statistically significant, and the quadratic models are not supported.

Alternative Statistical Approaches

In this section we present and compare some alternative statistical approaches to the linear and quadratic models. These results are presented for All the data but not by sprayer type.

The fitted model parameters and confidence intervals are presented in Tables B54 to B64 below.

Model Parameters

Table B54. Alternative fitted statistical models for Long Dermal Hat Exposure (mg). All Data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	−8.124	6.026	10.221
	β	1.277	1.000	1.555
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−2.292	−20.766	16.182
	β	−1.580	−6.625	3.464
	γ	−0.192	−0.530	0.146
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	5.631	−290.109	301.370
	c	47.286	−13,952.836	14,047.407
	β	−909.944	−4,988.513	3,168.625
5. Gamma model for exposure	**μ**	8.131	6.468	9.794
	β	1.261	1.042	1.481
	ϕ	4.123	2.159	7.873

Table B55. Alternative fitted statistical models for Long Short Dermal Hat Exposure (mg). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	7.947	6.159	9.735
	β	1.181	0.944	1.417
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−4.884	−19.701	9.933
	β	−2.340	−6.385	1.706
	γ	−0.236	−0.507	0.035
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	5.088	−150.057	160.233
	c	42.904	-6,616.701	6,702.510
	β	−863.392	−4,065.795	2,339.011
5. Gamma model for exposure	**μ**	7.858	6.310	9.407
	β	1.155	0.950	1.360
	ϕ	5.064	2.640	9.713

Table B56. Alternative fitted statistical models for Hands Only Exposure (mg). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	8.432	5.783	11.082
	β	1.335	0.985	1.685

Model	Parameter	Estimate	Lower Bound	Upper Bound
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−4.659	−28.006	18.687
	β	−2.257	−8.632	4.117
	γ	−0.241	−0.668	0.186
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	5.465	−268.300	279.230
	c	36.951	−10,091.755	10,165.657
	β	−907.792	−5,334.772	3,519.189
5. Gamma model for exposure	**μ**	8.234	6.294	10.173
	β	1.285	1.029	1.542
	ϕ	3.065	1.618	5.807

Table B57. Alternative fitted statistical models for Long Dermal No Hat Exposure (mg). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	7.981	6.120	9.841
	β	1.234	0.988	1.480
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−3.881	−19.697	11.935
	β	−2.021	−6.339	2.298
	γ	−0.218	−0.508	0.071
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			

Model	Parameter	Estimate	Lower Bound	Upper Bound
4. 3-parameter logistic regression of exposure on NF	**α**	5.779	−615.918	627.476
	c	60.548	−37,562.767	37,683.862
	β	−800.990	−6,135.556	4,533.577
5. Gamma model for exposure	**μ**	8.022	6.468	9.576
	β	1.225	1.020	1.431
	ϕ	4.902	2.558	9.397

Table B58. Alternative fitted statistical models for Long Short Dermal No Hat Exposure (mg). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	7.914	6.158	9.670
	β	1.163	0.931	1.395
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−5.968	−20.120	8.183
	β	−2.646	−6.510	1.218
	γ	−0.255	−0.514	0.003
3. Log-log logistic regression of exposure on NF	**α**	3.48E−03	−6.27E−03	1.32E−02
	γ	1.84E−06	−3.97E−05	4.34E−05
	β	−1.35E+00	−3.92E+00	1.22E+00
4. 3-parameter logistic regression of exposure on NF	**α**	4.420	−1.354	10.194
	c	2.105	1.679	2.531
	β	−6,061.332	−15,143.327	3,020.663
5. Gamma model for exposure	**μ**	7.835	6.282	9.388
	β	1.139	0.934	1.345
	ϕ	5.146	2.682	9.873

Table B59. Alternative fitted statistical models for Inhalation (total inhalable) Concentration (mg/m³). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	−0.718	−4.701	3.266
	β	0.709	0.182	1.235
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−1.445	−38.339	35.450
	β	0.509	−9.565	10.583
	γ	−0.013	−0.688	0.661
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	2.496	−2.354	7.345
	c	0.012	0.004	0.020
	β	−2,576.777	−11,795.649	6,642.095
5. Gamma model for exposure	**μ**	−0.243	−2.907	2.421
	β	0.717	0.365	1.069
	ϕ	1.360	0.741	2.497

Table B60. Alternative fitted statistical models for Inhalation (total inhalable) Dose (mg). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	2.299	−1.768	6.366
	β	1.144	0.607	1.682
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−3.267	−40.800	34.265
	β	−0.383	−10.631	9.865

Model	Parameter	Estimate	Lower Bound	Upper Bound
	γ	−0.102	−0.789	0.584
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	3.534	−7.411	14.479
	c	0.017	0.004	0.029
	β	−3,220.725	−21,537.854	15,096.404
5. Gamma model for exposure	**μ**	2.881	0.031	5.730
	β	1.163	0.786	1.539
	ϕ	1.268	0.693	2.319

Table B61. Alternative fitted statistical models for Inhalation (total inhalable) Time-weighted Average Concentration (mg/m^3). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	0.220	−3.848	4.287
	β	1.144	0.607	1.682
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	−5.347	−42.879	32.186
	β	−0.383	−10.631	9.865
	γ	−0.102	−0.789	0.584
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	3.5341	−7.4111	14.4793
	c	0.0021	0.0005	0.0036

Model	Parameter	Estimate	Lower Bound	Upper Bound
	β	−3,220.8210	−21,538.4423	15,096.8003
5. Gamma model for exposure	**μ**	0.801	-2.049	3.651
	β	1.163	0.786	1.539
	ϕ	1.268	0.693	2.319

Table B62. Alternative fitted statistical models for Inhalation (respirable) Concentration (mg/m^3). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	−3.765	−9.459	1.929
	β	0.589	−0.164	1.341
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	16.713	−34.685	68.112
	β	6.207	−7.827	20.241
	γ	0.377	−0.563	1.317
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	6.629	−49,807.518	49,820.776
	c	0.580	−28,830.607	28,831.766
	β	-249.731	−23,564.918	23,065.456
5. Gamma model for exposure	**μ**	-1.476	-5.099	2.148
	β	0.771	0.294	1.249
	ϕ	0.662	0.374	1.170

Table B63. Alternative fitted statistical models for Inhalation (respirable) Dose (mg). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	−0.748	−6.713	5.217
	β	1.024	0.236	1.813
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	14.891	−39.615	69.397
	β	5.315	−9.567	20.198
	γ	0.288	−0.709	1.285
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**	3.769	−6.392	13.930
	c	0.004	−0.010	0.019
	β	−2,590.463	−22,401.495	17,220.569
5. Gamma model for exposure	**μ**	1.590	−2.280	5.460
	β	1.205	0.694	1.716
	ϕ	0.624	0.354	1.099

Table B64. Alternative fitted statistical models for Inhalation (respirable) Time-weighted Average Concentration (mg/m^3). All data. Excludes ME 17.

Model	Parameter	Estimate	Lower Bound	Upper Bound
1. Linear regression of Ln(exposure) on Ln(NF)	μ	−2.828	−8.792	3.137
	β	1.024	0.236	1.813

Model	Parameter	Estimate	Lower Bound	Upper Bound
2. Quadratic regression of Ln(exposure) on Ln(NF)	μ	12.812	−41.694	67.318
	β	5.315	−9.567	20.198
	γ	0.288	−0.709	1.285
3. Log-log logistic regression of exposure on NF	**α**			
	γ			
	β			
4. 3-parameter logistic regression of exposure on NF	**α**			
	c			
	β			
5. Gamma model for exposure	**μ**	−0.490	−4.360	3.380
	β	1.205	0.694	1.716
	ϕ	0.624	0.354	1.099

Model Comparisons

One way to compare the fit of the 5 models presented above is to use the Akaike Information Criterion (AIC), which takes minus twice the log-likelihood and then makes an adjustment or penalty for the number of parameters in the model. To properly apply this approach to the seven models it was first necessary to re-express all of them using the same dependent variable, ln(exposure), since models 1 and 2 were specified using ln(exposure) but models 3 to 5 were specified using exposure. The following two tables compare the AIC values for the various Dermal and Inhalation exposure measures. The smaller values of the AIC suggest a better-fitting model. AIC values for models that failed to converge are not shown.

Table B65. Akaike Information Criteria values for alternative models for Dermal Exposure. All data. Excludes ME 17.

Model	Long Dermal Hat	Long Short Dermal Hat	Hands Only	Long Dermal No Hat	Long Short Dermal No Hat
1. Linear regression of Ln(exposure) on Ln(NF)	36.2	30.5	44.6	31.9	29.8

Model	Long Dermal Hat	Long Short Dermal Hat	Hands Only	Long Dermal No Hat	Long Short Dermal No Hat
2. Quadratic regression of Ln(exposure) on Ln(NF)	36.5	28.6	44.9	30.9	26.9
3. Log-log logistic regression of exposure on NF					52.3
4. 3-parameter logistic regression of exposure on NF	75.0	58.4	78.8	71.8	52.4
5. Gamma model for exposure	31.5	27.8	37.0	28.4	27.5

Table B66. Akaike Information Criteria values for alternative models for Inhalation Exposure. All data. Excludes ME 17.

Model	Inhalation (total inhalable) Concentration	Inhalation (total inhalable) Dose	Inhalation (total inhalable) Time-Weighted Average Concentration	Inhalation (respirable) Concentration	Inhalation (respirable) Dose	Inhalation (respirable) Time-Weighted Average Concentration
1. Linear regression of Ln(exposure) on Ln(NF)	59.3	60.1	60.1	72.2	73.9	73.9
2. Quadratic regression of Ln(exposure) on Ln(NF)	61.4	62.0	62.0	73.3	75.4	75.4
3. Log-log logistic regression of exposure on NF						
4. 3-parameter logistic regression of exposure on NF	80.3	103.1	103.1	116.4	133.3	
5. Gamma model for exposure	53.1	54.5	54.5	69.0	70.4	70.4

Based on the AIC, the best-fitting models are the gamma model for all the exposure routes, with the exception of Long Short Dermal No Hat exposure, for which the quadratic model was the best-fitting (despite the fact that the quadratic coefficient was not statistically significant the 5% significance level).

3. Threshold Analyses

As shown in the main memo, two statistical models were fitted to the exposure data and can be used to estimate the conditional mean exposure, i.e., the expected exposure conditional on the normalizing factor, NF, E{Exposure | NF}. For this study, NF is the amount (pounds) of active ingredient handled

Linear Model

$$\text{Log (Exposure)} = \text{Intercept} + \text{Slope} \times \text{Log (NF)} + \text{Random Error},$$

which implies

Equation 1: $E\{\text{Exposure} \mid \text{NF}\} = \text{Expected Exposure Given NF} = C \times NF^{\text{Slope}}$,

where

$$C = e^{\text{Intercept}} \times e^{\text{Varerror}/2}.$$

Lognormal Model

If the value of Slope in the linear model is 1, then

$$\text{Log (Normalized Exposure)} = \text{Log(Exposure / NF)}$$

$$= \text{Intercept}^* + \text{Random Error},$$

which implies

Equation 2: $E\{\text{Exposure} \mid \text{NF}\} = \text{Expected Exposure Given the NF} = C^* \times NF$,

where

$$C^* = e^{\text{Intercept}^*} \times e^{\text{Varerror}^*/2}.$$

(The parameters for the lognormal model are asterisked). If Slope equals 1 then the two models are identical.

These two statistical models can be compared by calculating the threshold value of the normalizing factor at which both models predict the same conditional mean exposure.

Define Threshold = $\left(\frac{C}{C^*}\right)^{\frac{1}{1-Slope}}$.

Thus E(X | NF) for the lognormal model > E(X | NF) for the linear model if and only if

$C^* \times NF > C \times NF^{\text{Slope}}$, which is true if and only if

Either Slope < 1 and NF > Threshold

Or Slope > 1 and NF < Threshold.

These are the conditions under which the lognormal model overestimates exposure compared to the linear model.

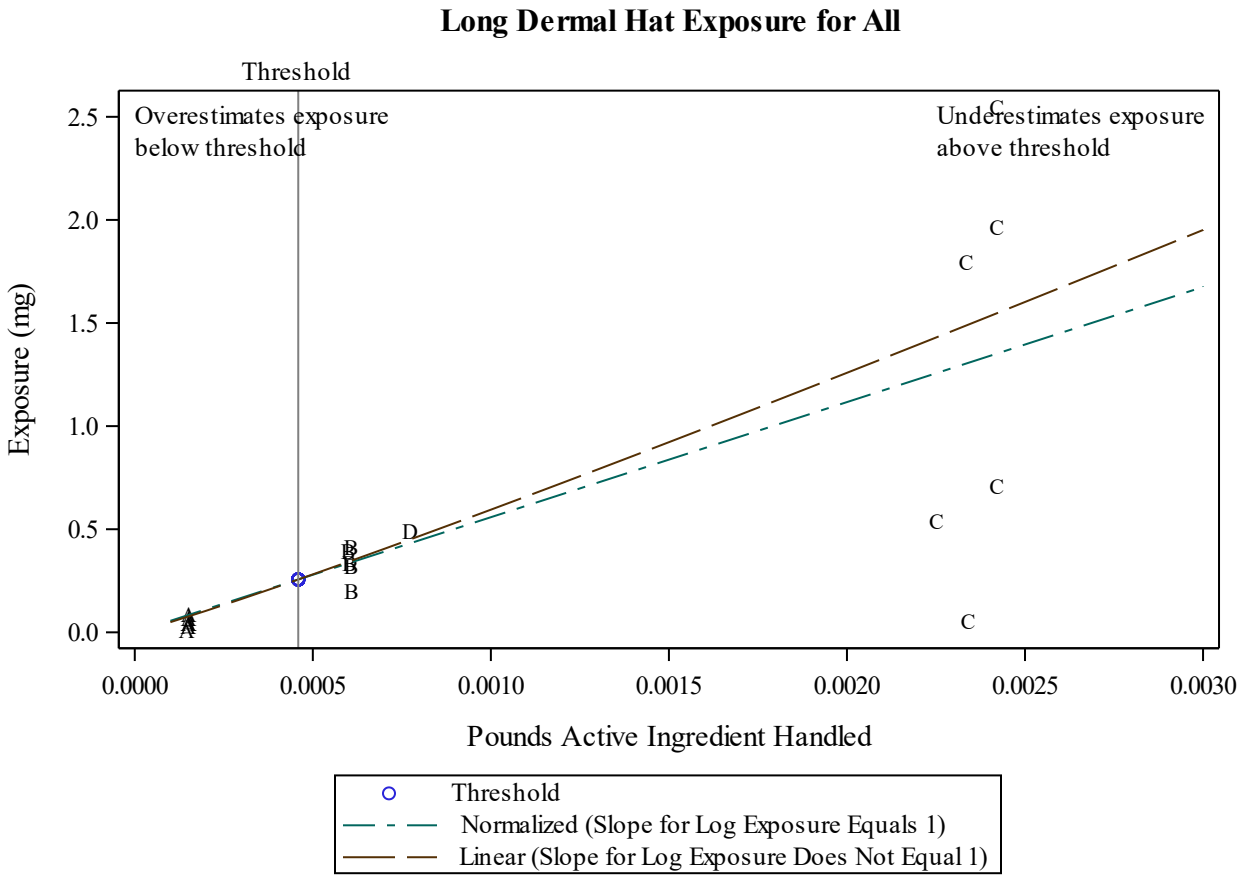
The most useful case is when slope < 1. If so, the lognormal model is "more conservative" (i.e., predicts higher exposure) when the normalizing factor is high (more specifically, above the threshold). When the normalizing factor is below the threshold, then either the linear model equation $C \times NF^{Slope}$ can be used to estimate the conditional mean exposure, or instead one can use the upper bound $C^* \times$ Threshold. If normalizing factor = Threshold, then the estimates of the conditional mean exposure are the same.

The Threshold normalizing factor values and corresponding exposure values $C^* \times$ Threshold were tabulated together with the estimated slopes in the corresponding main memo and Supplement Tables A45 and B45.

We now have two estimates of the conditional mean exposure for a given normalizing factor, equations 1 and 2. The graphs below compare the conditional mean exposure estimates for each normalizing factor (concentration or concentration time duration), all three scenarios, and all seven exposure routes. The conditional mean exposure is plotted against the normalizing factor. The brown curve gives the estimates for the linear model in equation 1. The green line gives the estimates for the lognormal model in equation 2. The two estimates are equal if the normalizing factor equals the Threshold value. The data points are labeled to show the sample target durations.

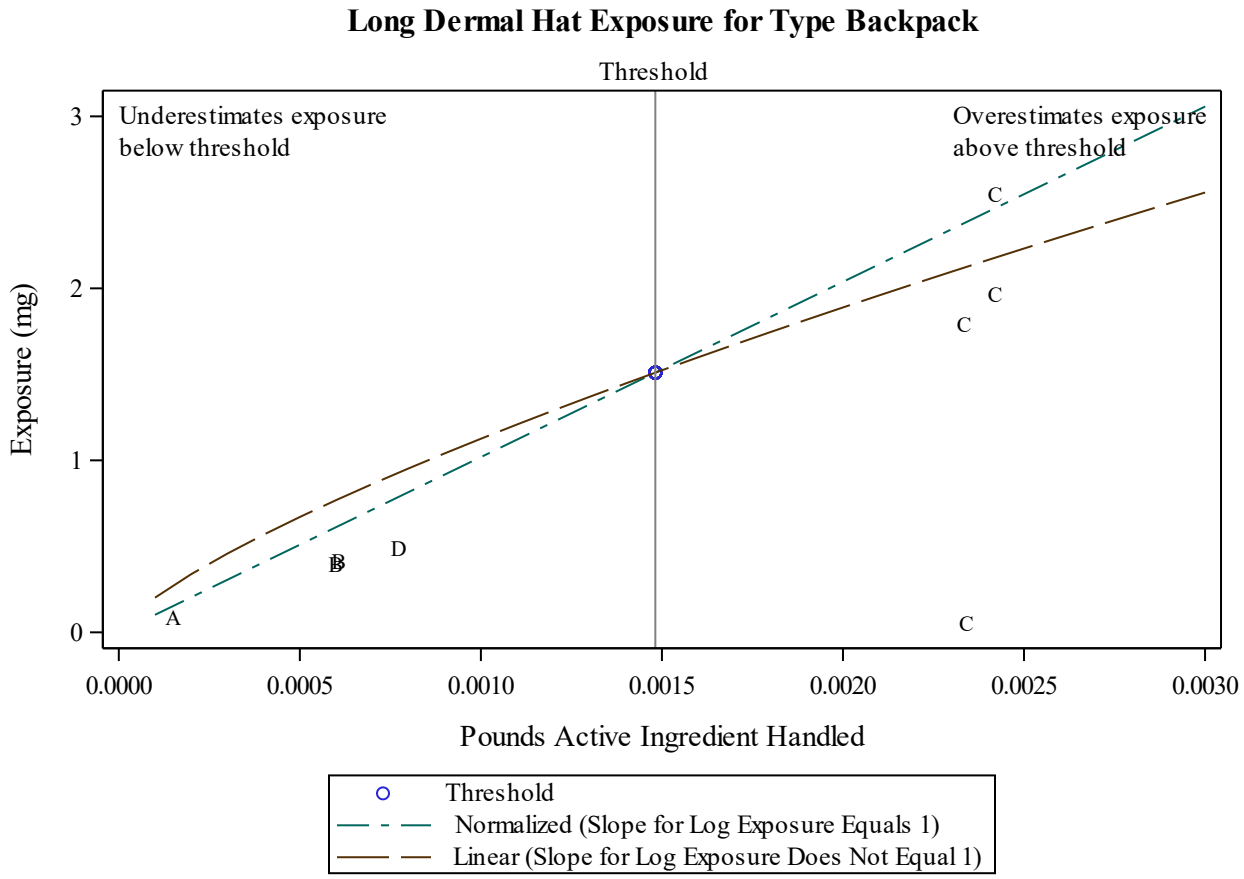
As proven above, the conditional mean exposure from the lognormal model will be greater than the conditional mean exposure from the linear model for normalizing factor values above the threshold (right hand side of the graph). The conditional mean exposure from the lognormal model will be less than the conditional mean exposure from the linear model for normalizing factor values below the threshold (left hand side of the graph).

The threshold plots for the analyses including the potential outlier ME 17 are shown below in Figures A67 to A99 for the 11 exposure routes and the sprayer type groups All, Backpack, and Cart. Note that for the Cart sprayer type, the threshold plots for the analyses including and excluding ME 17 are identical (other than the titles) since ME 17 used the Backpack sprayer. The threshold plots for the analyses excluding the potential outlier ME 17 are shown below in Figures B67 to B99 for the 11 exposure routes and the sprayer type groups All, Backpack, and Cart. Threshold plots are not presented for the Handheld sprayer type group due to the fact that those regression models had only one degree of freedom. (The threshold plot in Figure B71 for Long Short Dermal Hat exposure for the backpack sprayer type without the potential outlier looks very unusual compared to the other plots because the slope of 0.9997 is very close to 1 and gives a very high estimated Threshold value compared to the amounts of active ingredient used in the Scenario.)



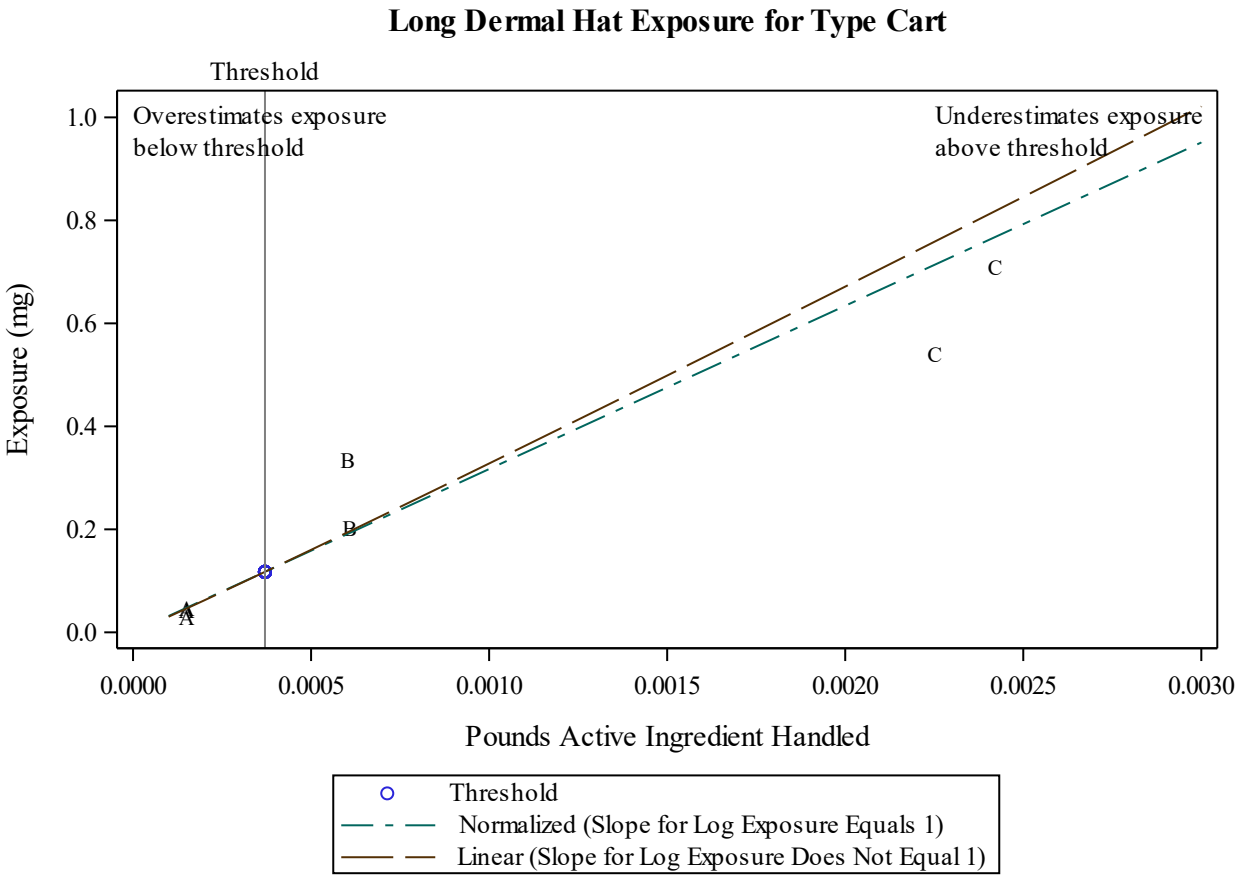
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A67. Threshold plot for Long Dermal Hat Exposure (mg). Group = All.



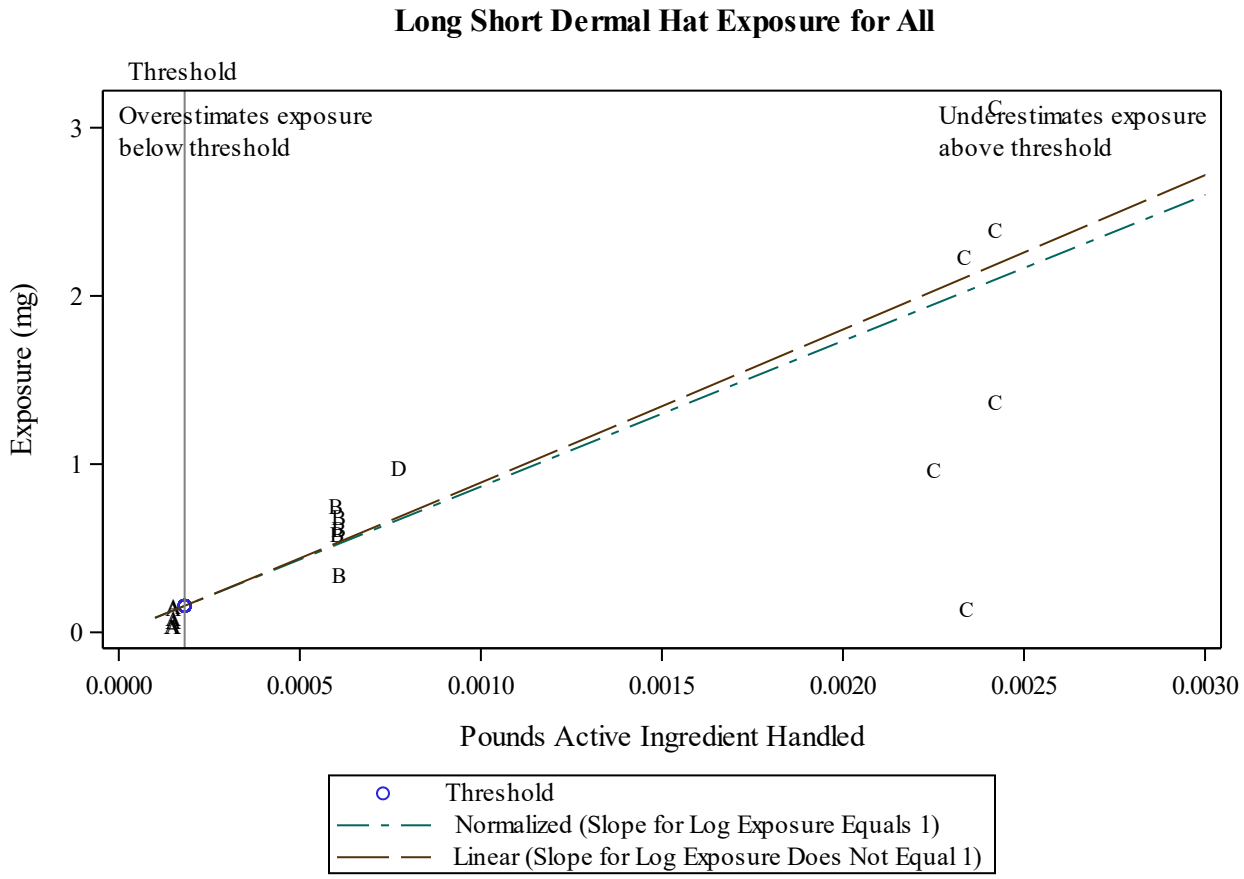
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A68. Threshold plot for Long Dermal Hat Exposure (mg). Group = Type Backpack.



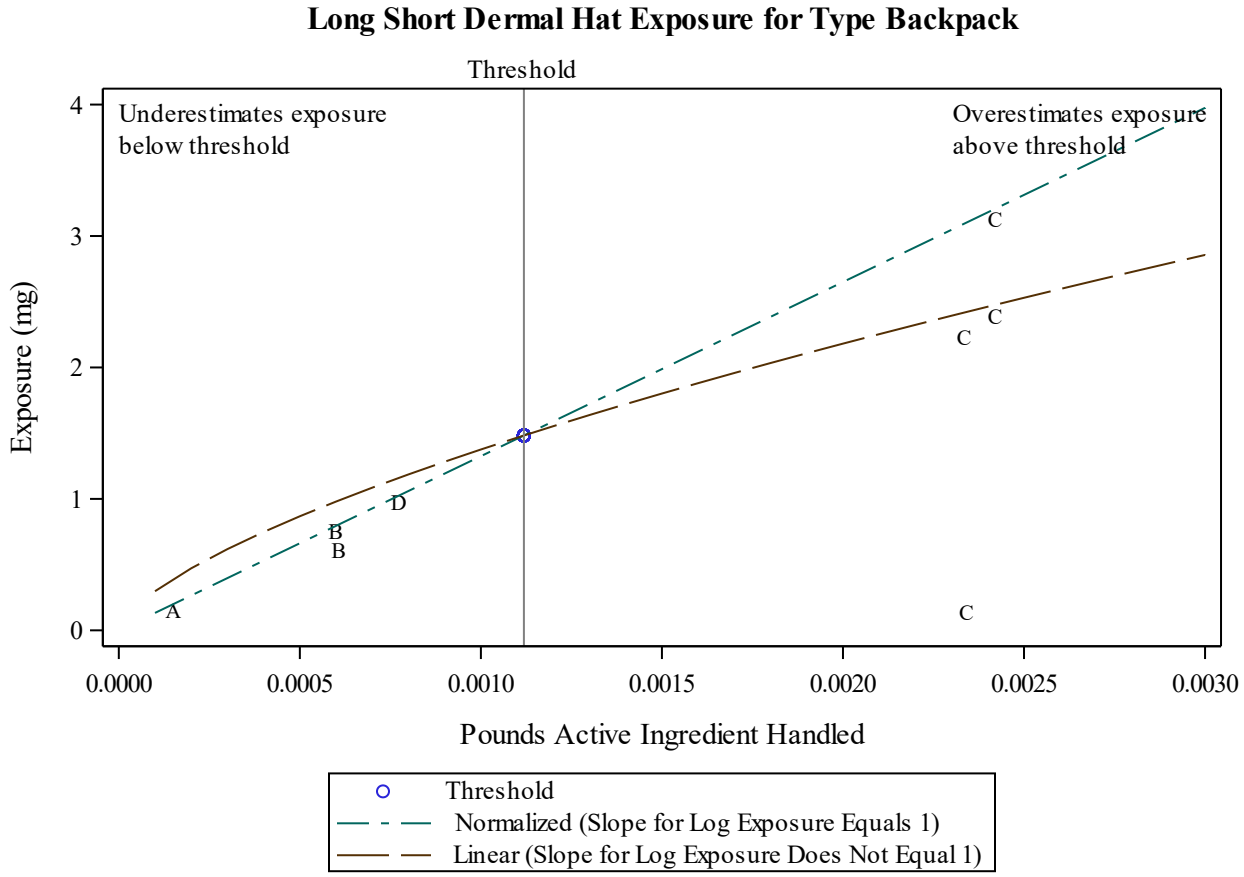
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A69. Threshold plot for Long Dermal Hat Exposure (mg). Group = Type Cart.



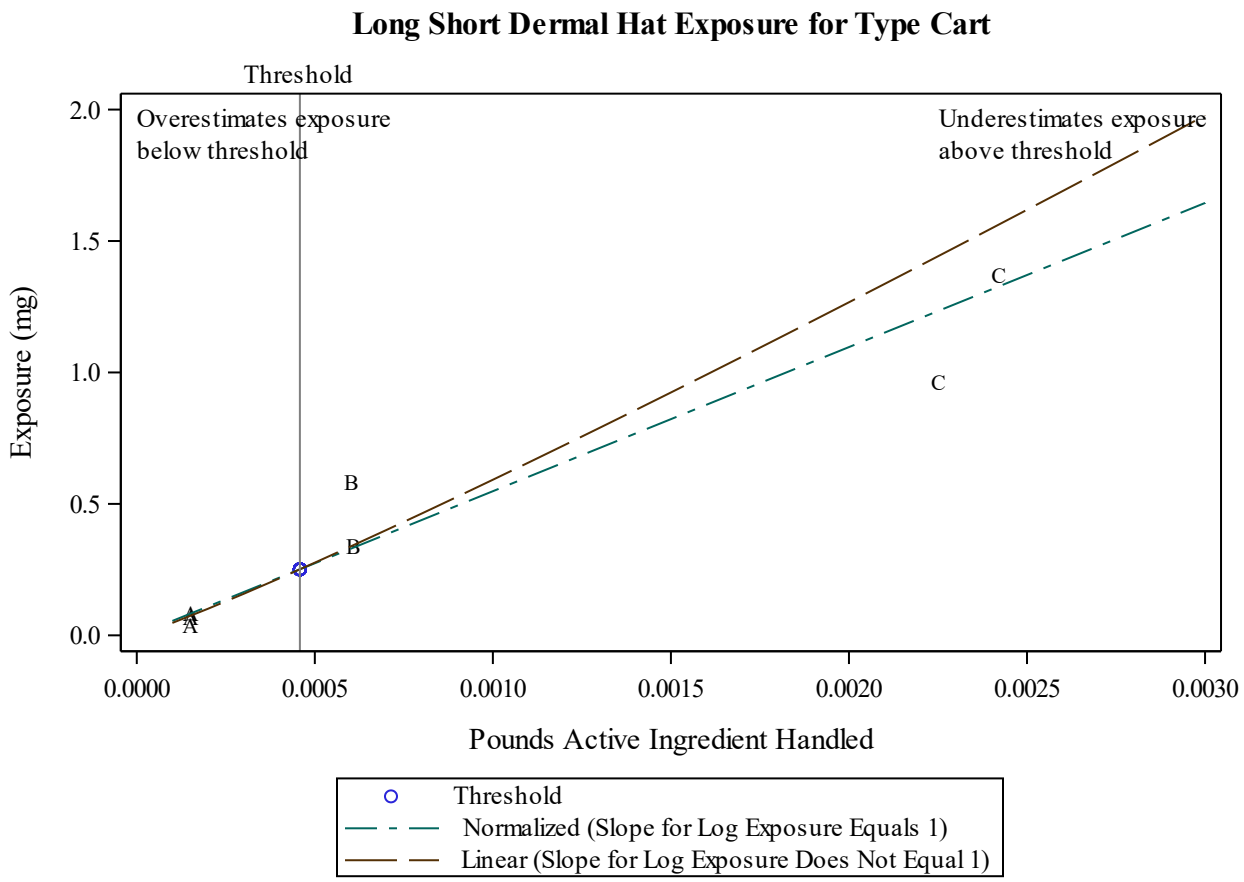
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A70. Threshold plot for Long Short Dermal Hat Exposure (mg). Group = All.



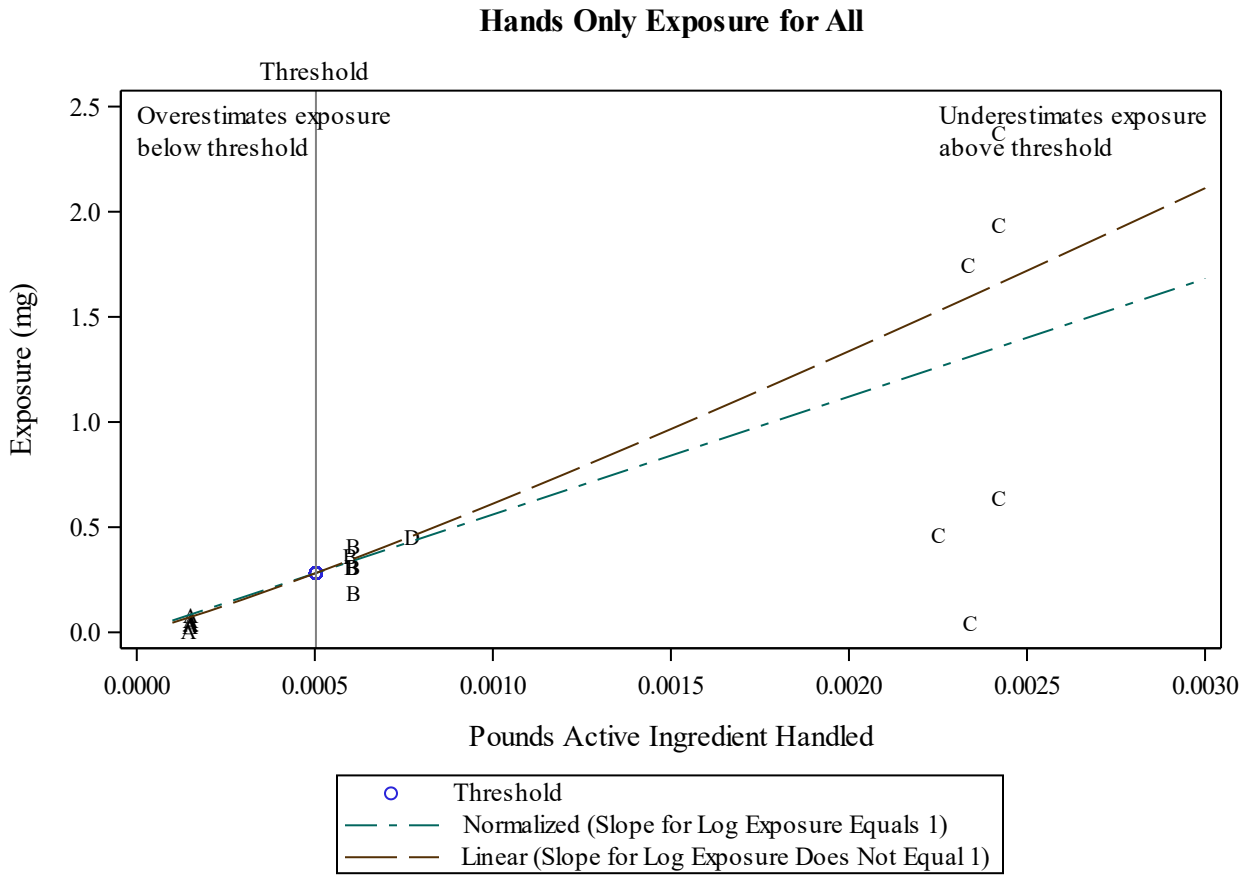
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A71. Threshold plot for Long Short Dermal Hat Exposure (mg). Group = Type Backpack.



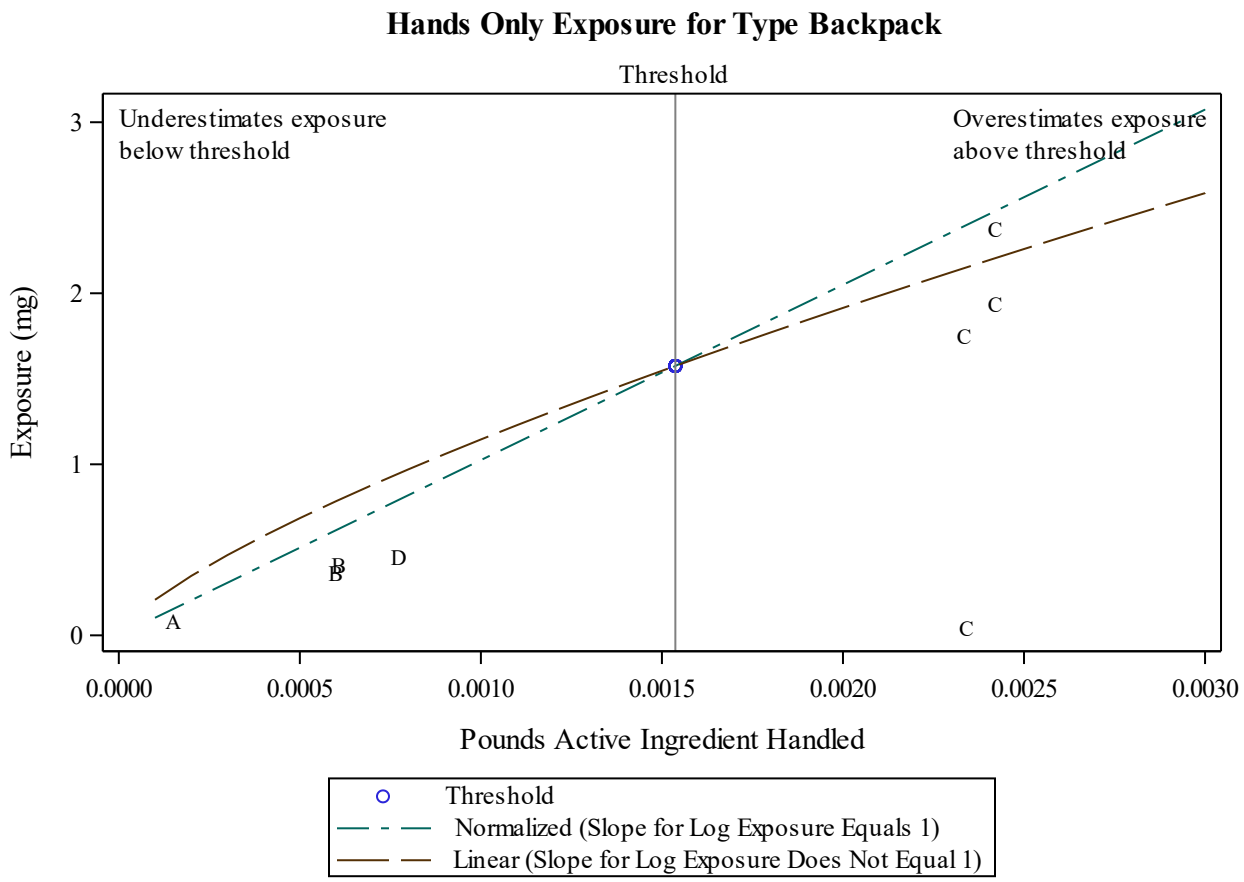
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A72. Threshold plot for Long Short Dermal Hat Exposure (mg). Group = Type Cart.



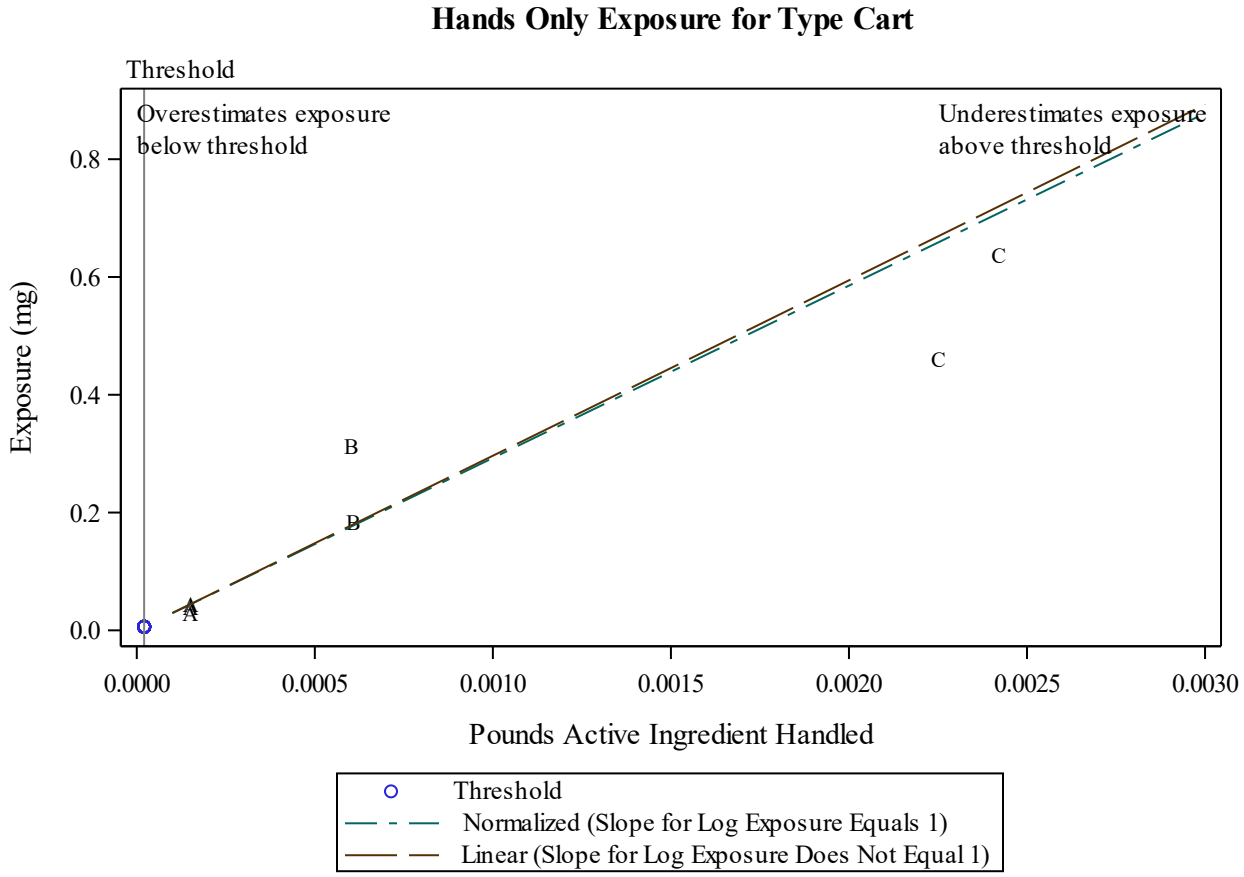
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A73. Threshold plot for Hands Only Exposure (mg). Group = All.



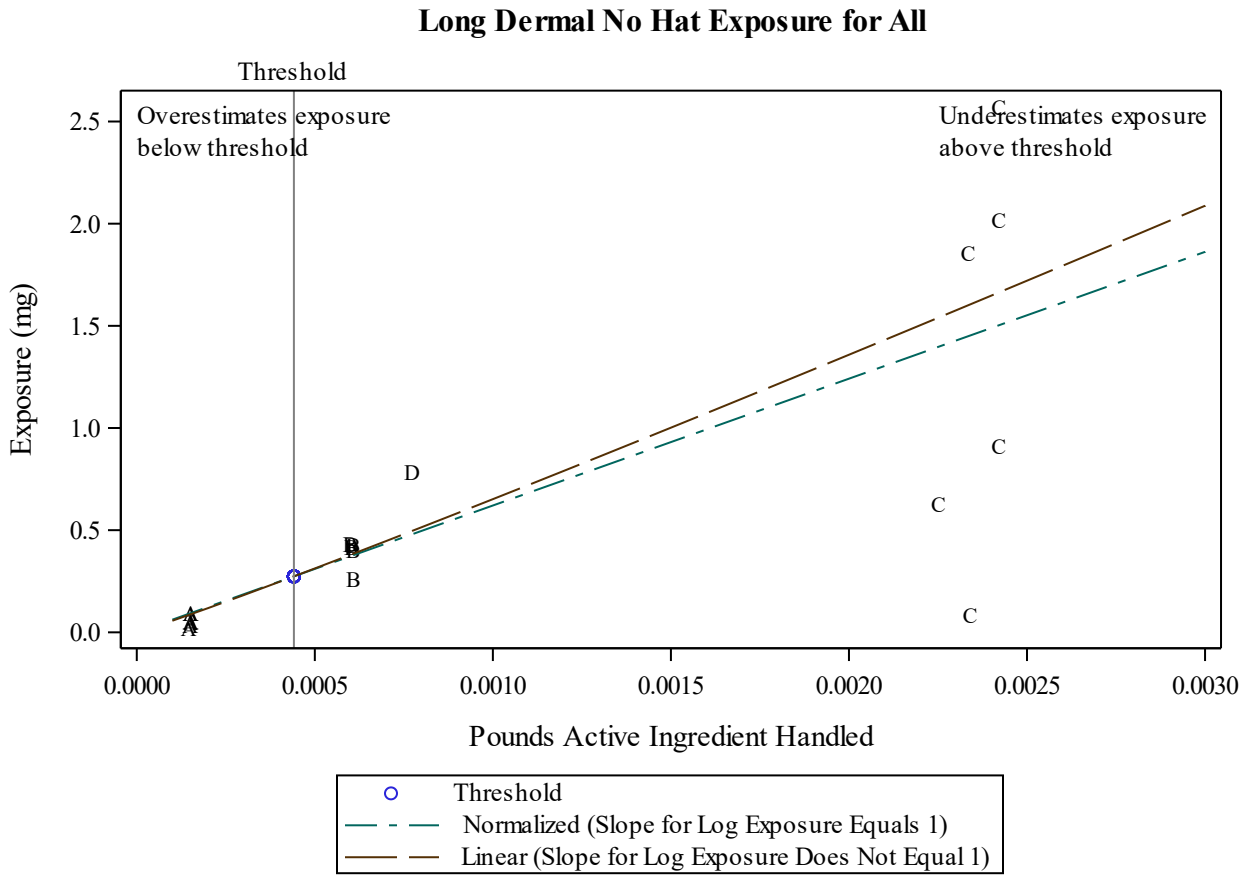
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A74. Threshold plot for Hands Only Exposure (mg). Group = Type Backpack.



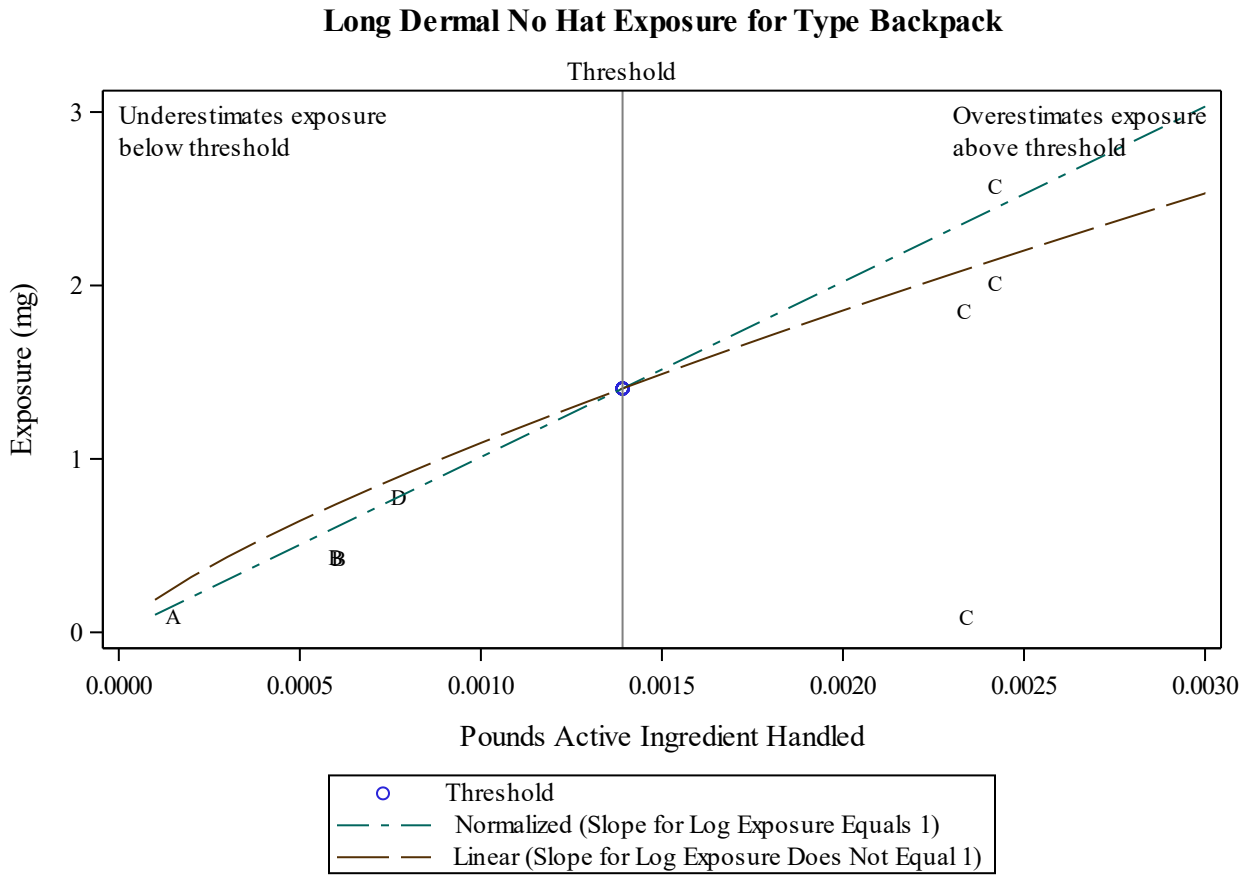
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A75. Threshold plot for Hands Only Exposure (mg). Group = Type Cart.



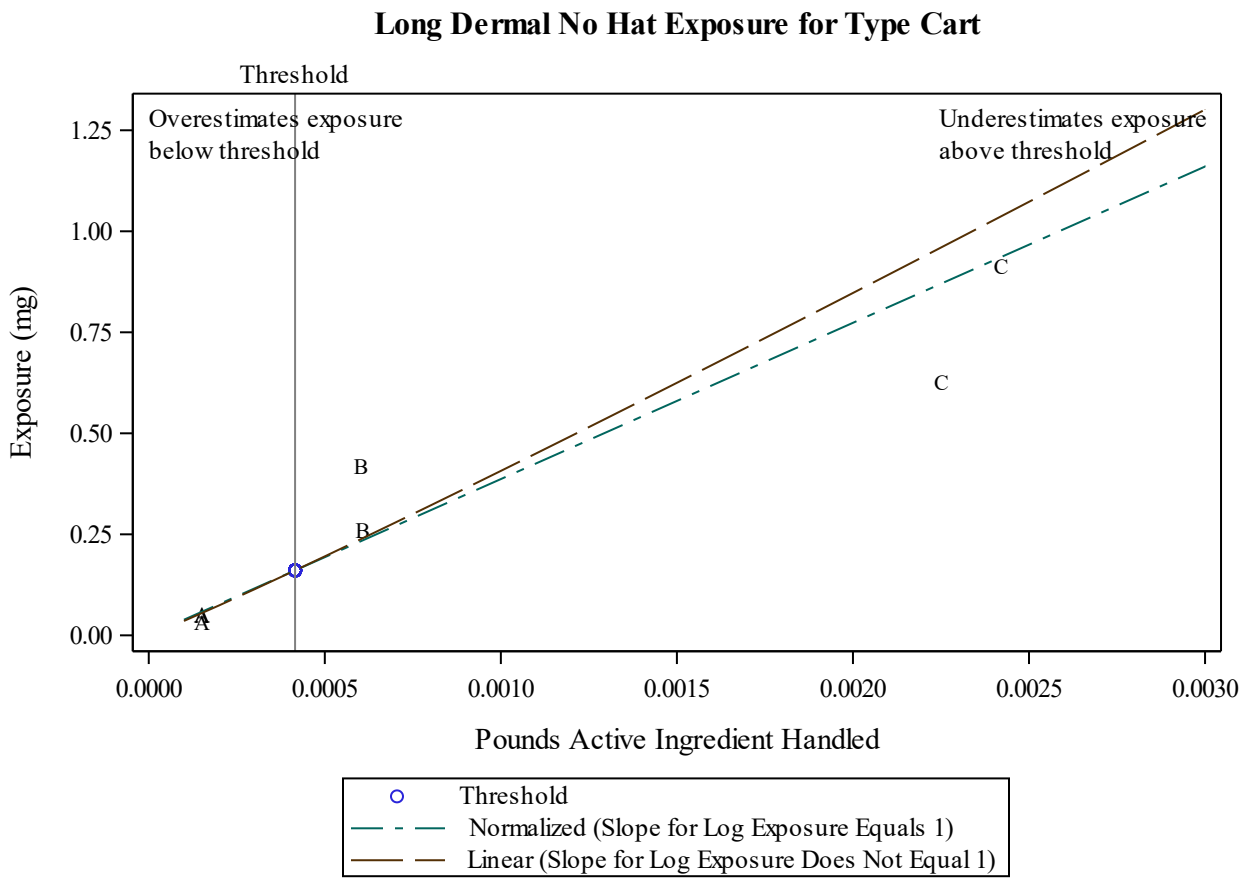
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A76. Threshold plot for Long Dermal No Hat Exposure (mg). Group = All.



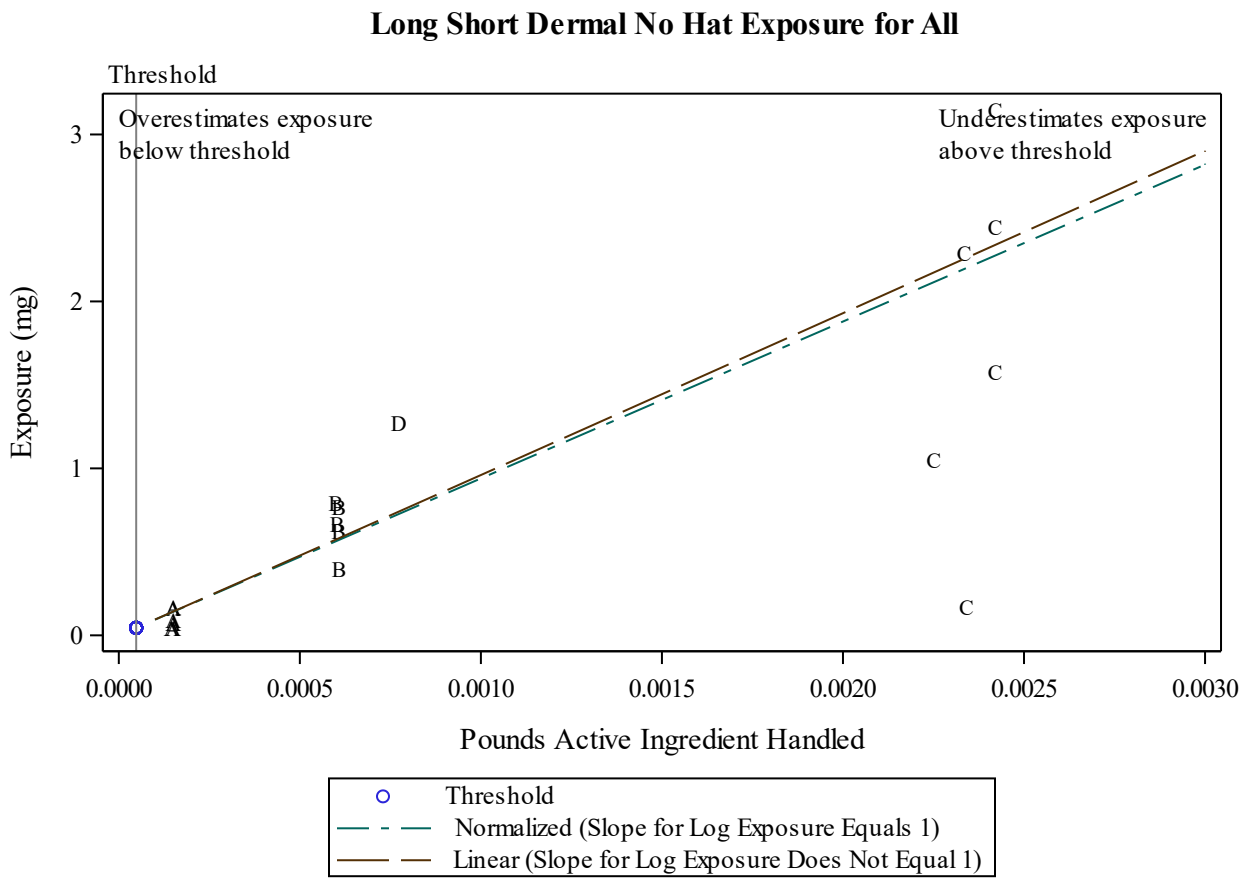
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A77. Threshold plot for Long Dermal No Hat Exposure (mg). Group = Type Backpack.



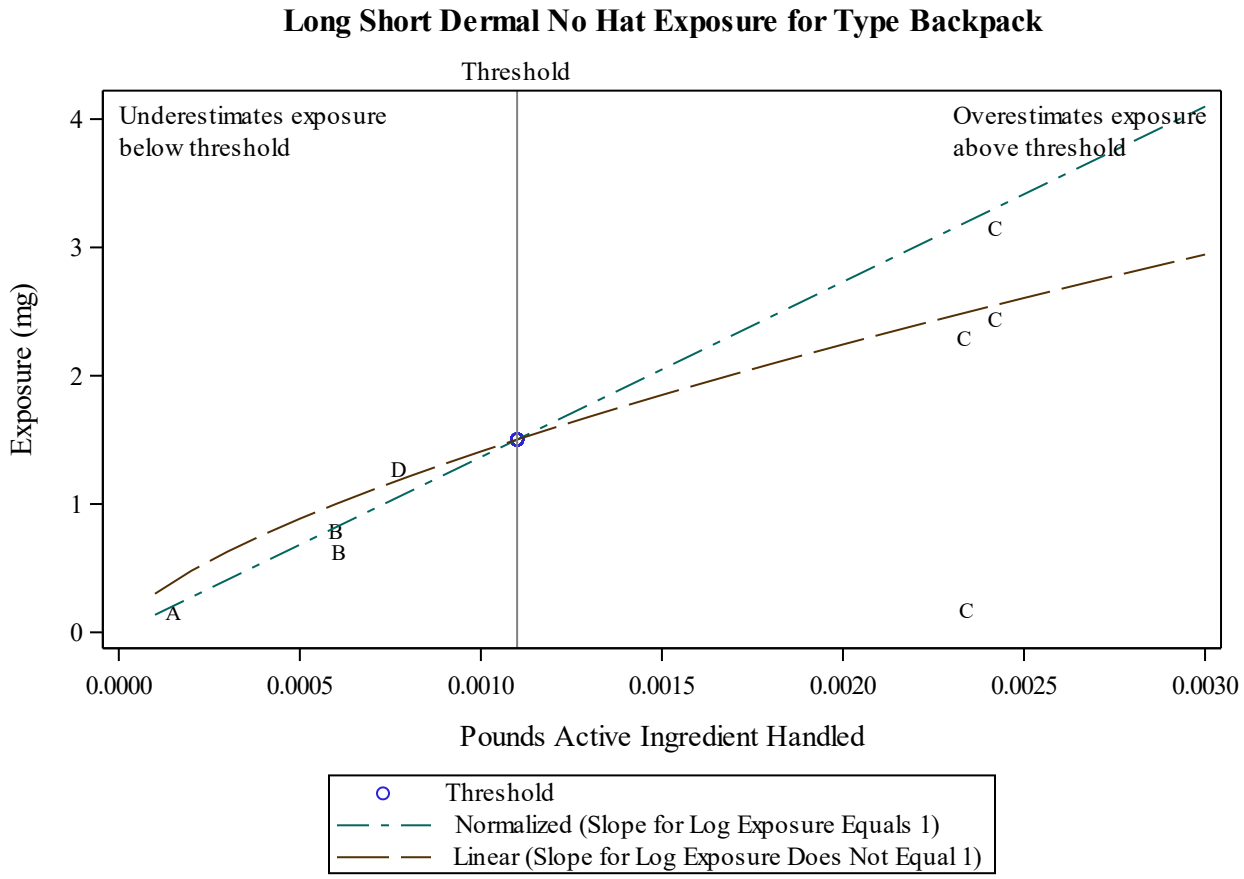
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A78. Threshold plot for Long Dermal No Hat Exposure (mg). Group = Type Cart.



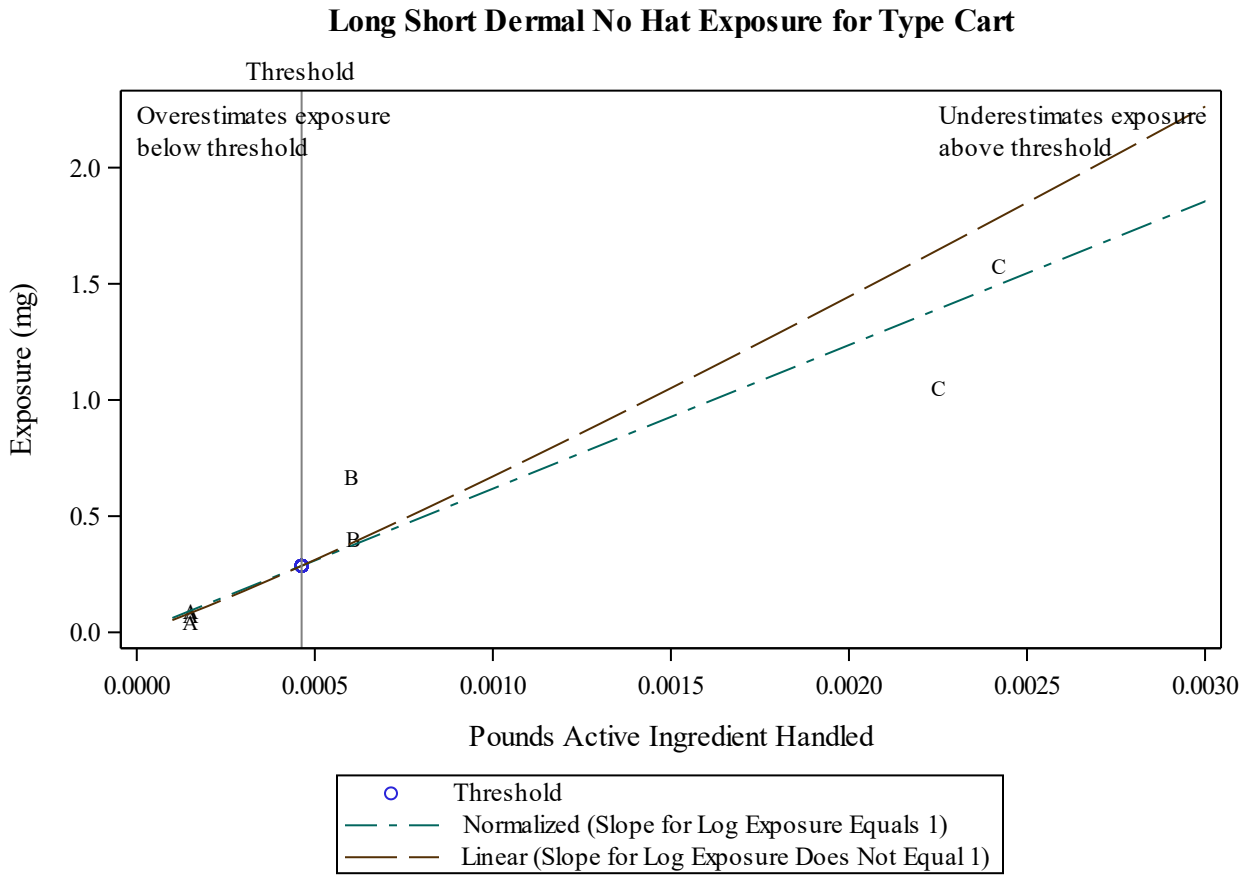
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A79. Threshold plot for Long Short Dermal No Hat Exposure (mg). Group = All.



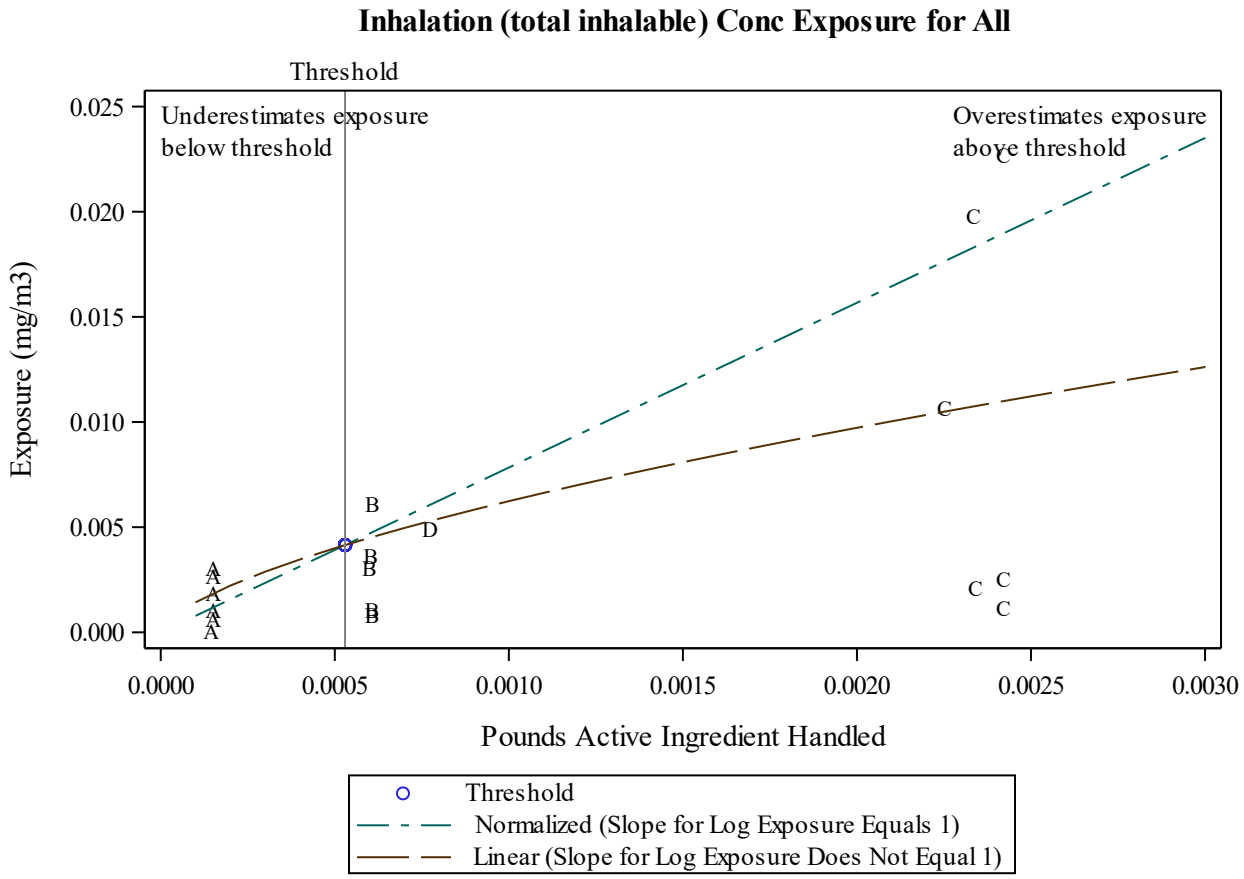
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A80. Threshold plot for Long Short Dermal No Hat Exposure (mg). Group = Type Backpack.



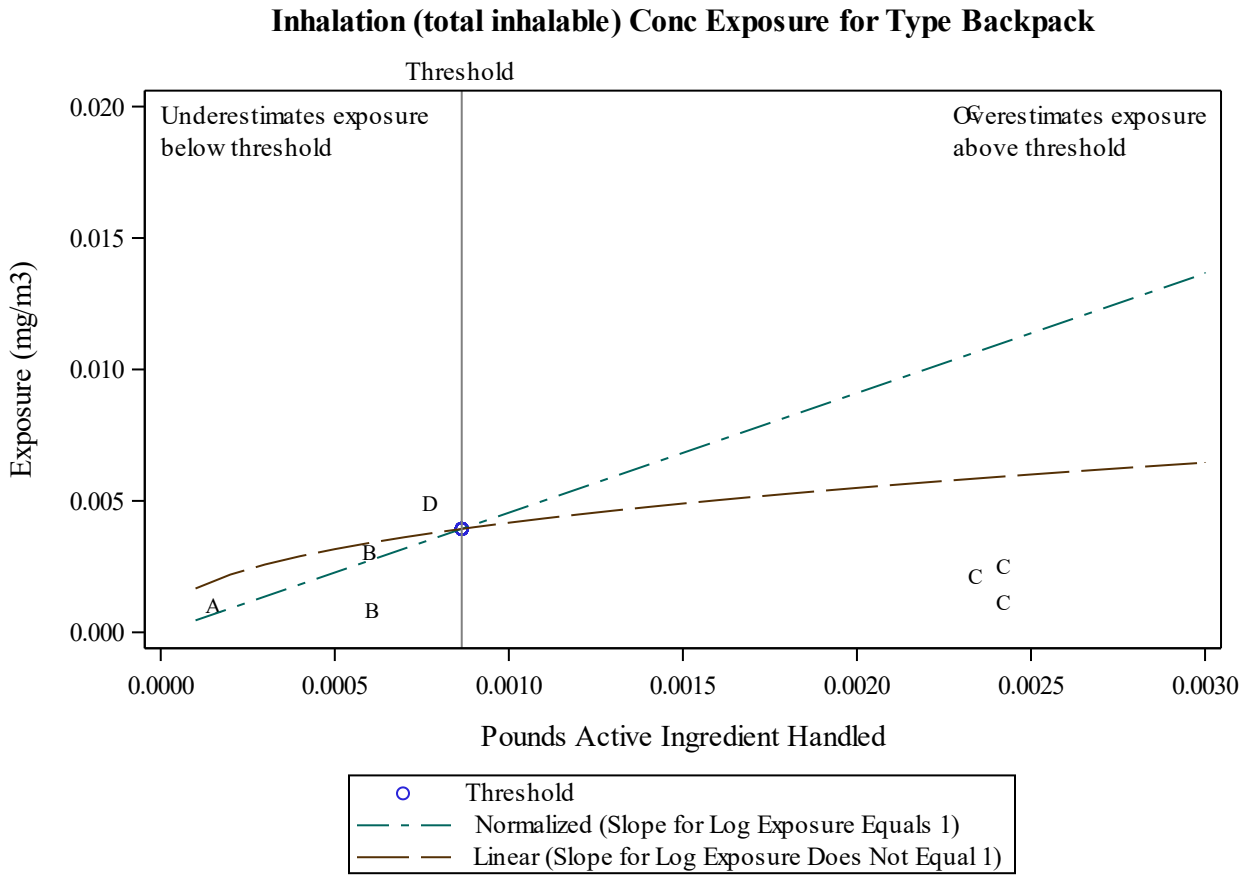
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A81. Threshold plot for Long Short Dermal No Hat Exposure (mg). Group = Type Cart.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A82. Threshold plot for Inhalation (total inhalable) Concentration Exposure (mg/m^3). Group = All.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A83. Threshold plot for Inhalation (total inhalable) Concentration Exposure (mg/m^3). Group = Type Backpack.

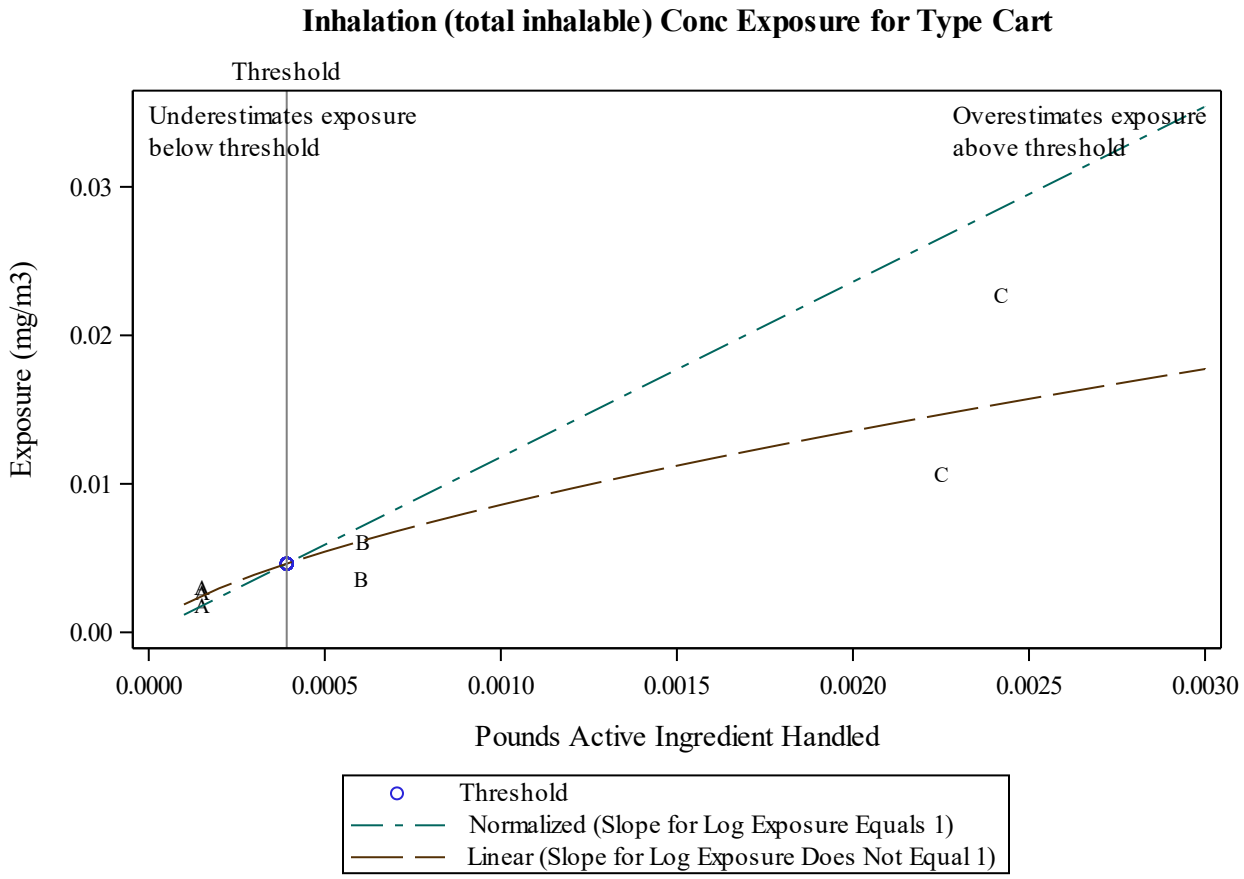
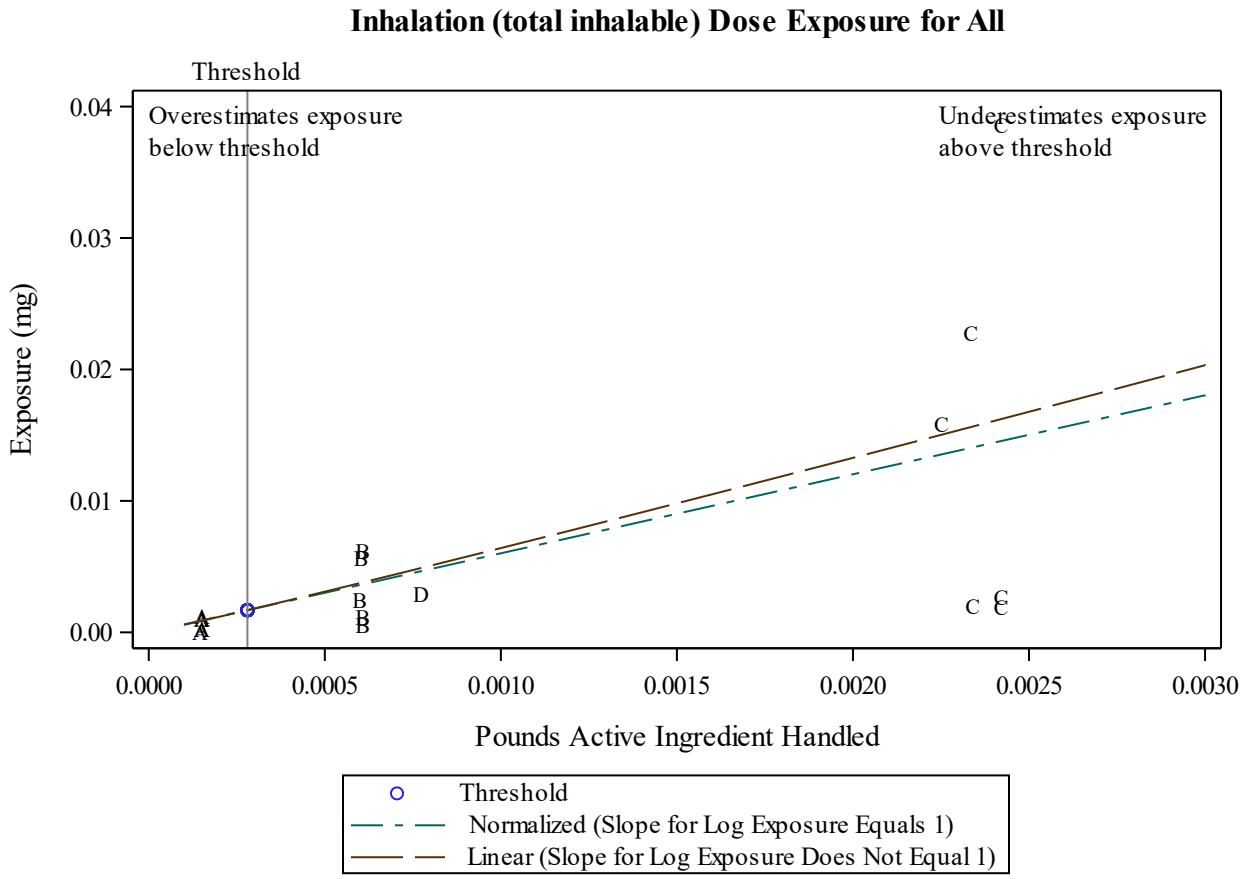


Figure A84. Threshold plot for Inhalation (total inhalable) Concentration Exposure (mg/m^3). Group = Type Cart.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A85. Threshold plot for Inhalation (total inhalable) Dose Exposure (mg). Group = All.

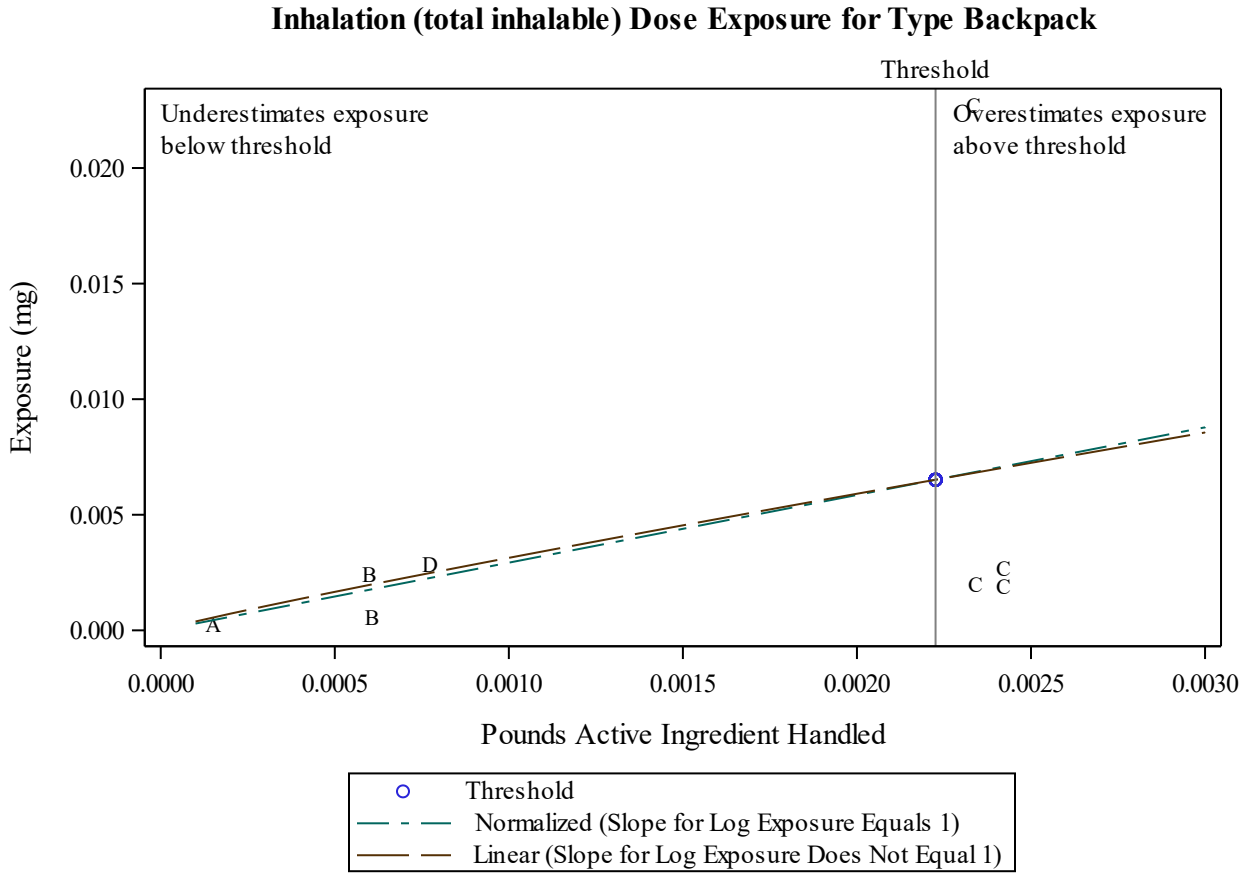
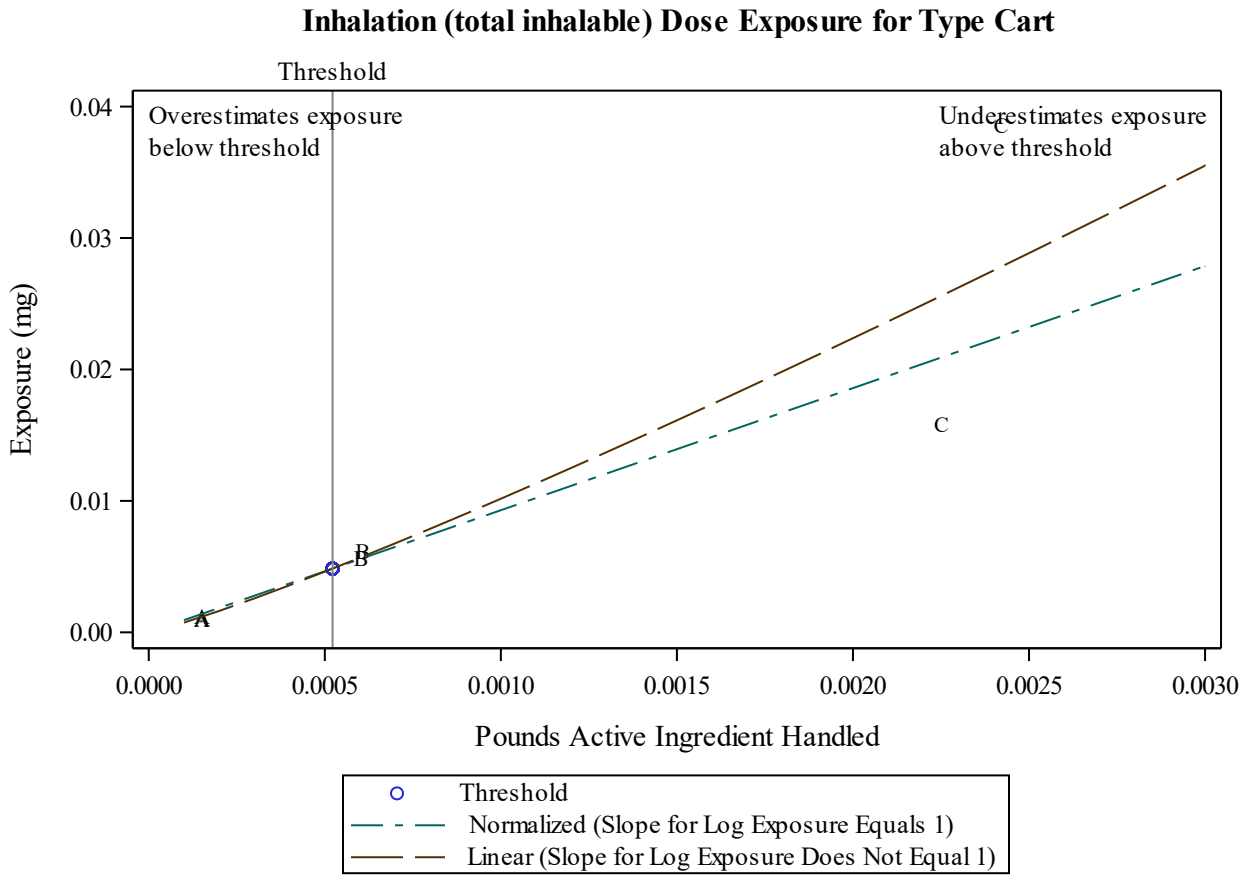
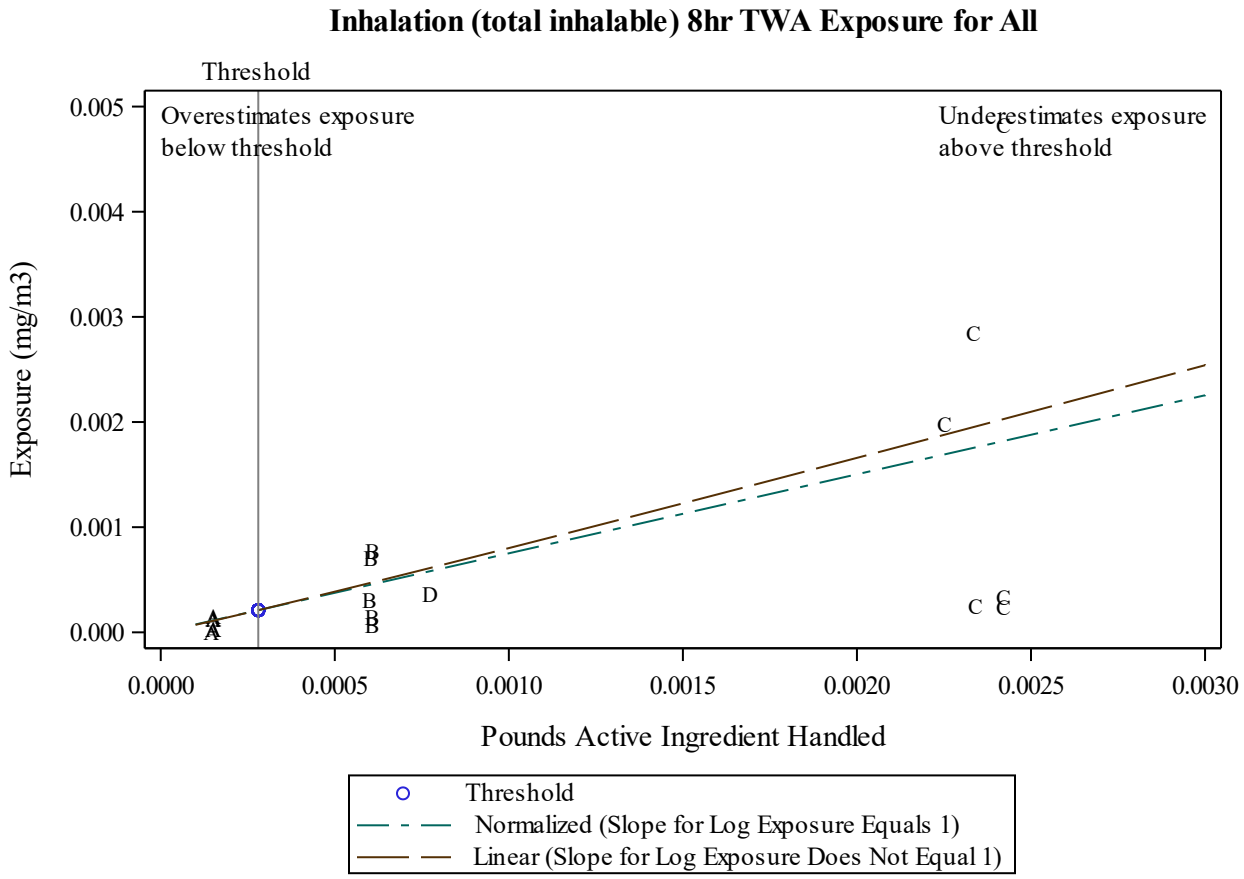


Figure A86. Threshold plot for Inhalation (total inhalable) Dose Exposure (mg). Group = Type Backpack.



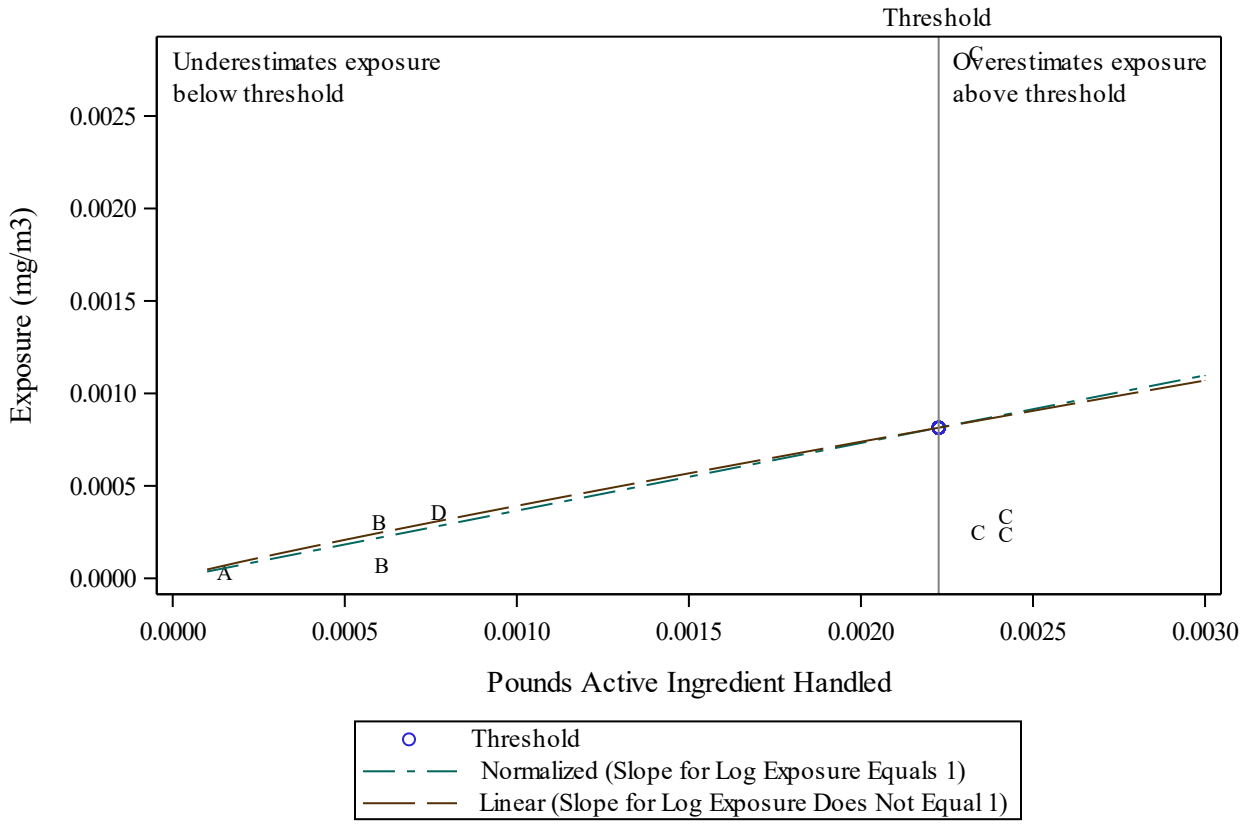
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A87. Threshold plot for Inhalation (total inhalable) Dose Exposure (mg). Group = Type Cart.



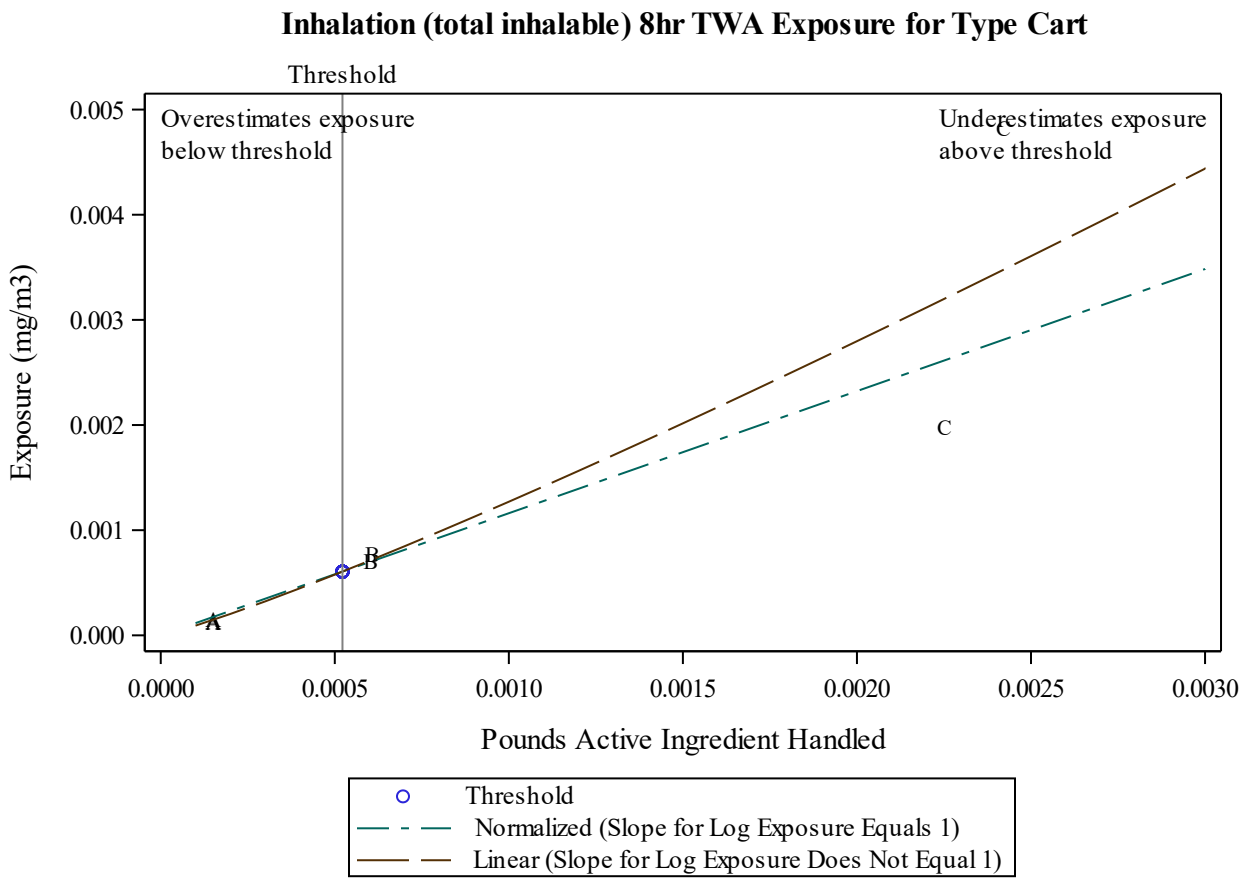
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A88. Threshold plot for Inhalation (total inhalable) Time-Weighted Average Exposure (mg/m^3). Group = All.



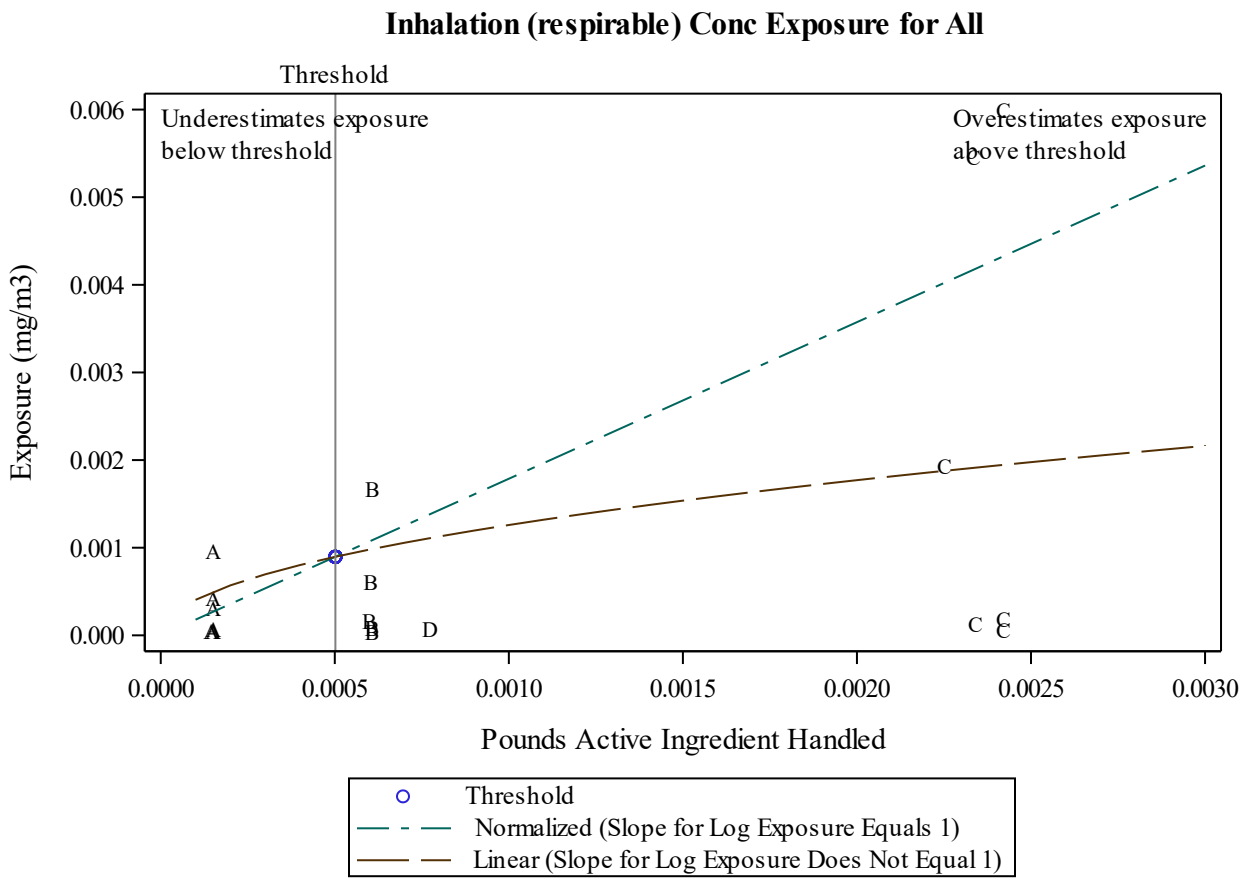
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A89. Threshold plot for Inhalation (total inhalable) Time-Weighted Average Exposure (mg/m^3). Group = Type Backpack.



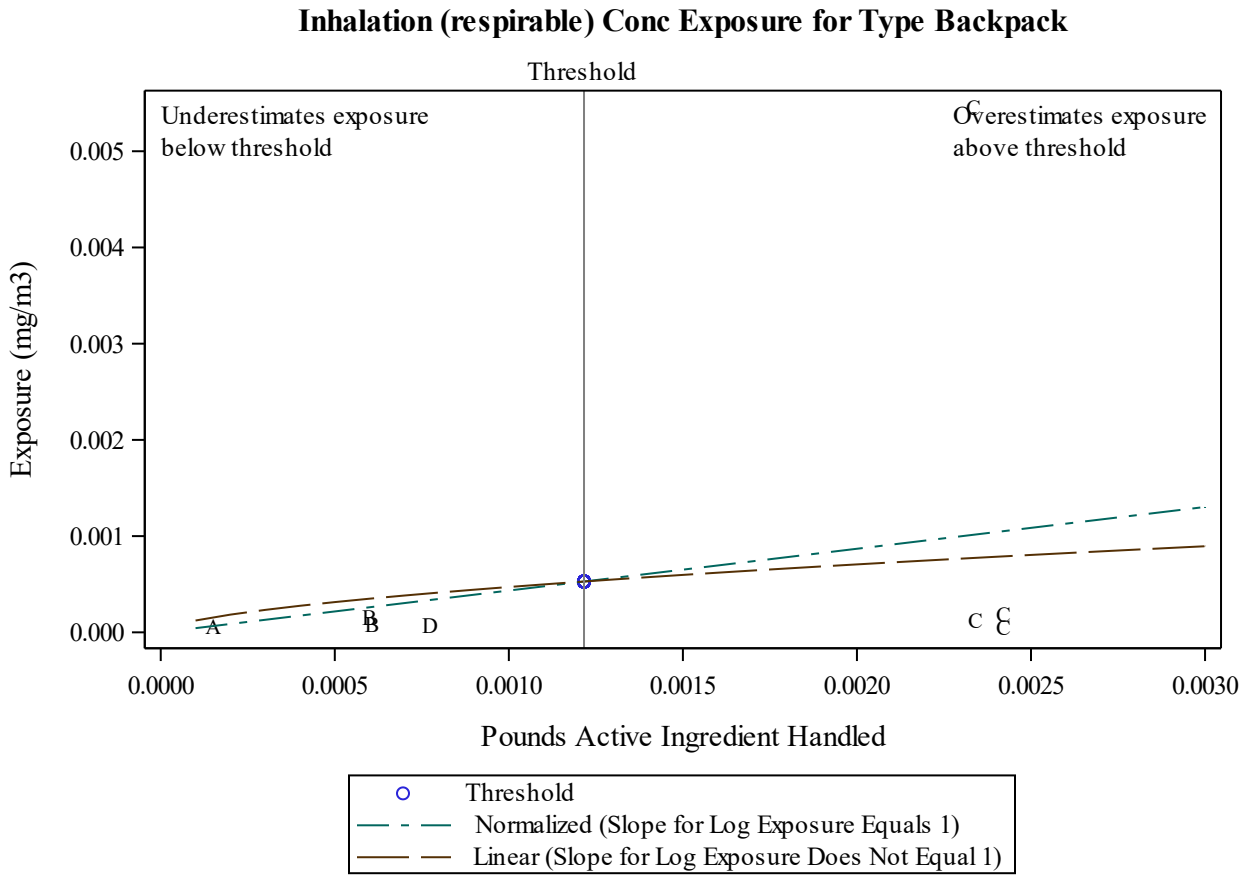
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A90. Threshold plot for Inhalation (total inhalable) Time-Weighted Average Exposure (mg/m^3). Group = Type Cart.



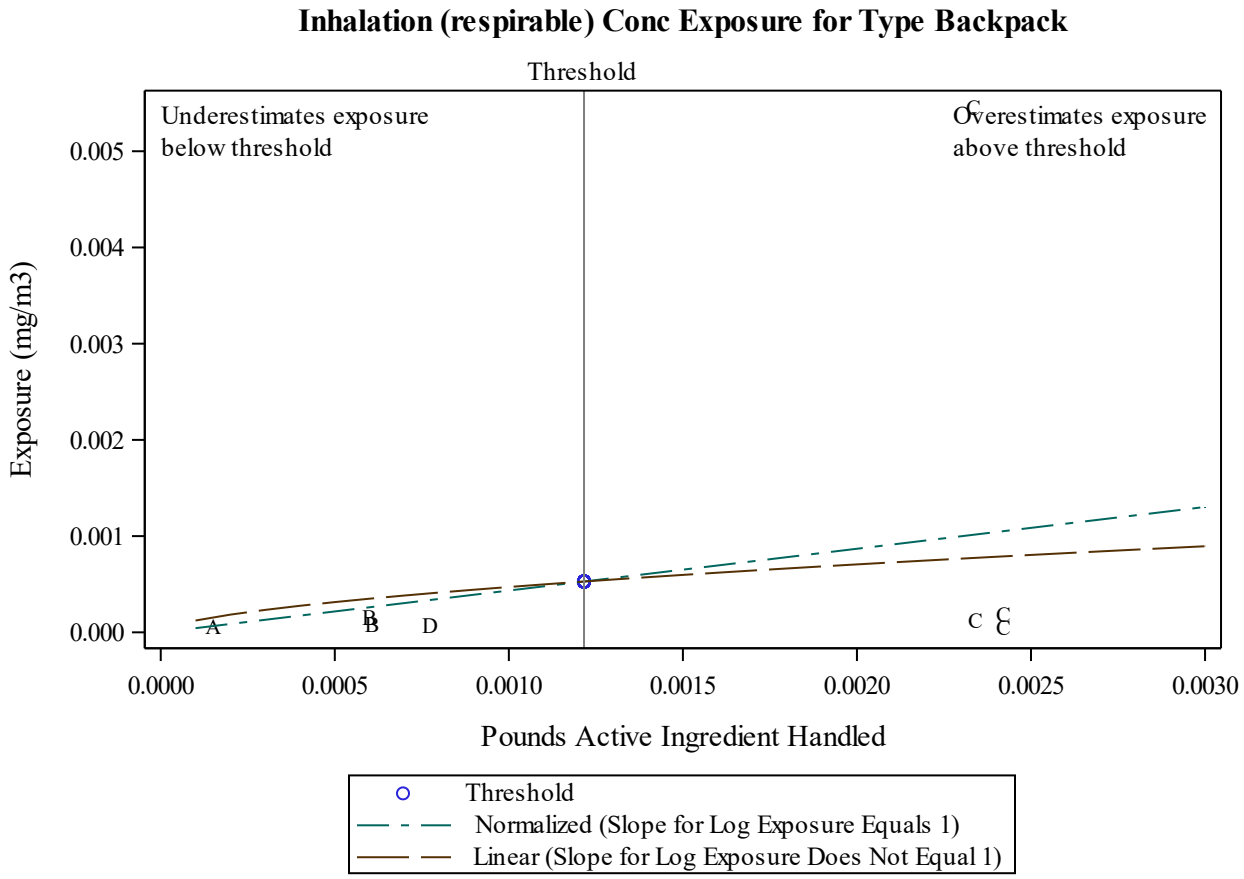
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A91. Threshold plot for Inhalation (respirable) Concentration Exposure (mg/m^3). Group = All.



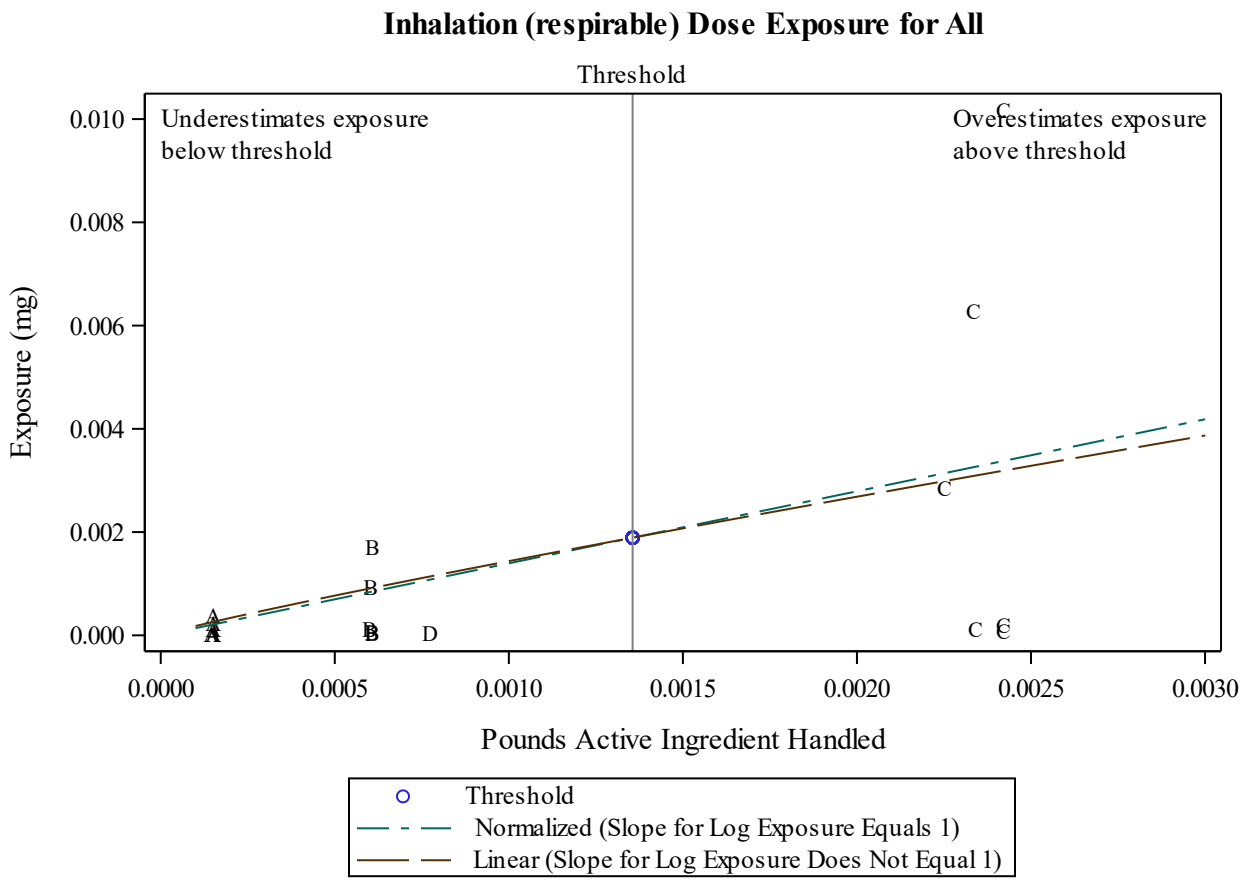
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A92. Threshold plot for Inhalation (respirable) Concentration Exposure (mg/m^3). Group = Type Backpack.



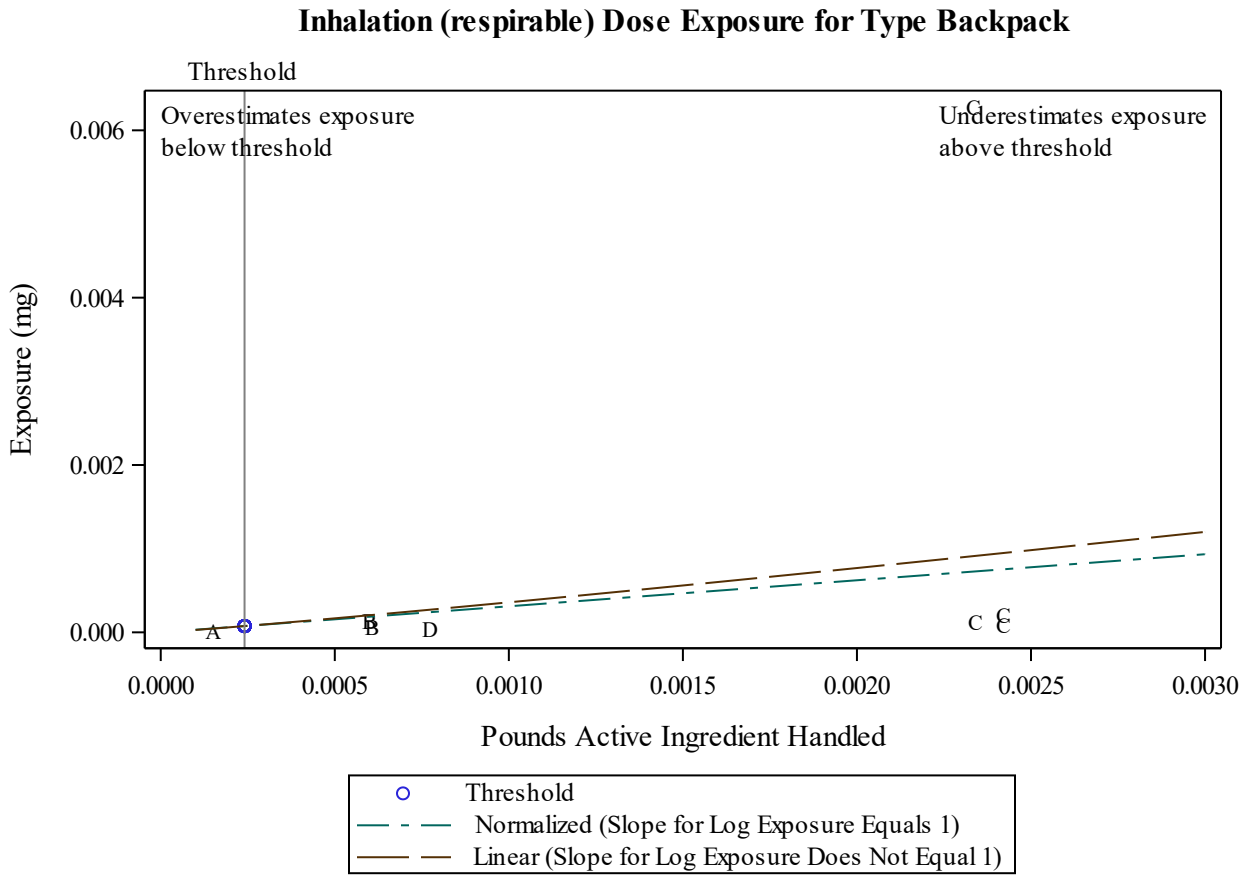
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A93. Threshold plot for Inhalation (respirable) Concentration Exposure (mg/m^3). Group = Type Cart.



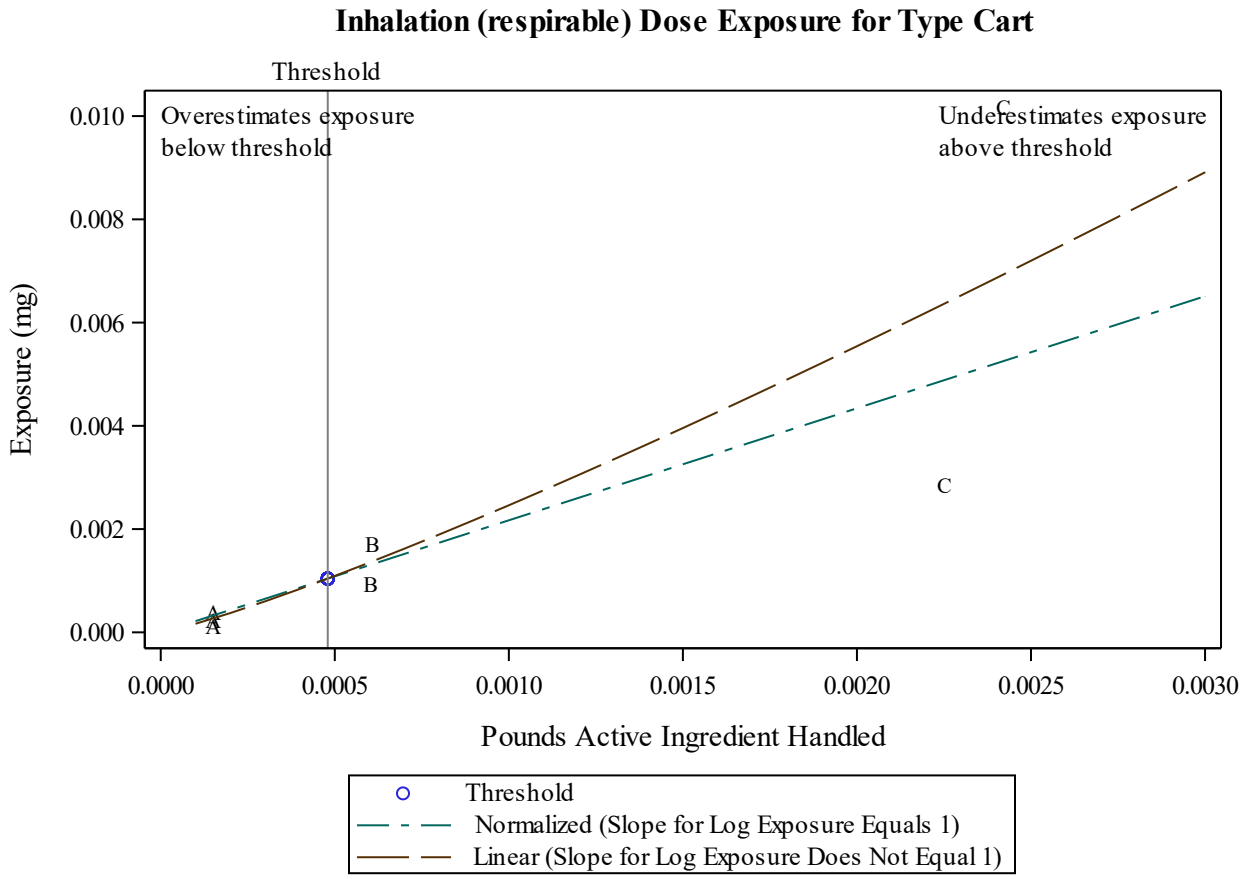
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A94. Threshold plot for Inhalation (respirable) Dose Exposure (mg). Group = All.



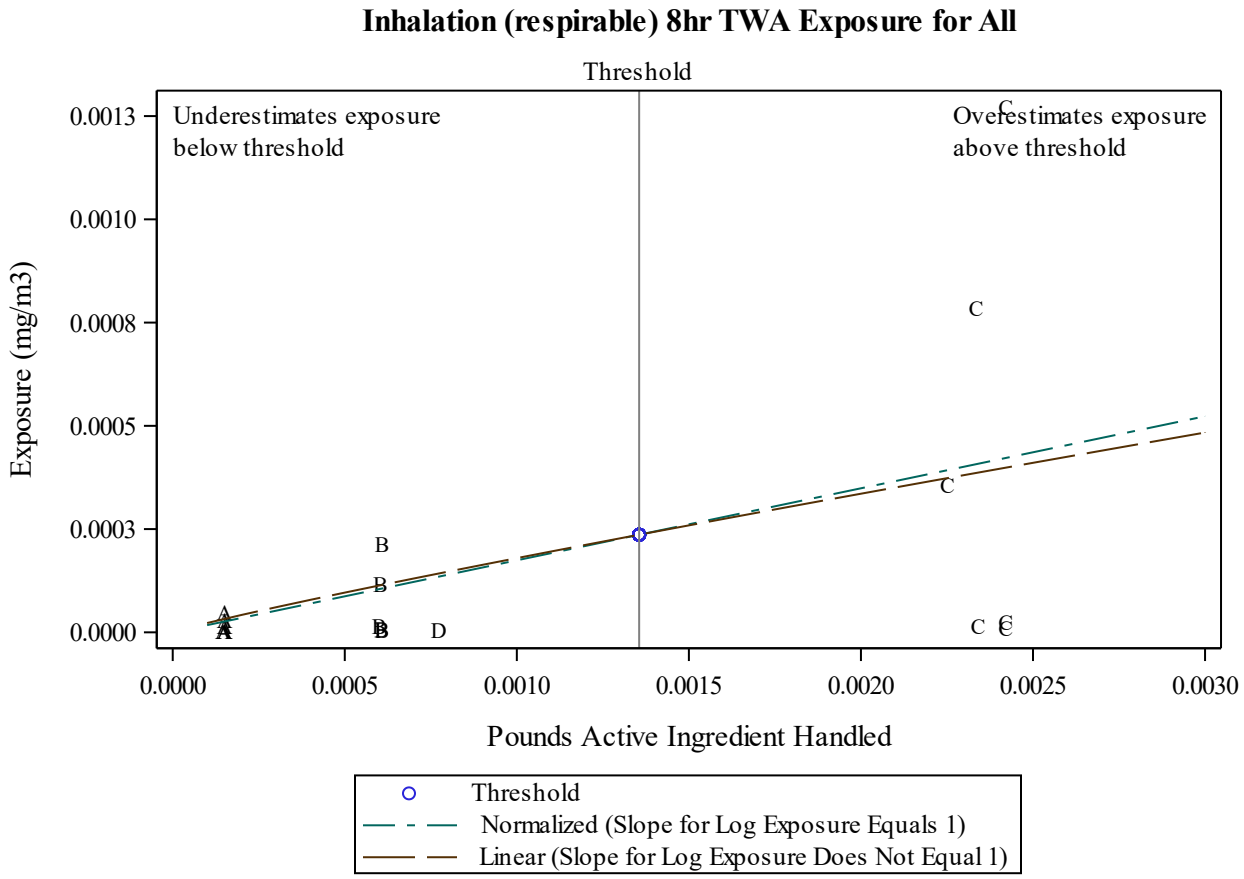
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A95. Threshold plot for Inhalation (respirable) Dose Exposure (mg). Group = Type Backpack.



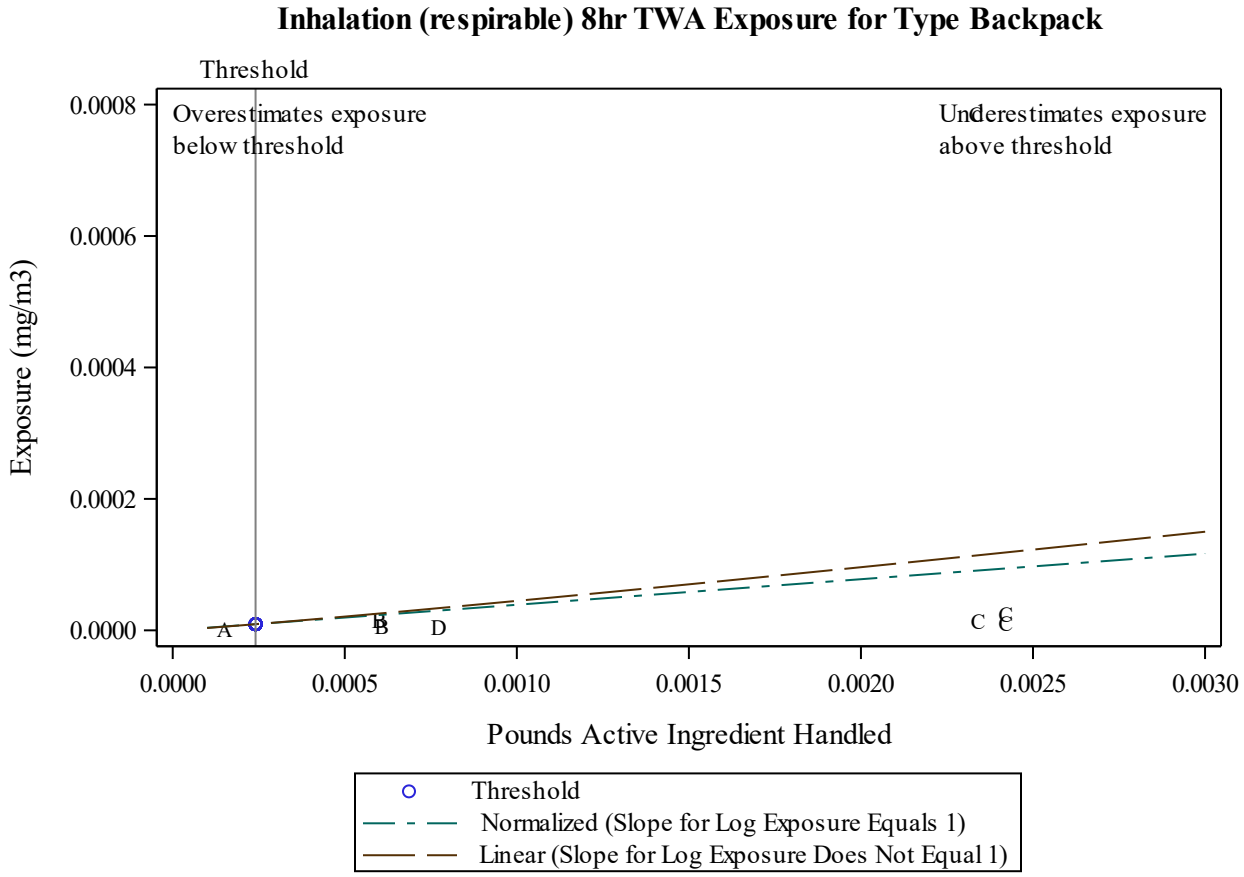
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A96. Threshold plot for Inhalation (respirable) Dose Exposure (mg). Group = Type Cart.



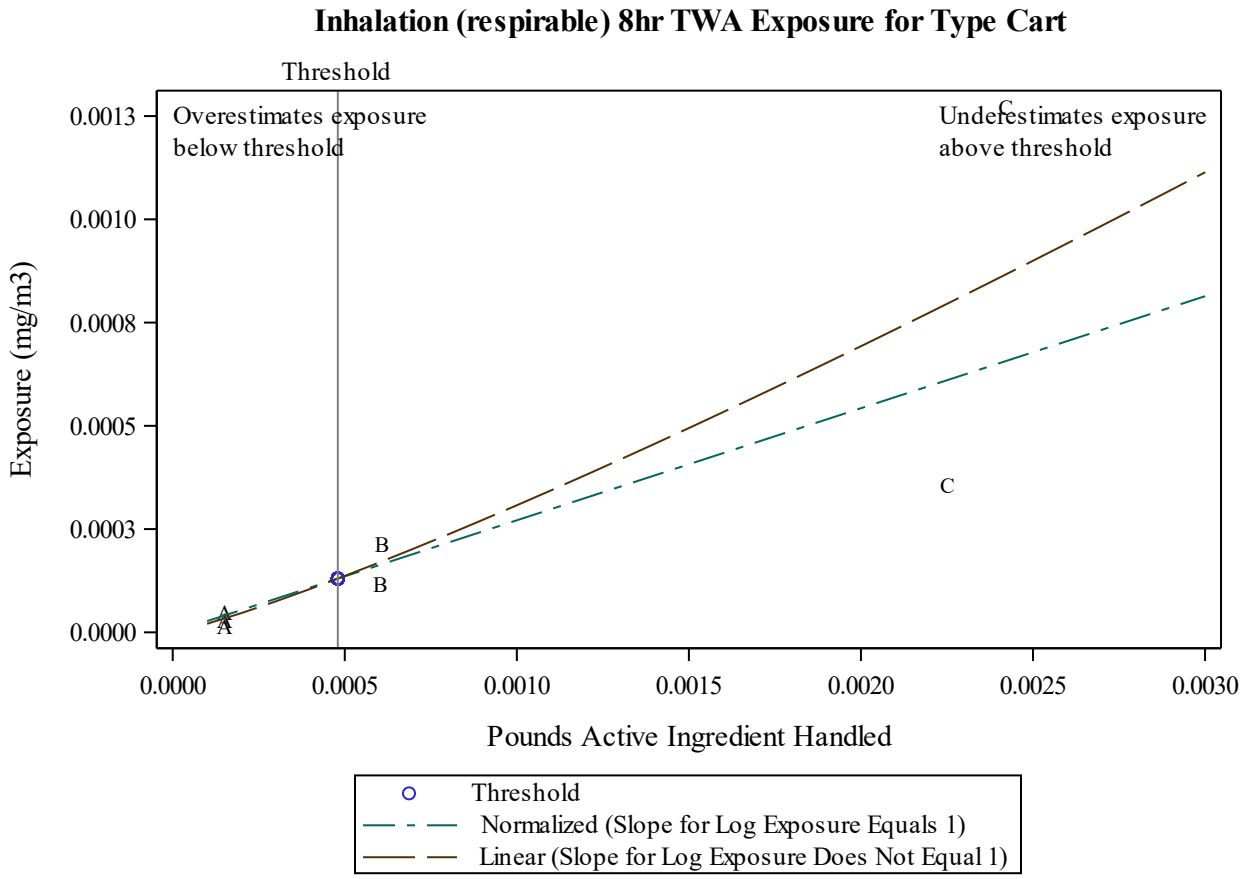
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A97. Threshold plot for Inhalation (respirable) Time-Weighted Average Exposure (mg/m^3). Group = All.



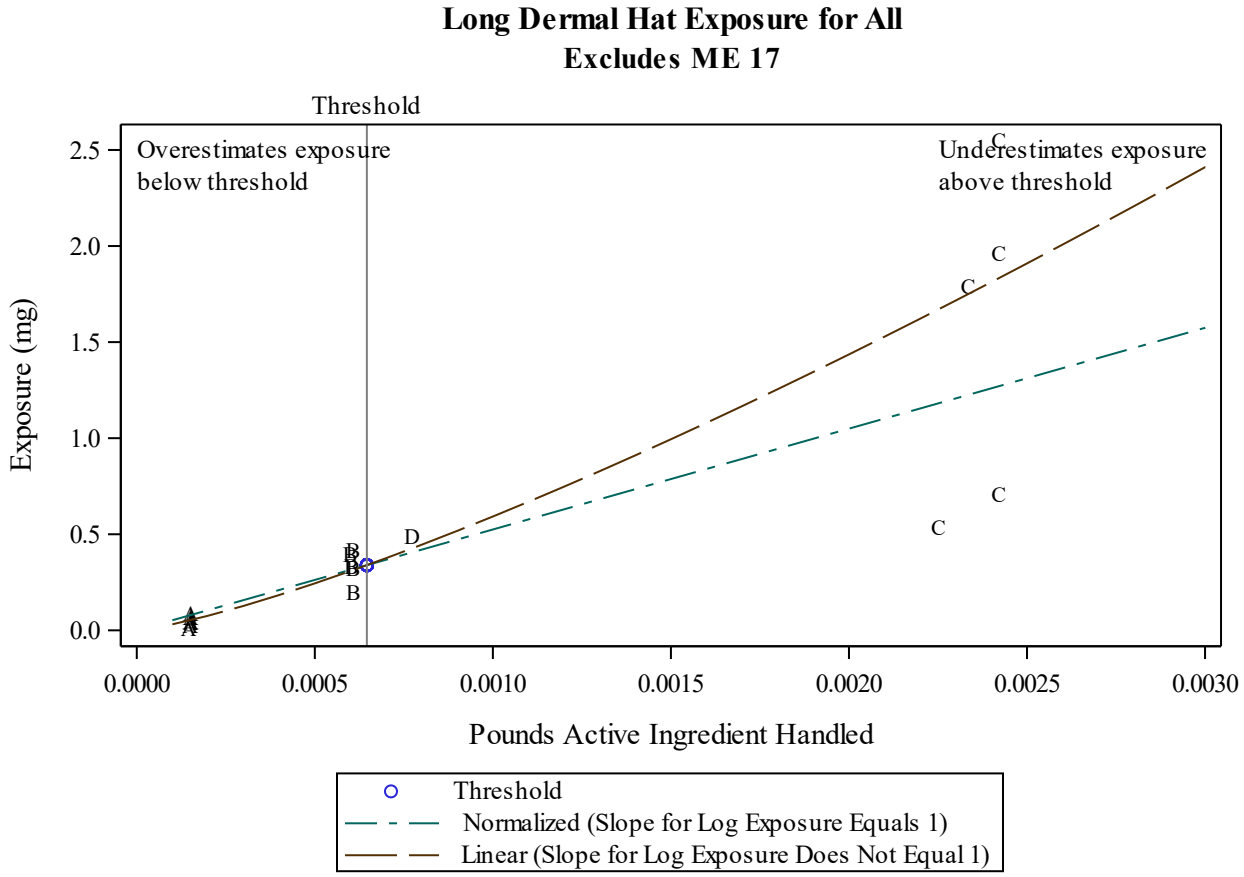
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A98. Threshold plot for Inhalation (respirable) Time-Weighted Average Exposure (mg/m^3). Group = Type Backpack.



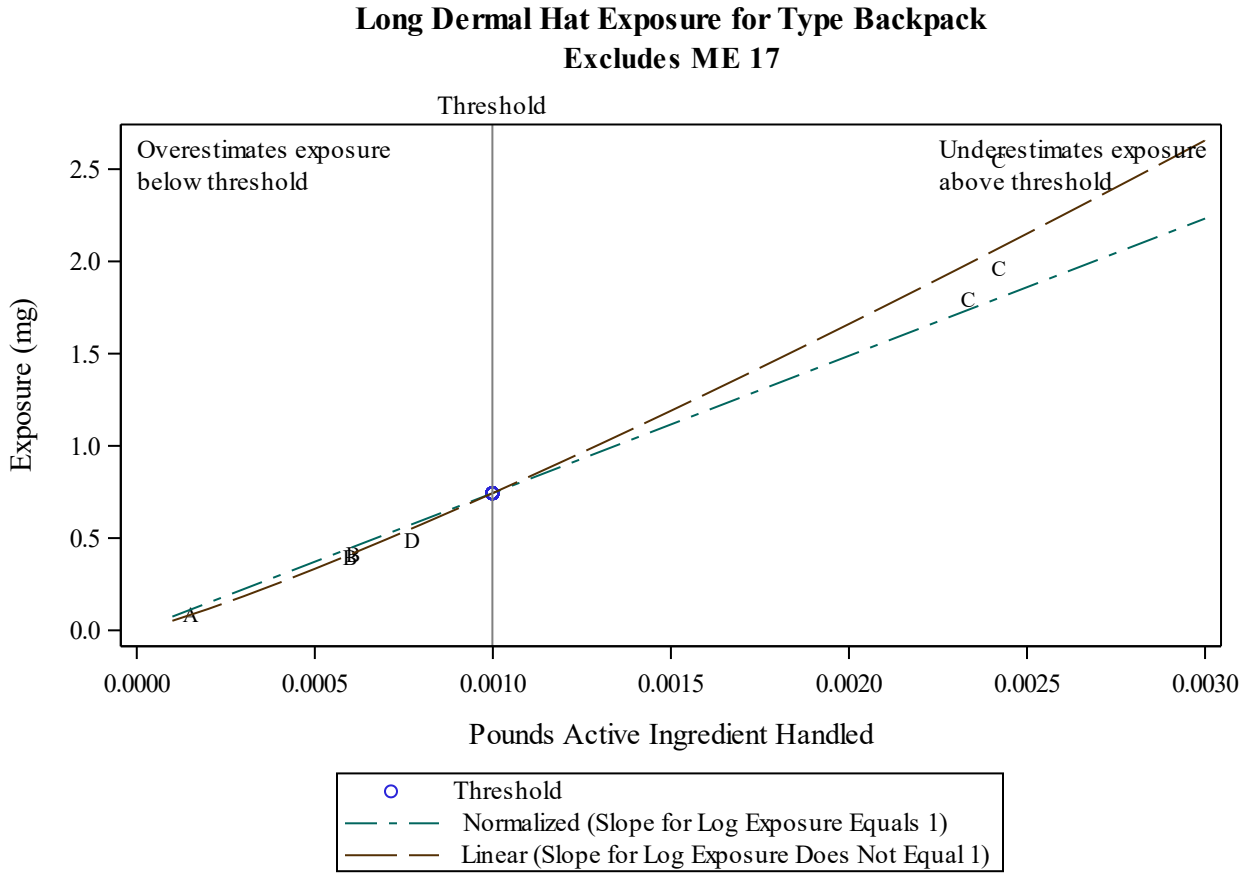
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure A99. Threshold plot for Inhalation (respirable) Time-Weighted Average Exposure (mg/m^3). Group = Type Cart.



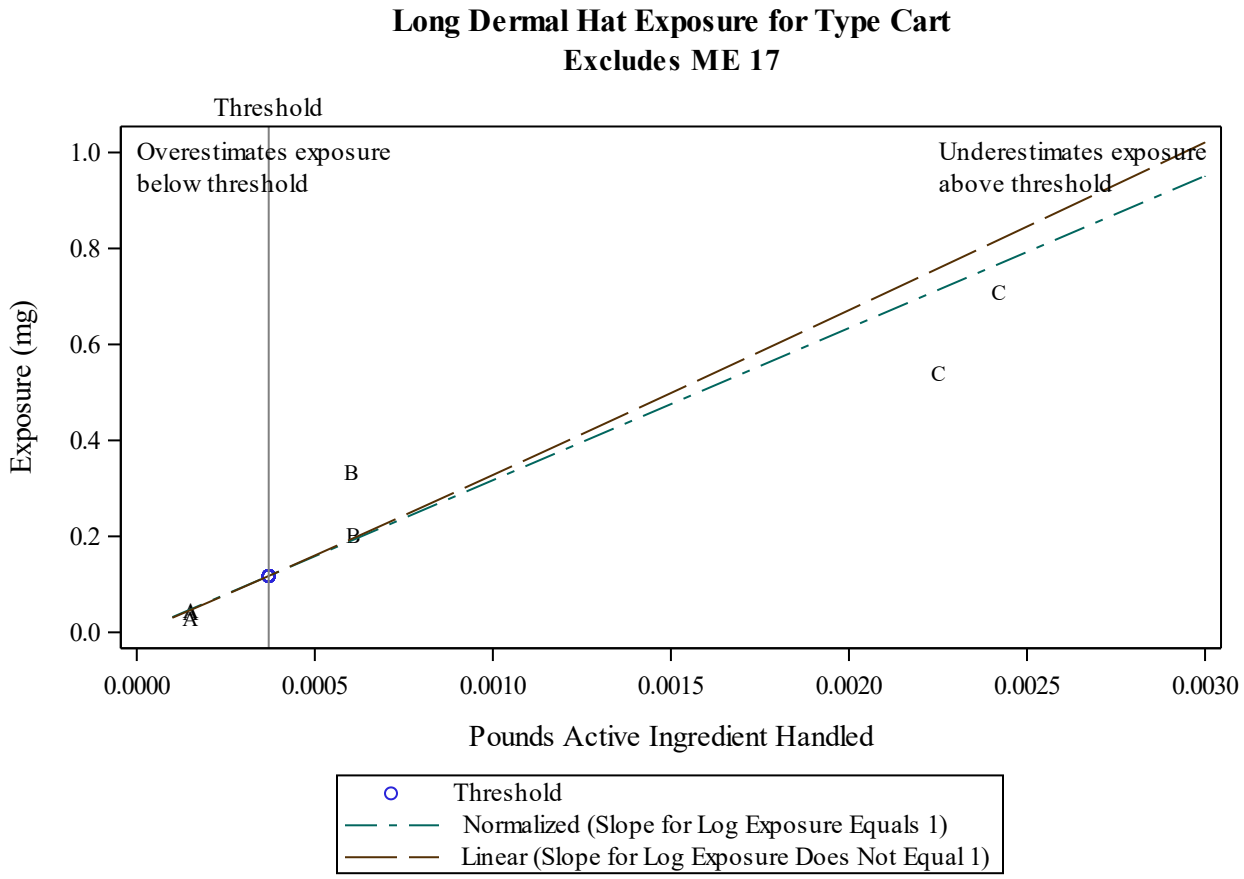
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B67. Threshold plot for Long Dermal Hat Exposure (mg). Group = All. Excludes ME 17.



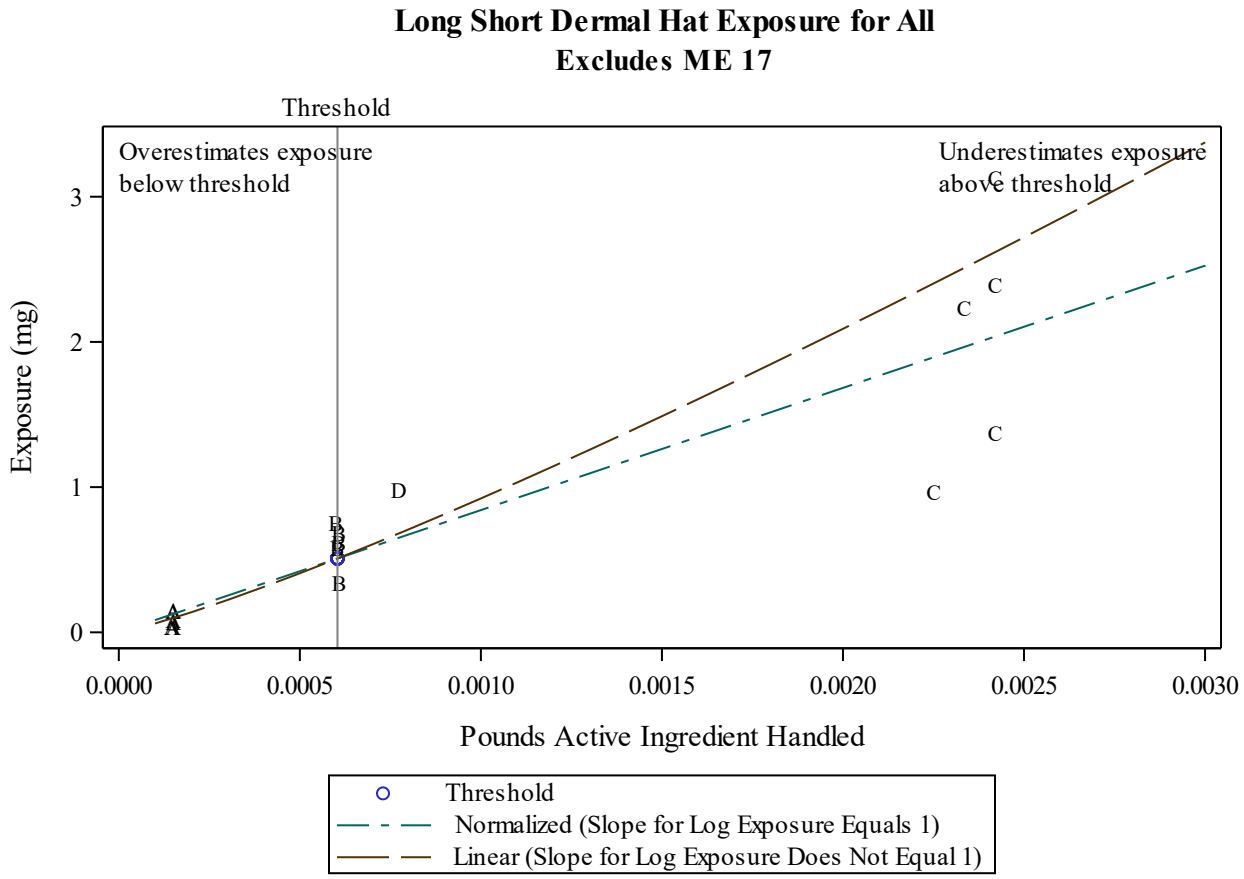
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B68. Threshold plot for Long Dermal Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



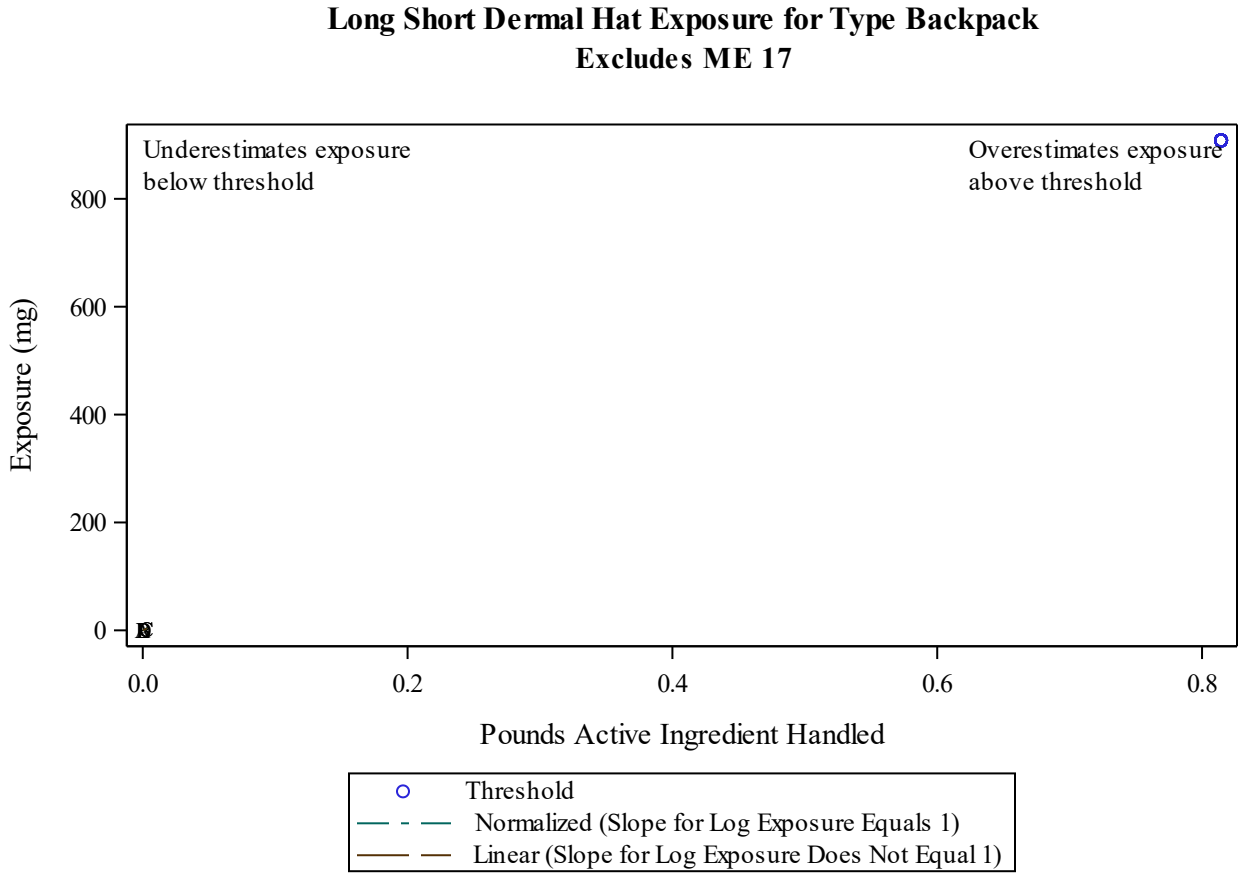
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B69. Threshold plot for Long Dermal Hat Exposure (mg). Group = Type Cart. Excludes ME 17.



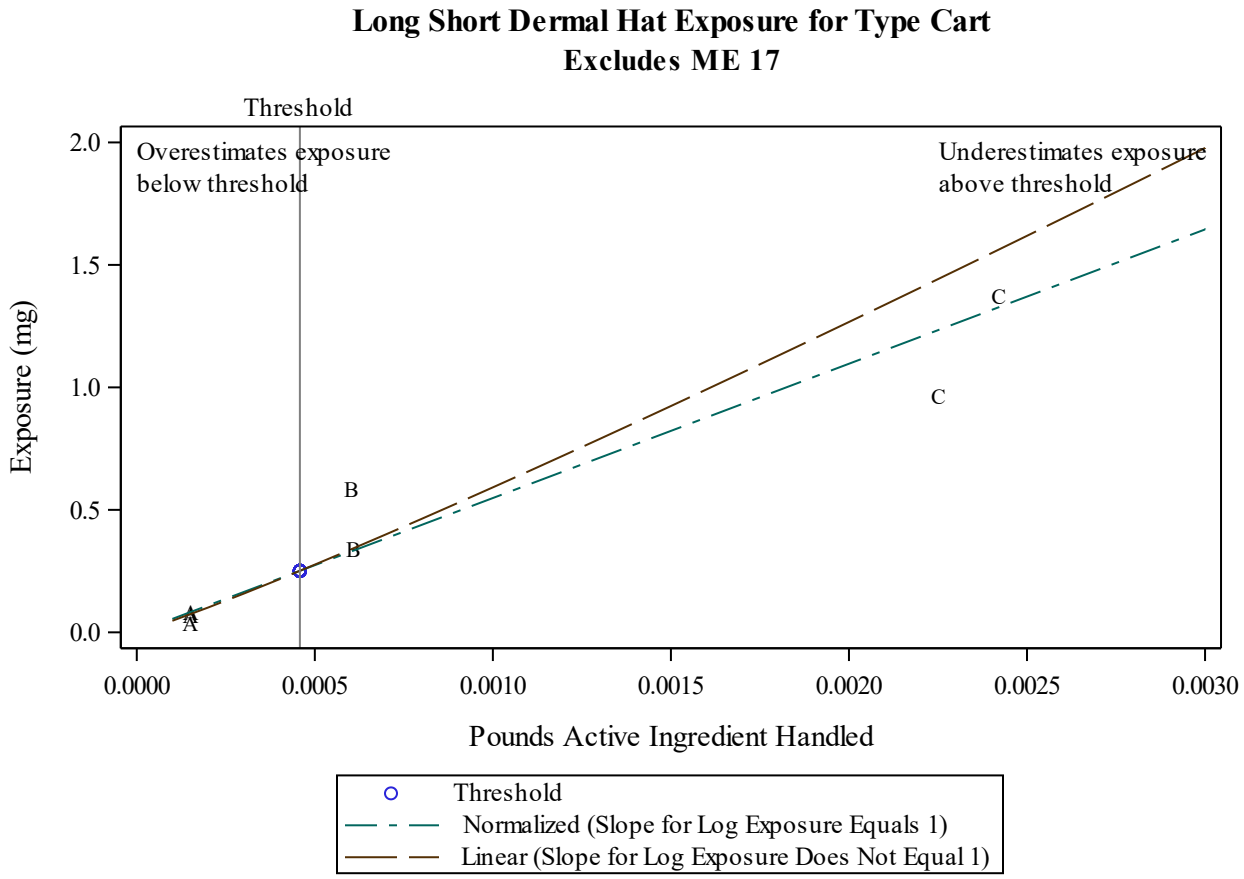
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B70. Threshold plot for Long Short Dermal Hat Exposure (mg). Group = All. Excludes ME 17.



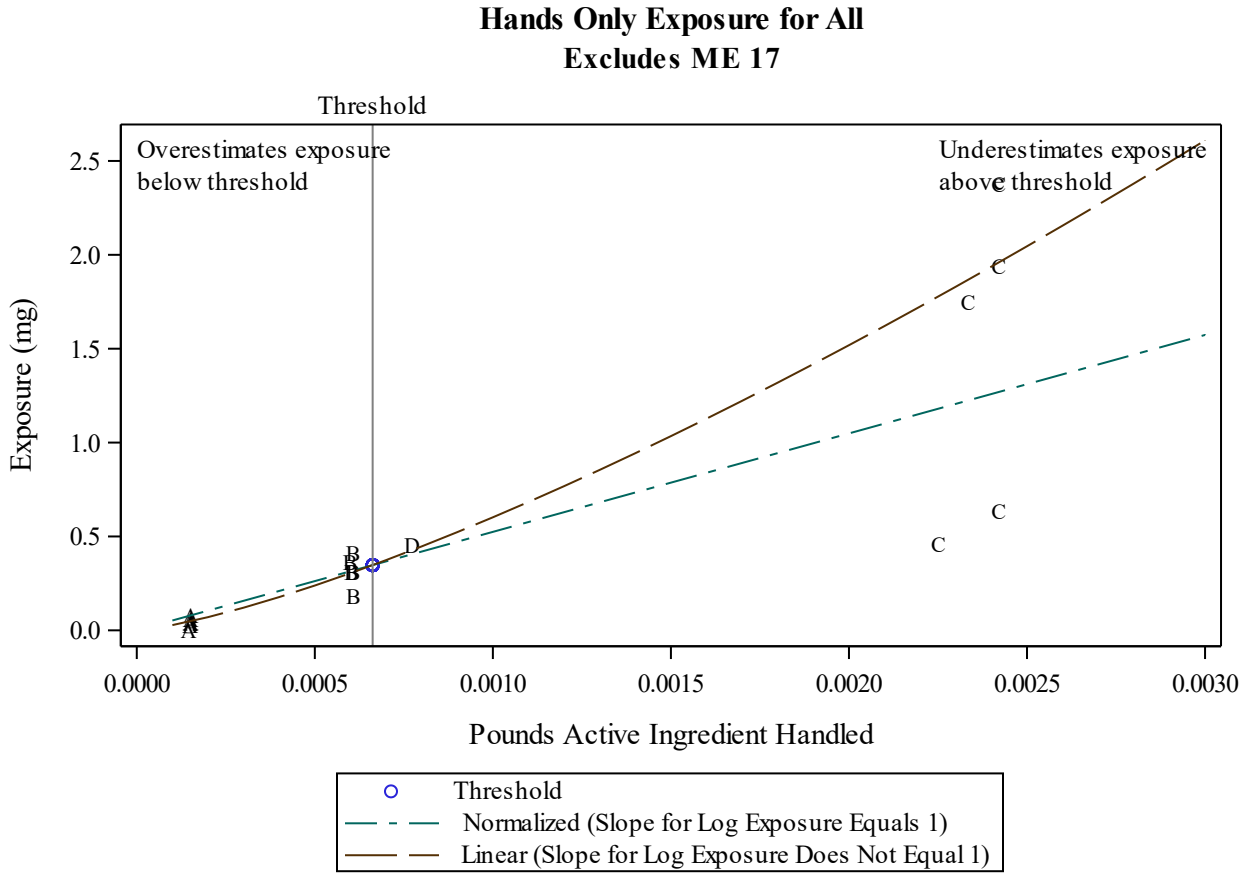
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B71. Threshold plot for Long Short Dermal Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



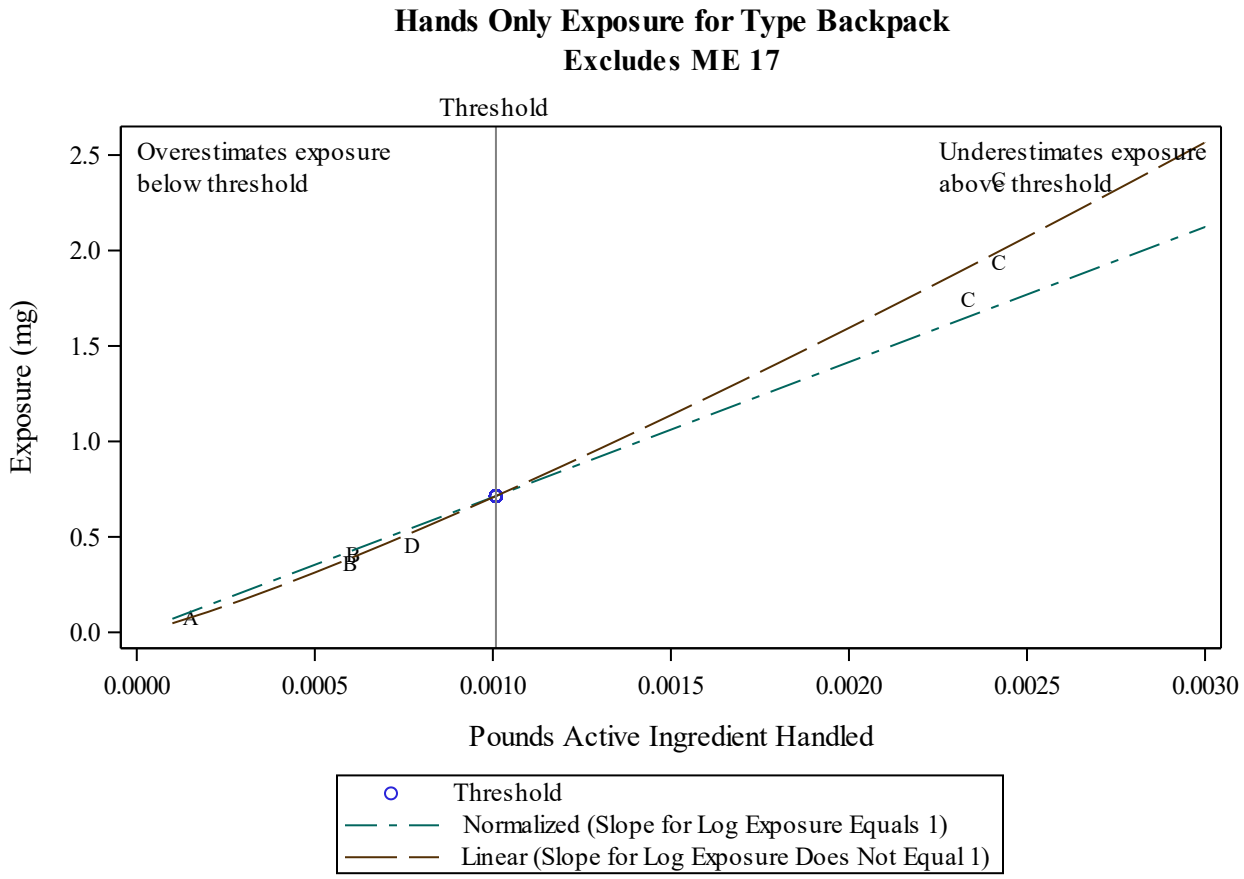
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B72. Threshold plot for Long Short Dermal Hat Exposure (mg). Group = Type Cart. Excludes ME 17.



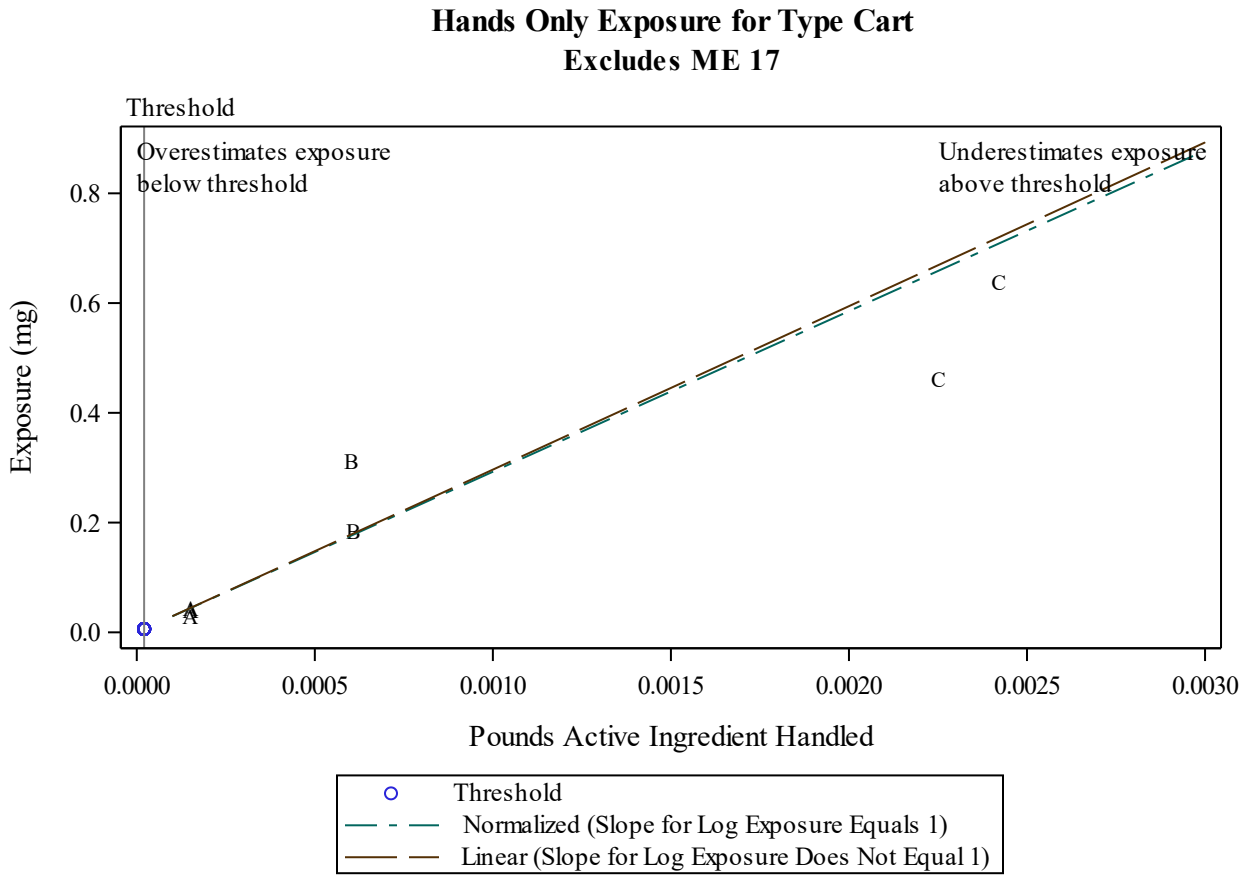
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B73. Threshold plot for Hands Only Exposure (mg). Group = All. Excludes ME 17.



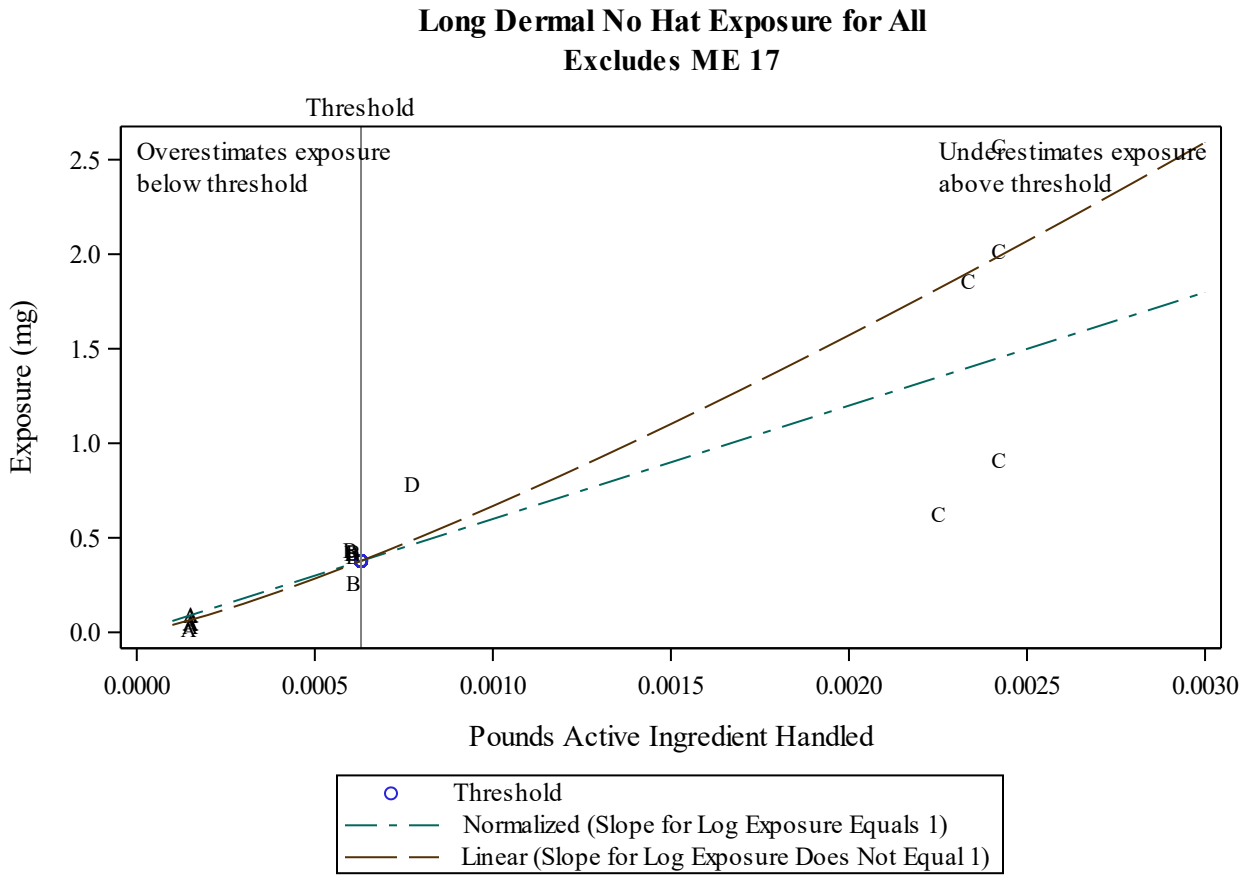
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B74. Threshold plot for Hands Only Exposure (mg). Group = Type Backpack. Excludes ME 17.



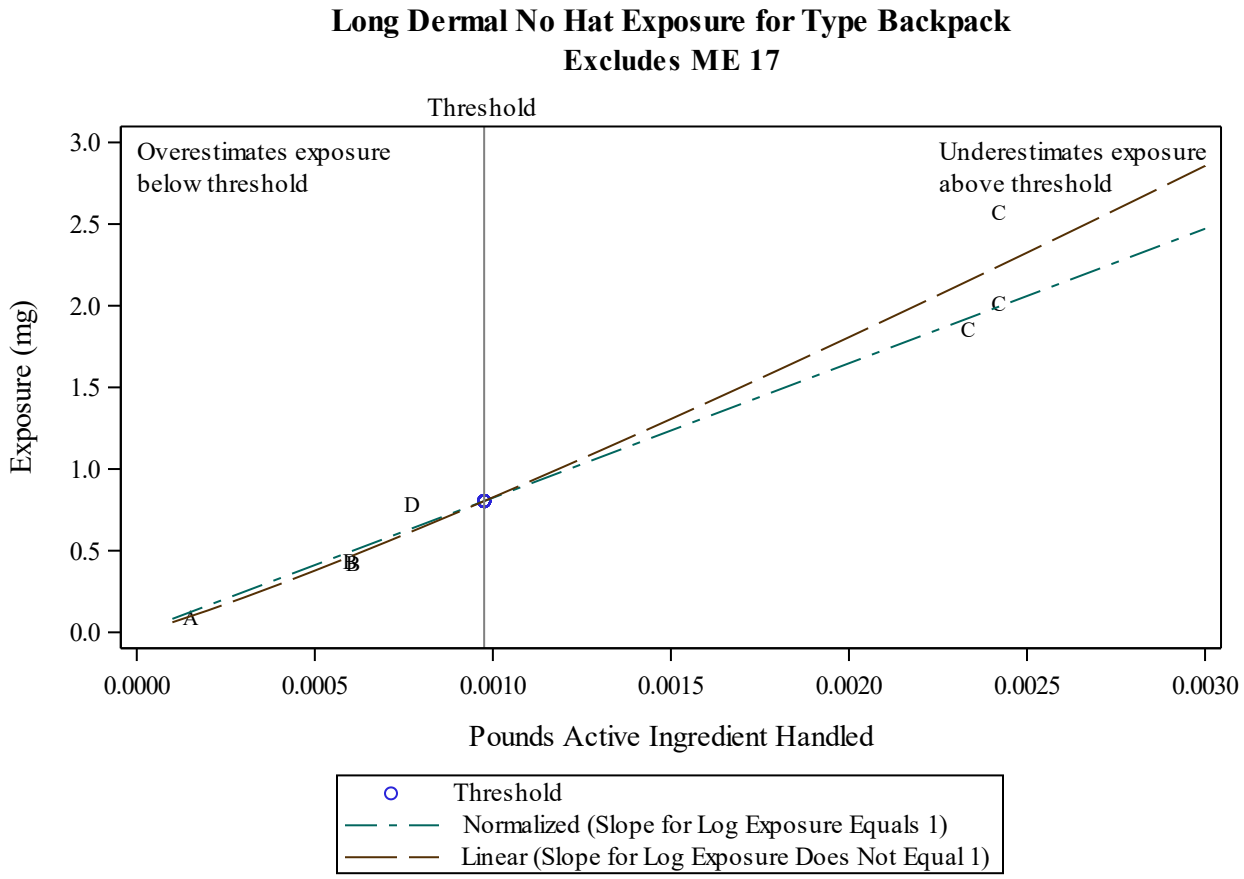
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B75. Threshold plot for Hands Only Exposure (mg). Group = Type Cart. Excludes ME 17.



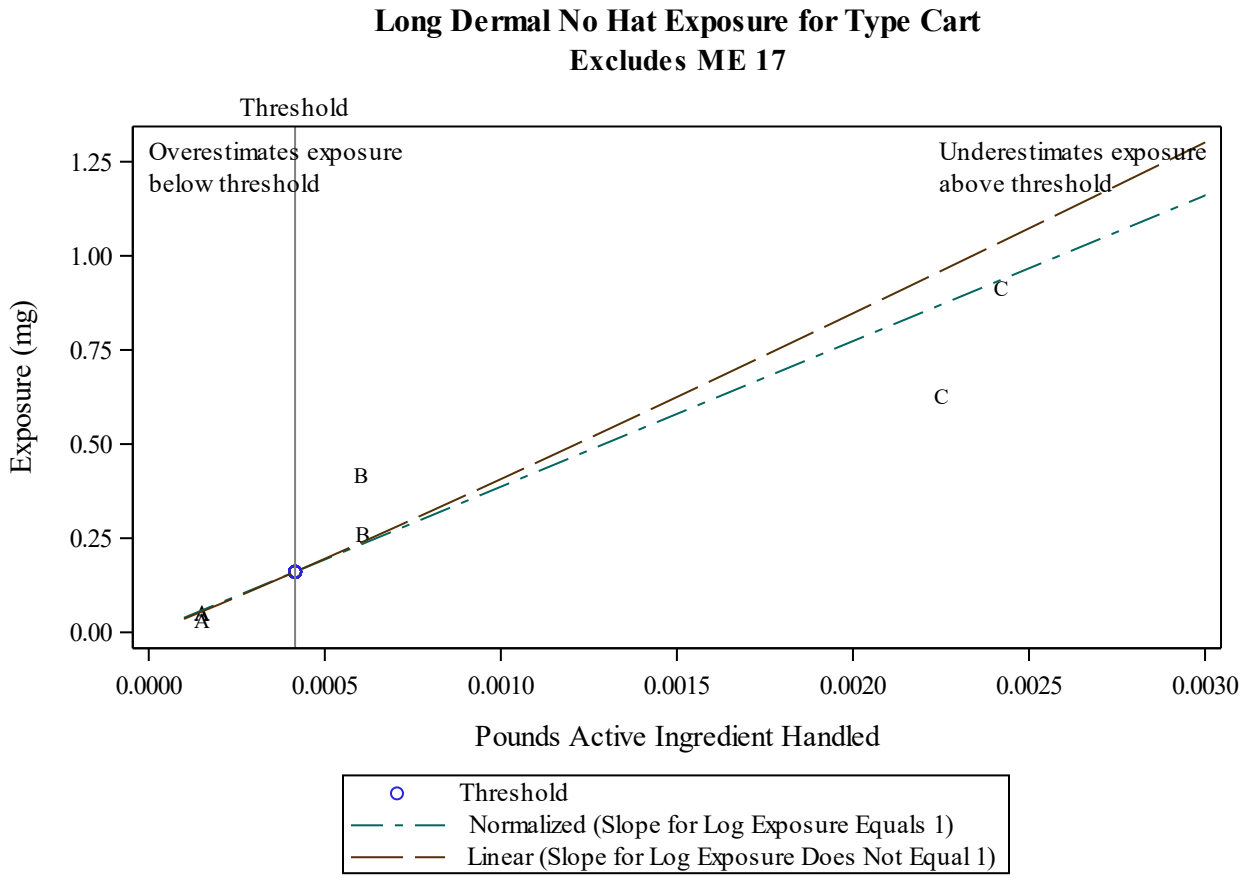
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B76. Threshold plot for Long Dermal No Hat Exposure (mg). Group = All. Excludes ME 17.



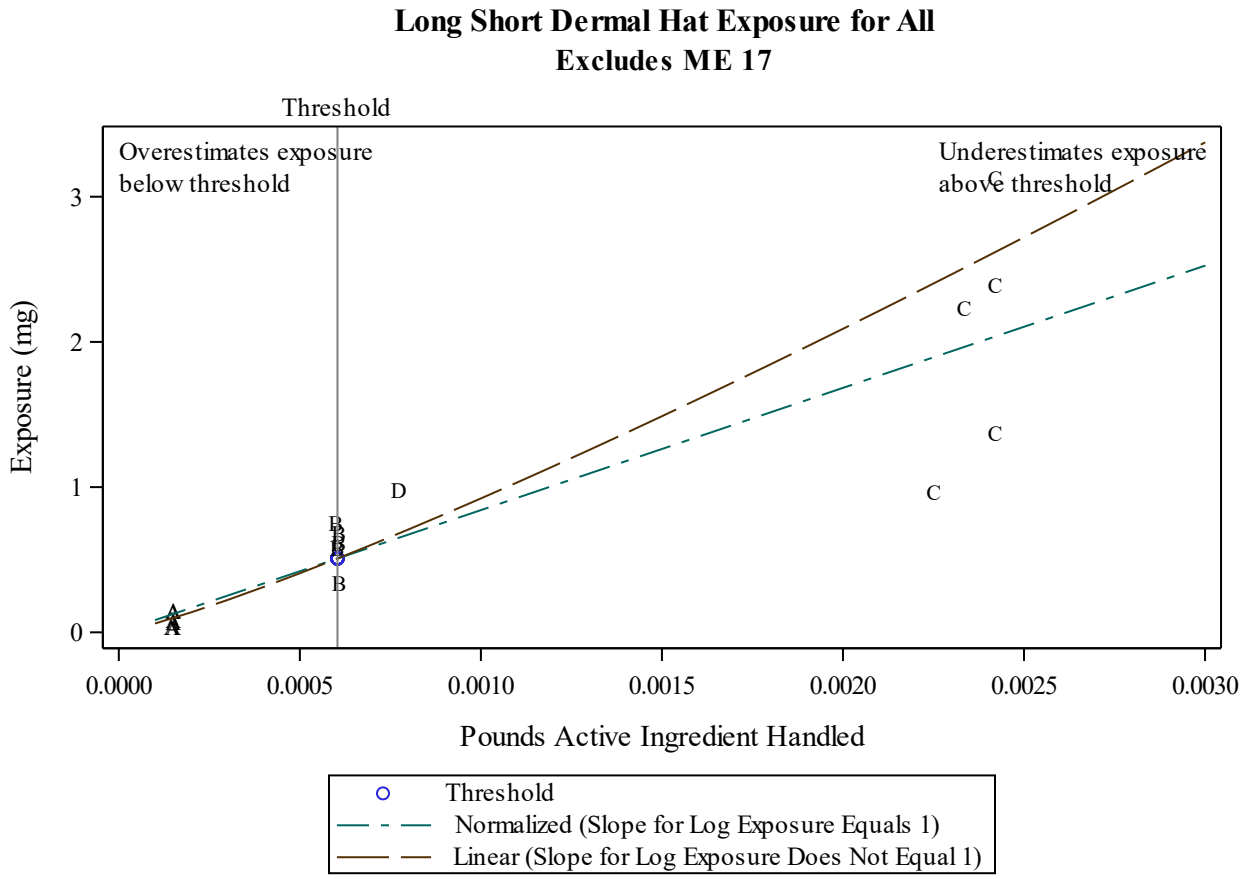
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B77. Threshold plot for Long Dermal No Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



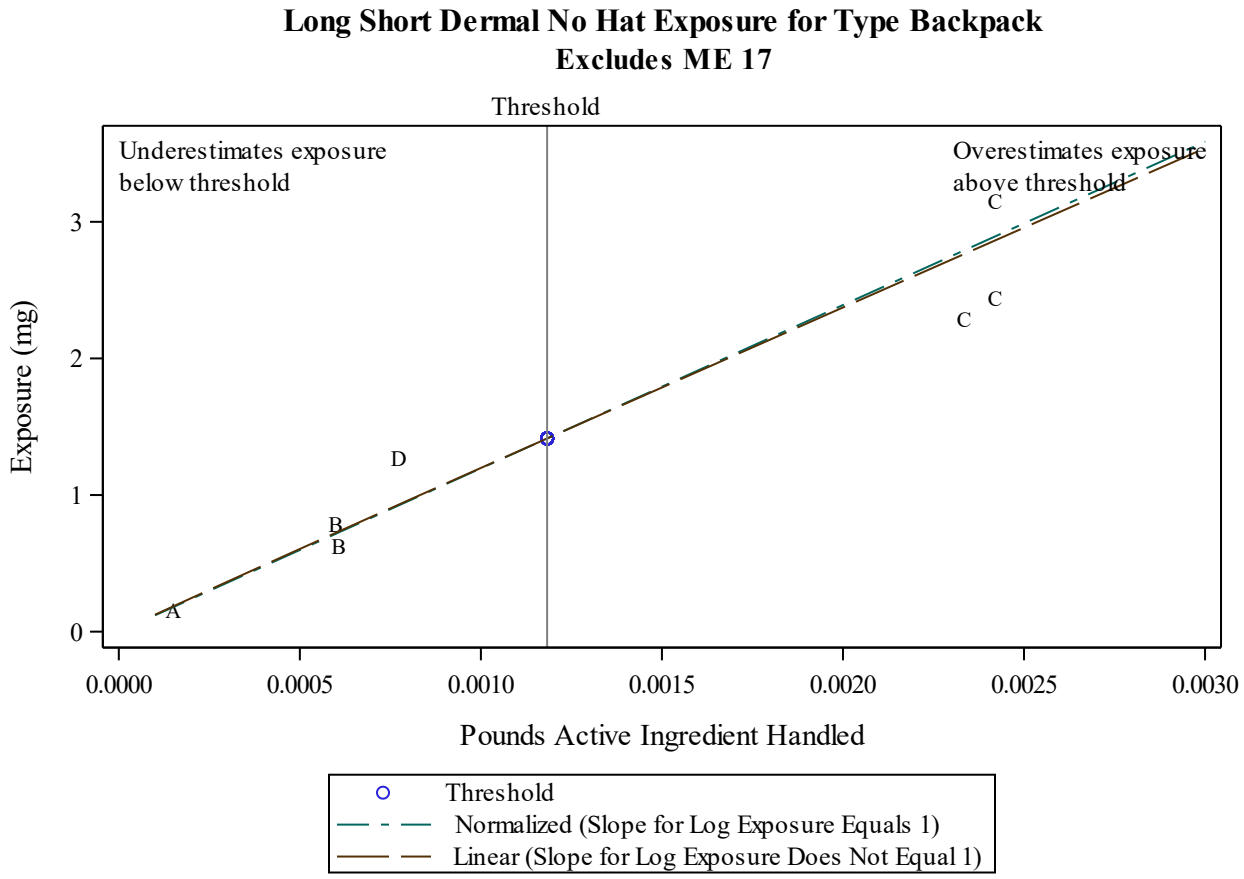
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B78. Threshold plot for Long Dermal No Hat Exposure (mg). Group = Type Cart. Excludes ME 17.



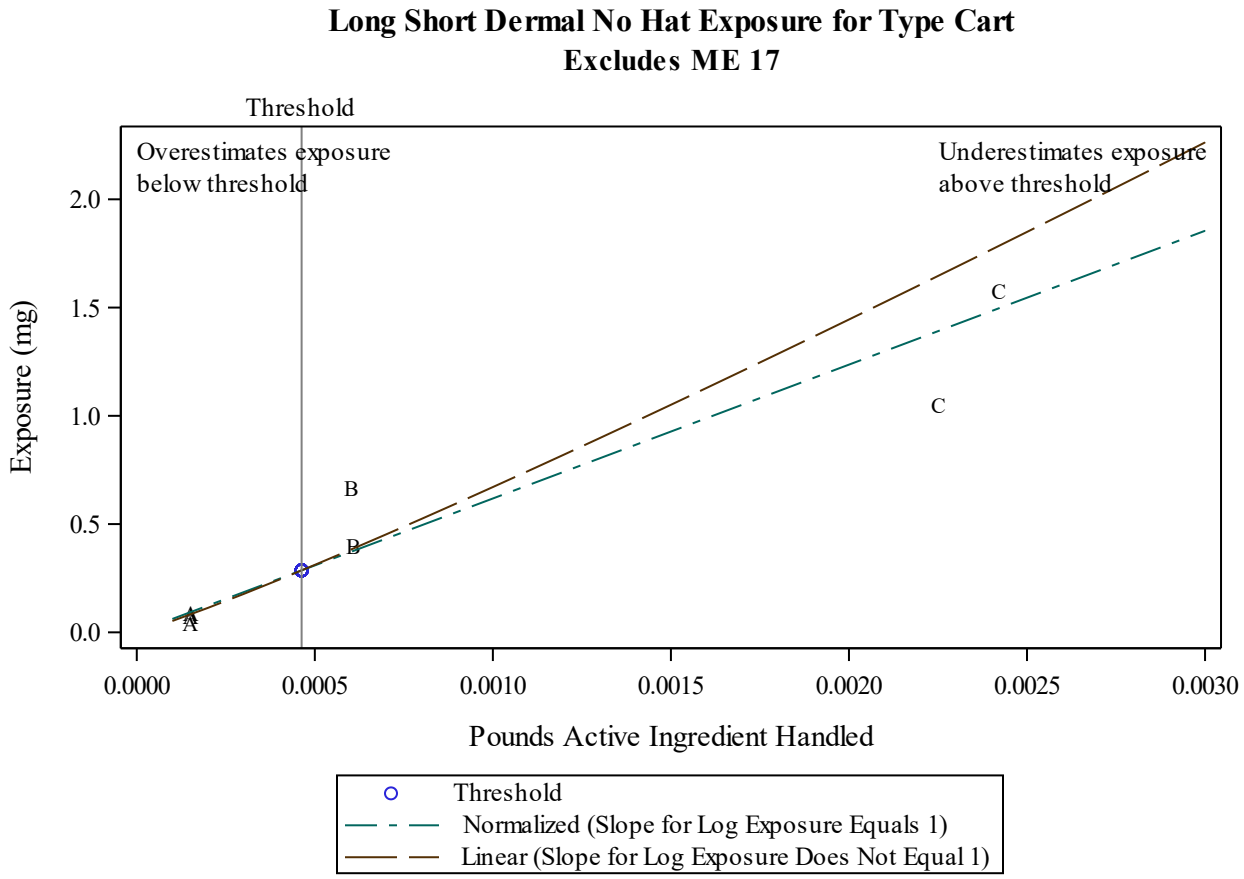
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B79. Threshold plot for Long Short Dermal No Hat Exposure (mg). Group = All. Excludes ME 17.



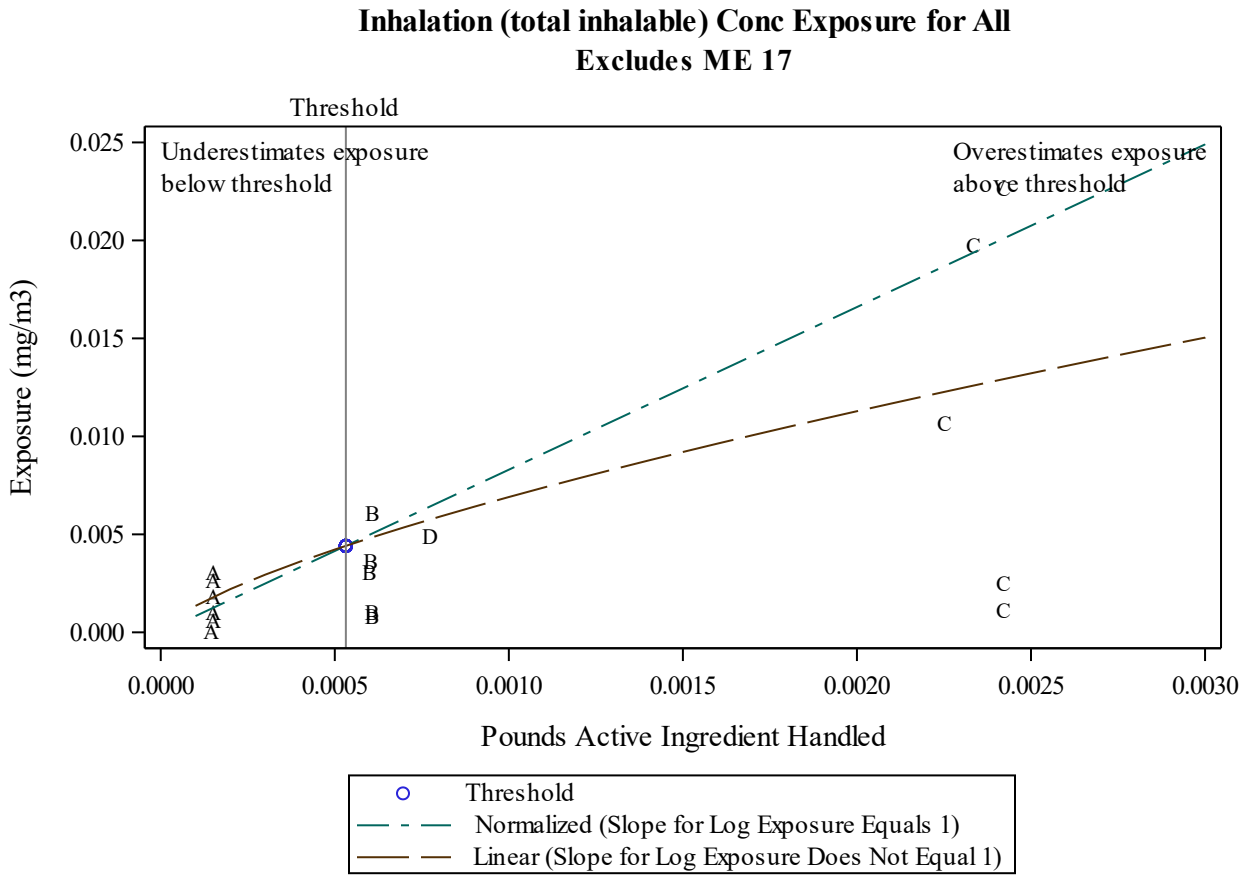
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B80. Threshold plot for Long Short Dermal No Hat Exposure (mg). Group = Type Backpack. Excludes ME 17.



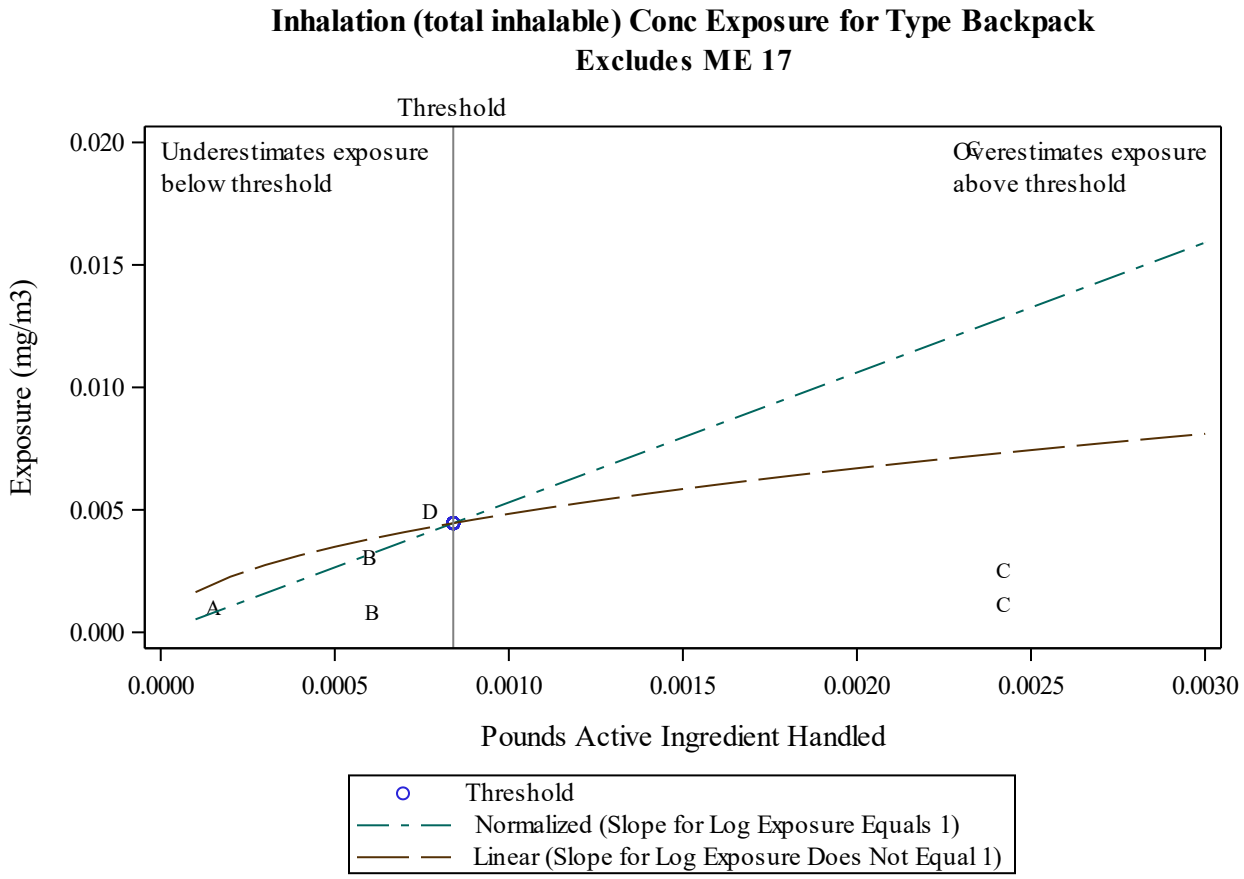
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B81. Threshold plot for Long Short Dermal No Hat Exposure (mg). Group = Type Cart. Excludes ME 17.



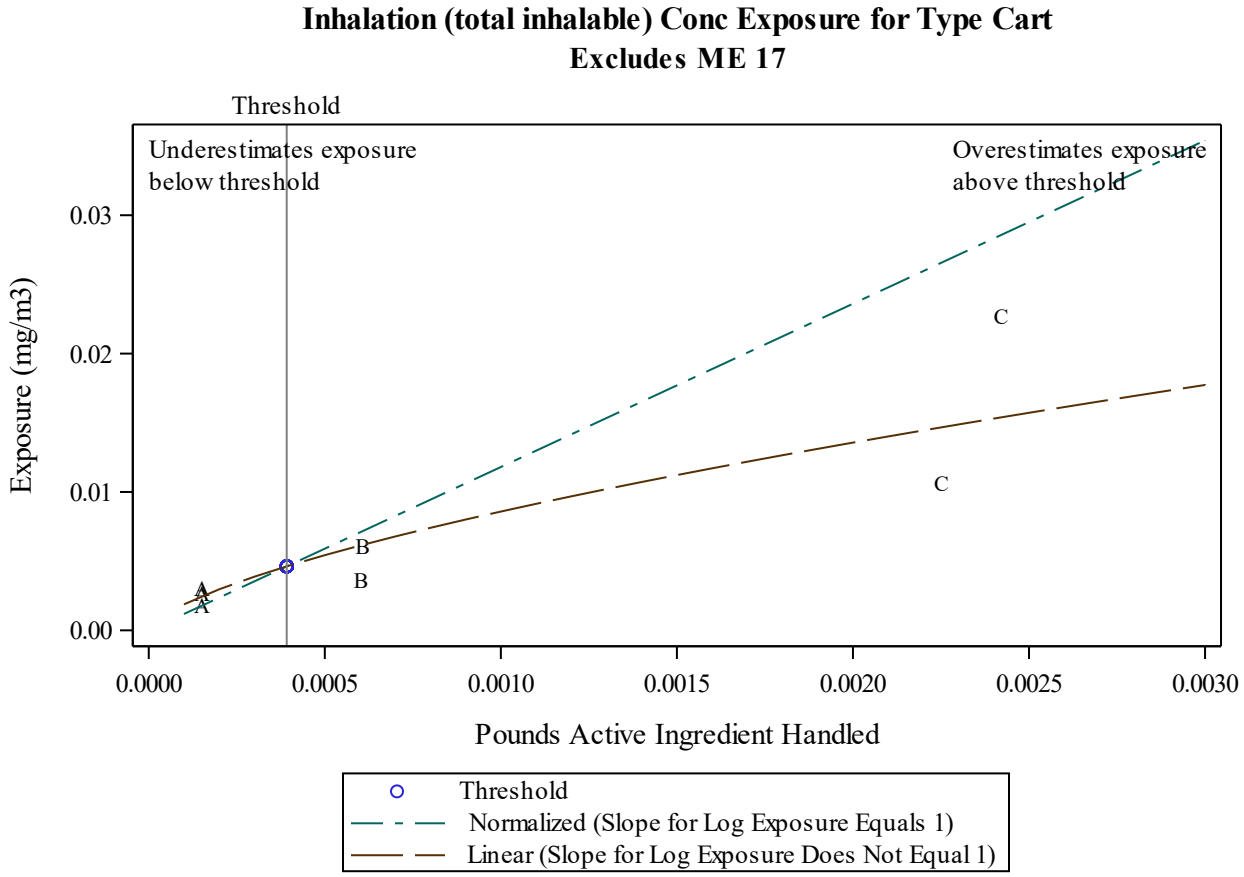
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B82. Threshold plot for Inhalation (total inhalable) Concentration Exposure (mg/m^3). Group = All. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B83. Threshold plot for Inhalation (total inhalable) Concentration Exposure (mg/m^3). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B84. Threshold plot for Inhalation (total inhalable) Concentration Exposure (mg/m^3). Group = Type Cart. Excludes ME 17.

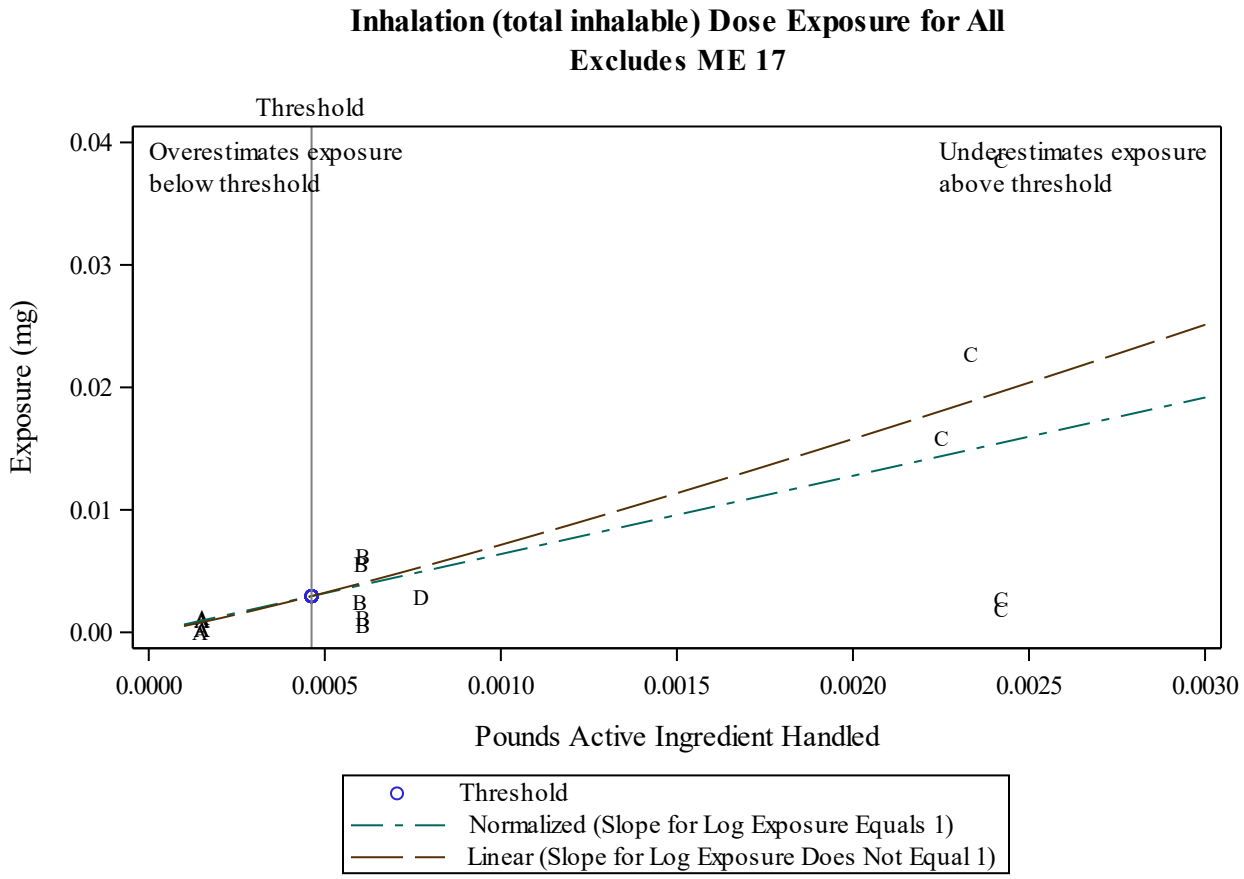
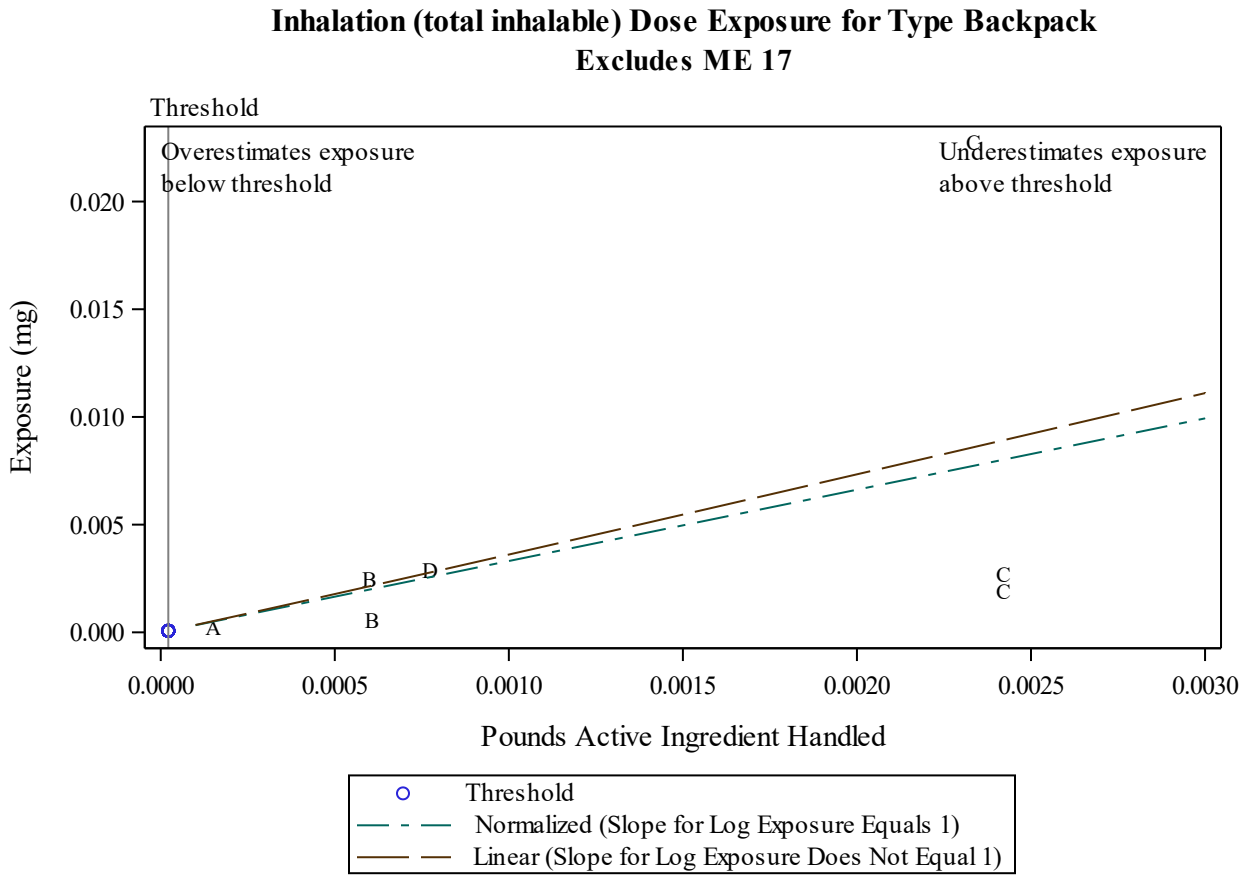


Figure B85. Threshold plot for Inhalation (total inhalable) Dose Exposure (mg). Group = All. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B86. Threshold plot for Inhalation (total inhalable) Dose Exposure (mg). Group = Type Backpack. Excludes ME 17.

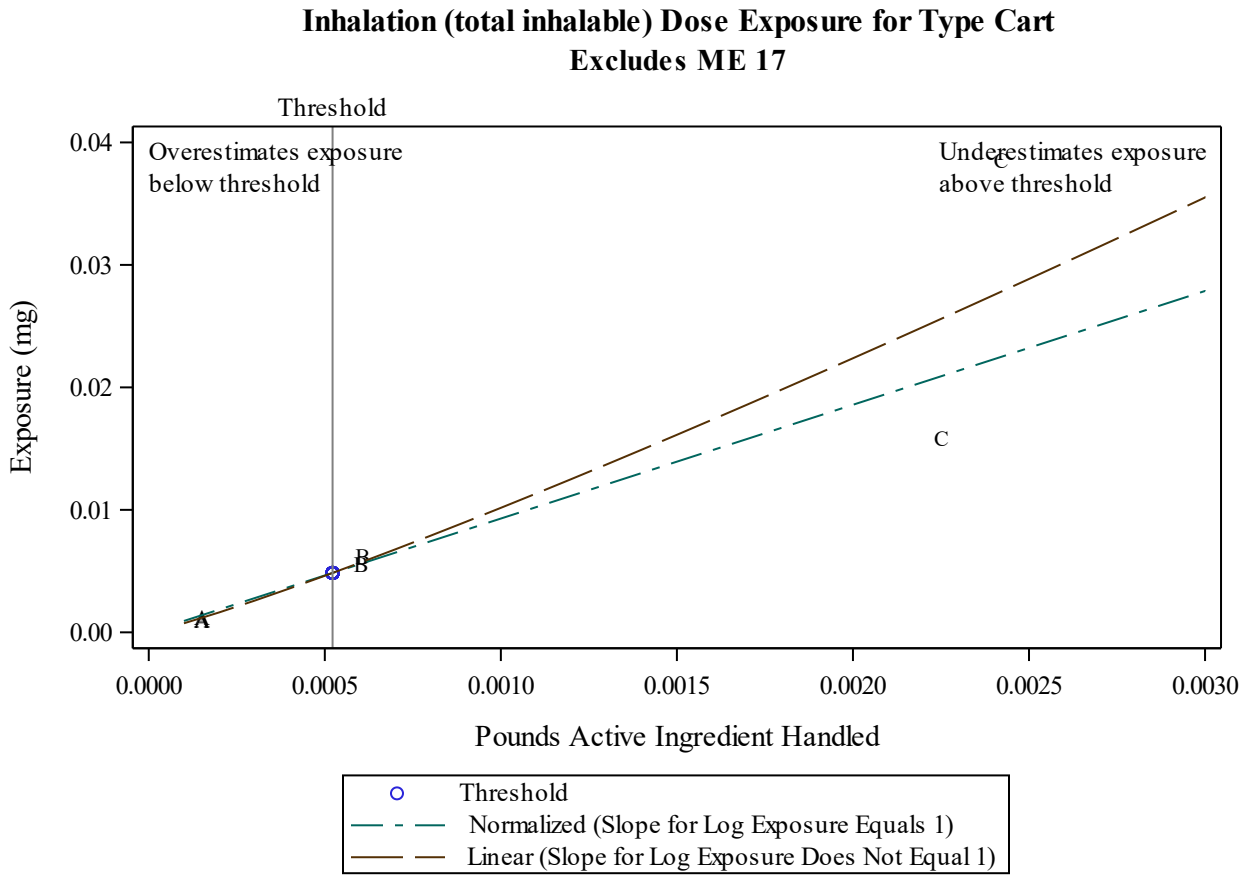
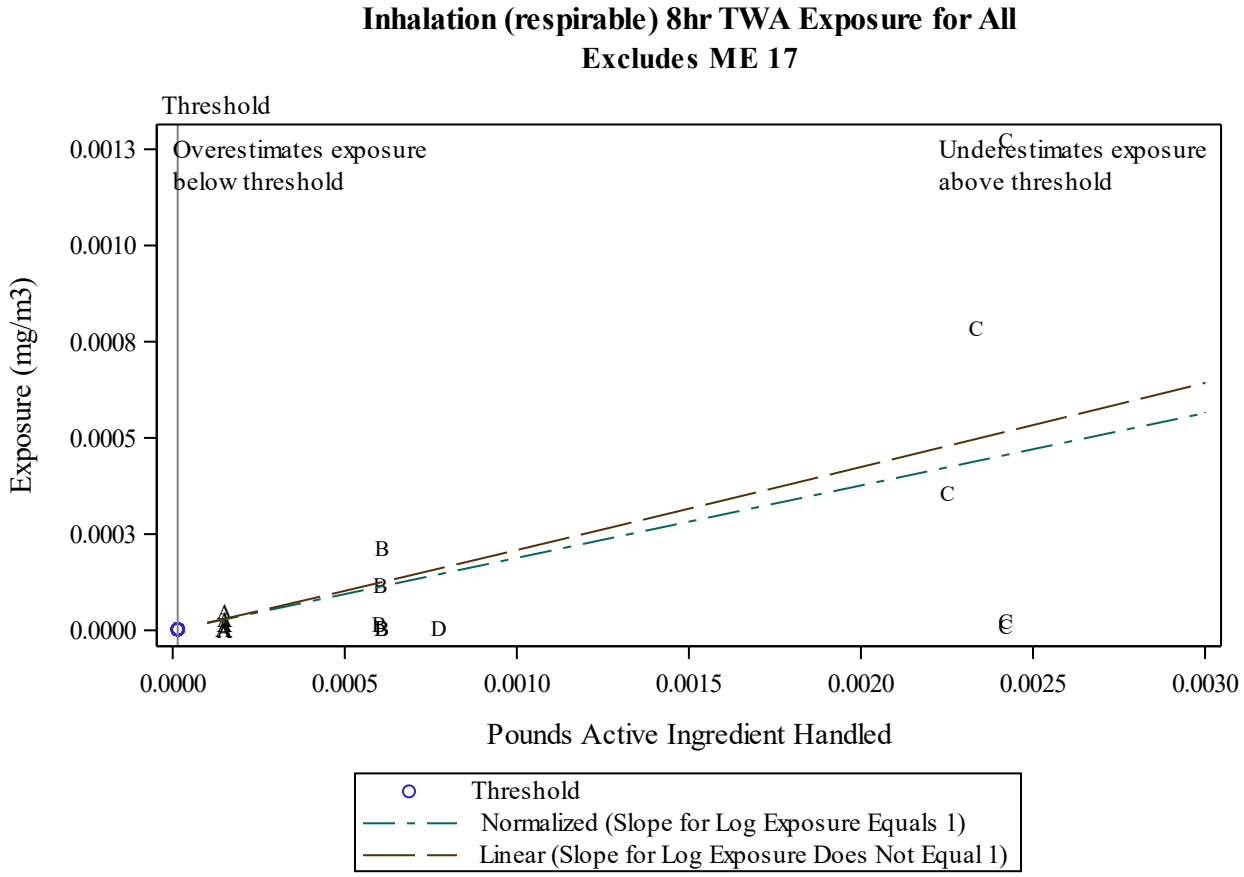
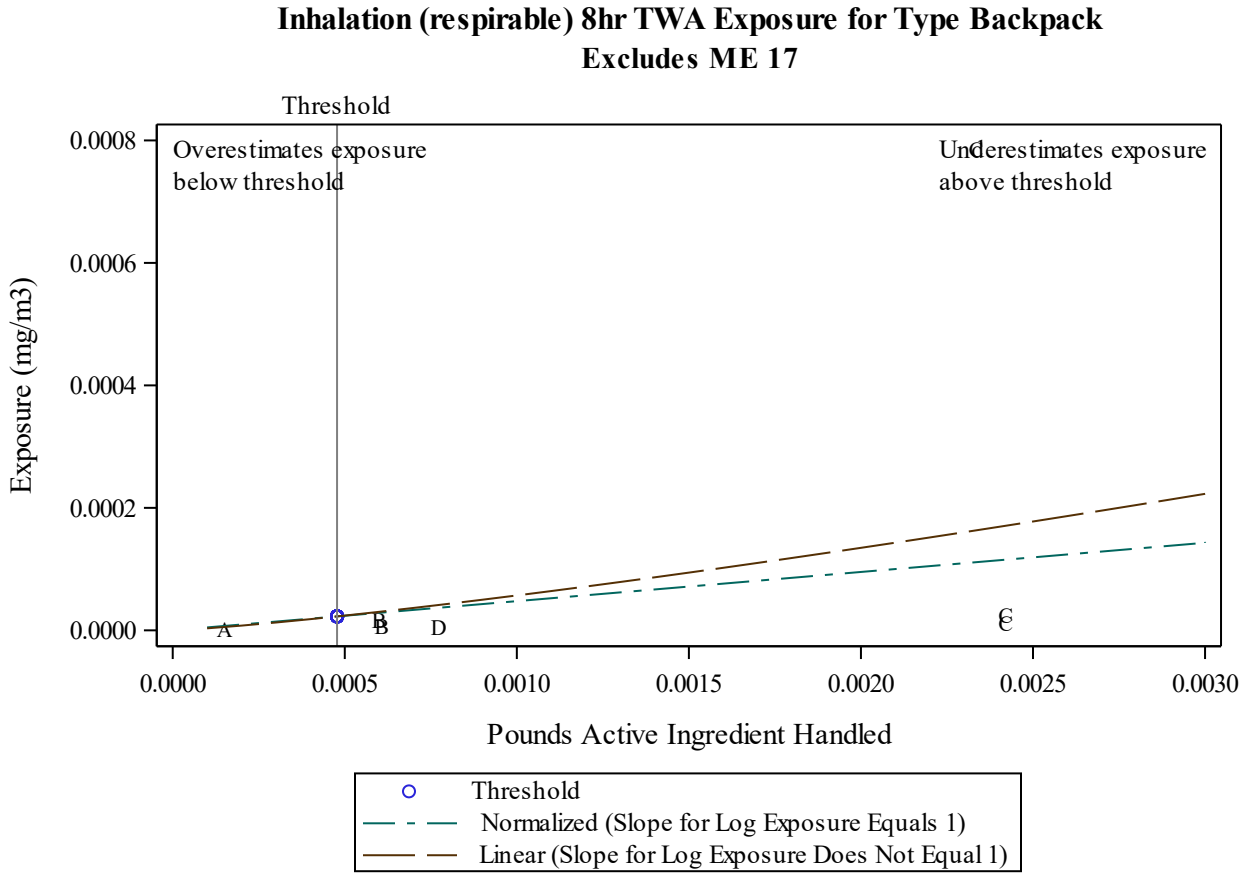


Figure B87. Threshold plot for Inhalation (total inhalable) Dose Exposure (mg). Group = Type Cart. Excludes ME 17.



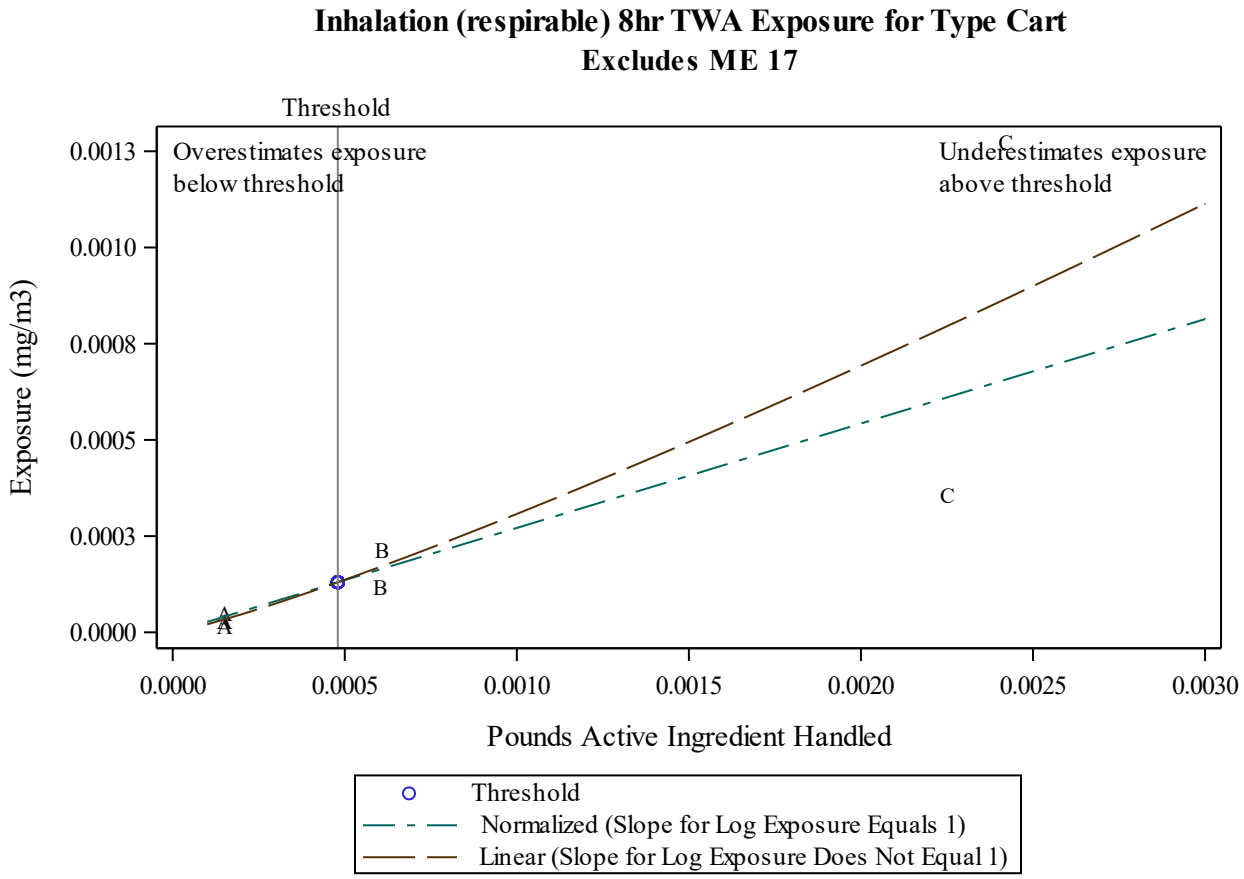
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B88. Threshold plot for Inhalation (total inhalable) Time-Weighted Average Exposure (mg/m^3). Group = All. Excludes ME 17.



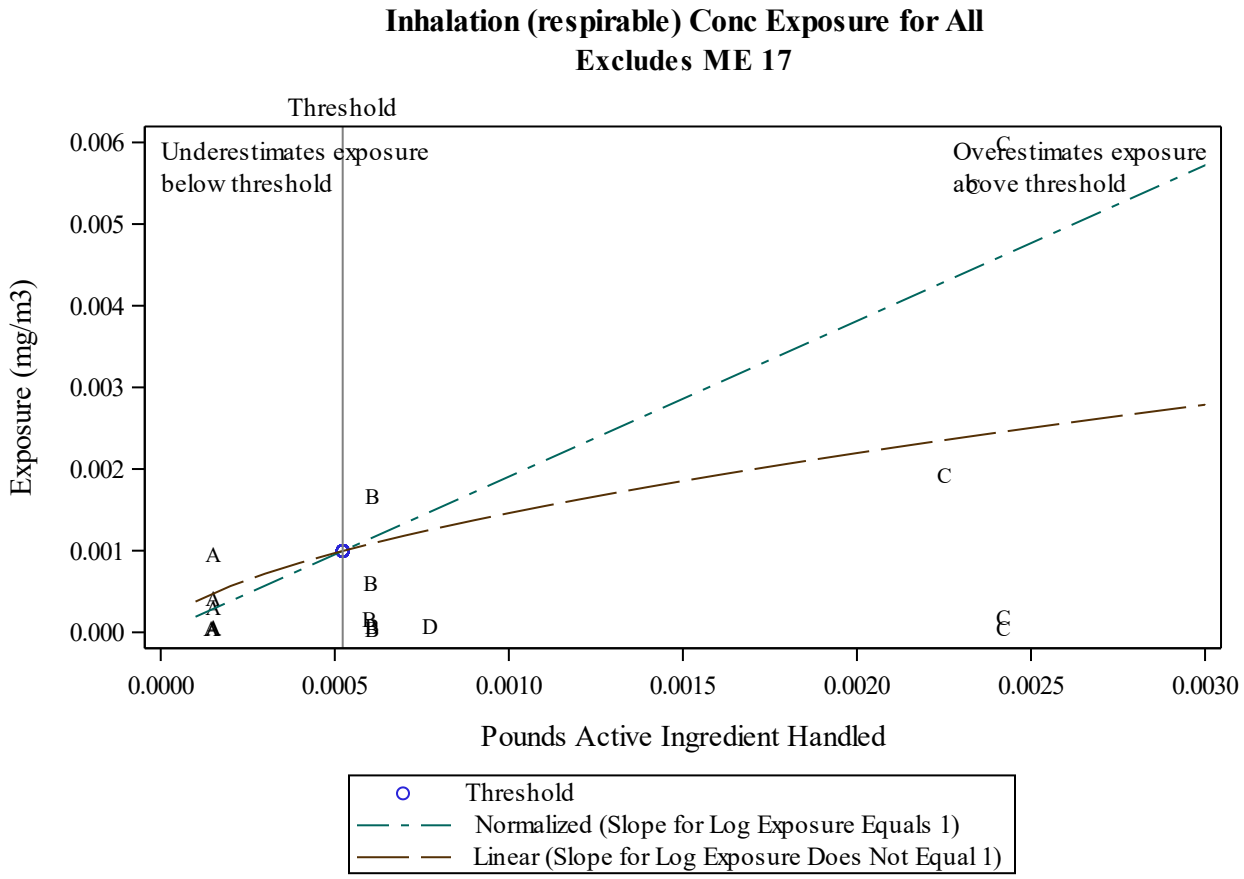
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B89. Threshold plot for Inhalation (total inhalable) Time-Weighted Average Exposure (mg/m^3). Group = Type Backpack. Excludes ME 17.



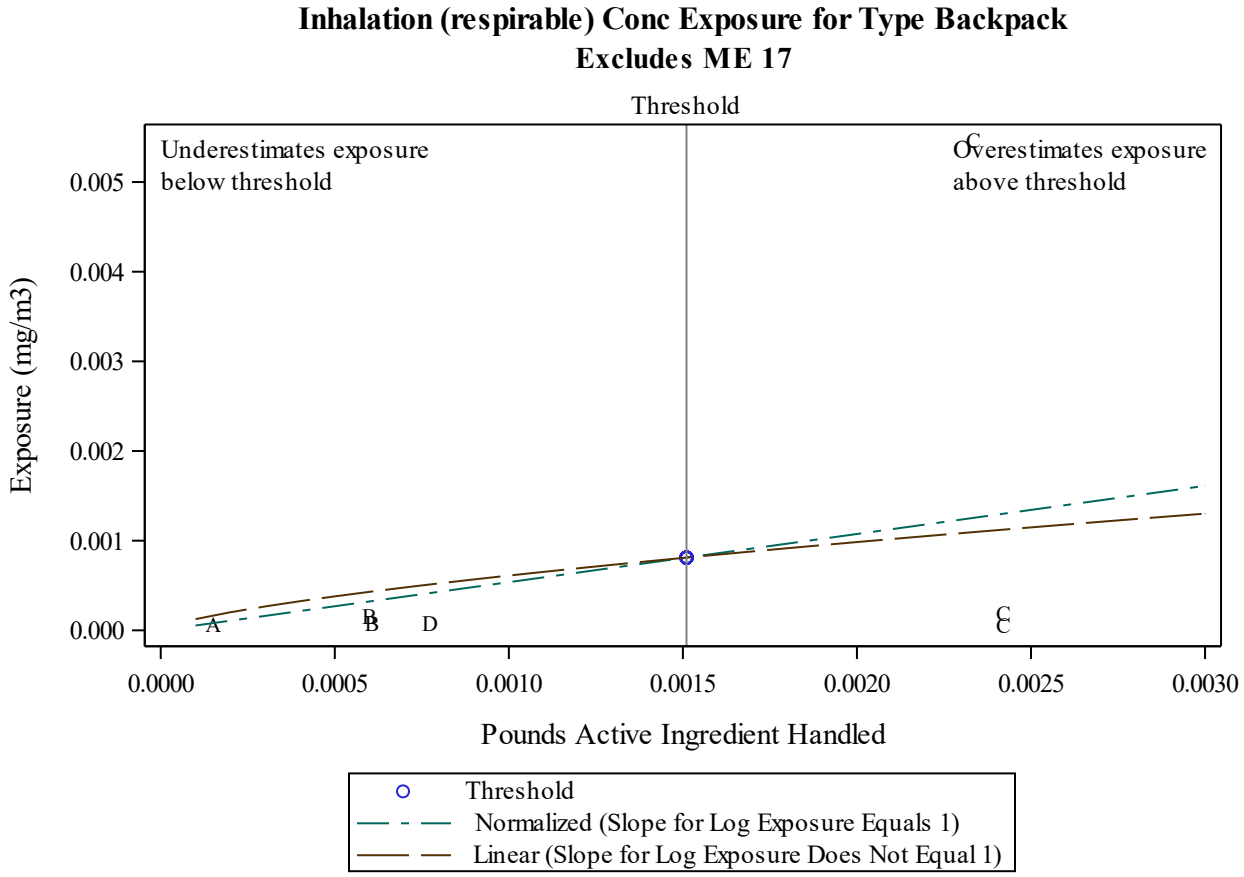
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B90. Threshold plot for Inhalation (total inhalable) Time-Weighted Average Exposure (mg/m^3). Group = Type Cart. Excludes ME 17.



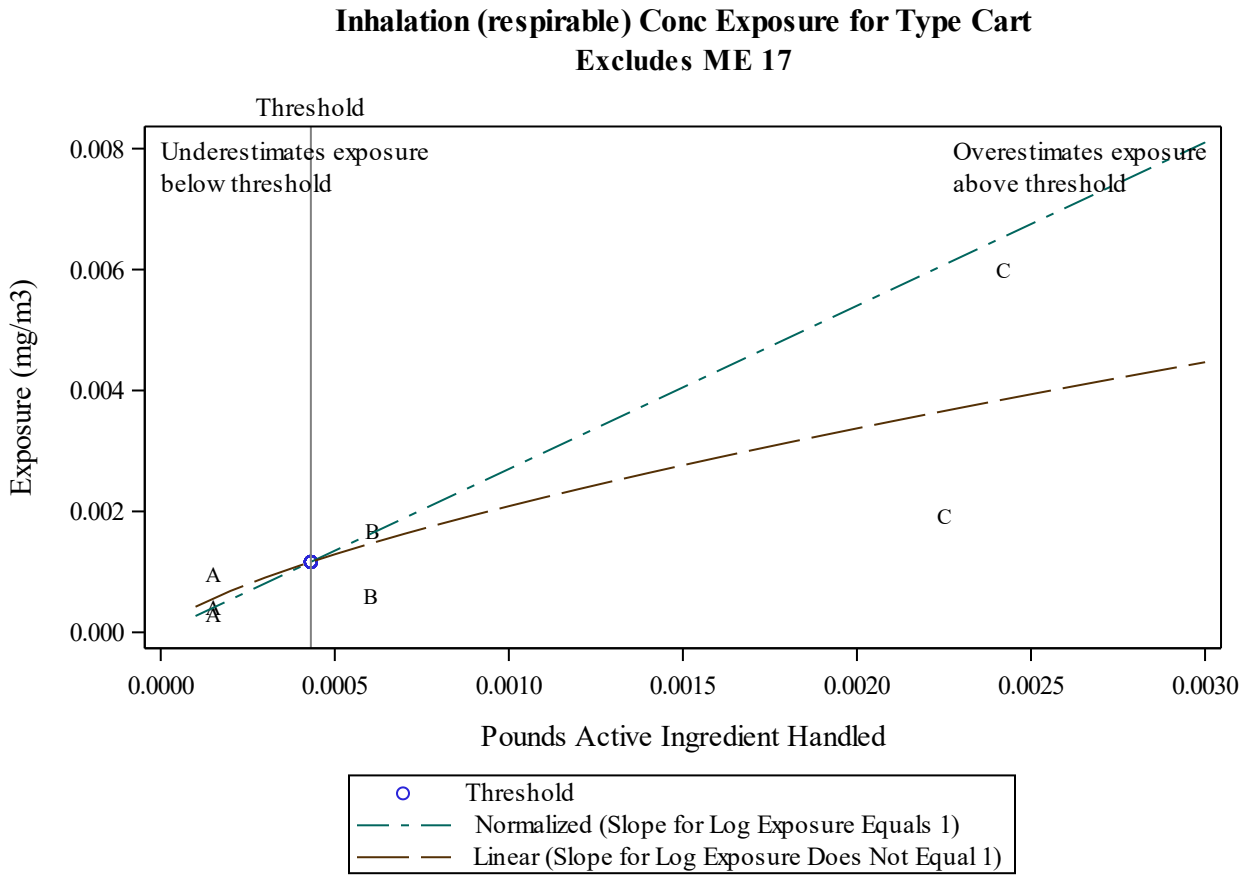
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B91. Threshold plot for Inhalation (respirable) Concentration Exposure (mg/m^3). Group = All. Excludes ME 17.



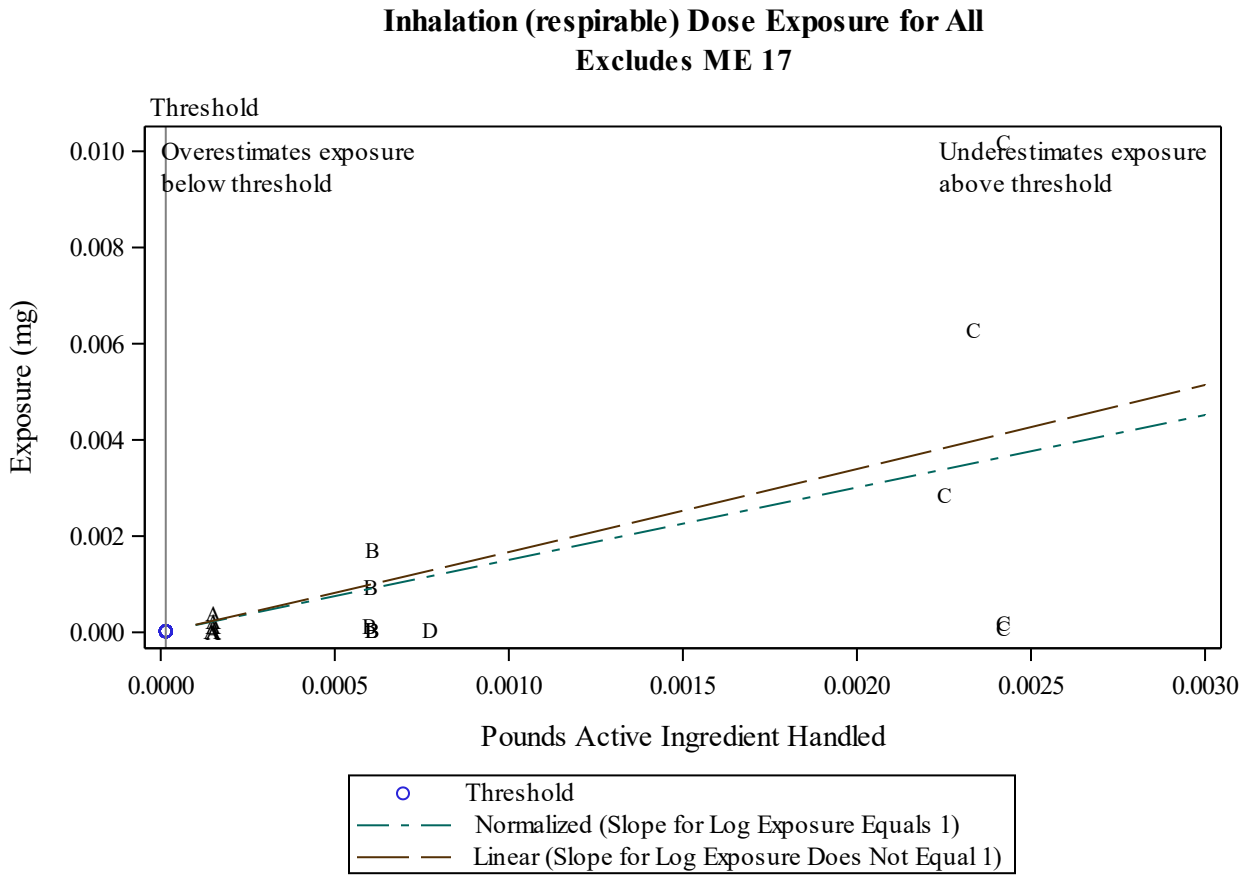
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B92. Threshold plot for Inhalation (respirable) Concentration Exposure (mg/m^3). Group = Type Backpack. Excludes ME 17.



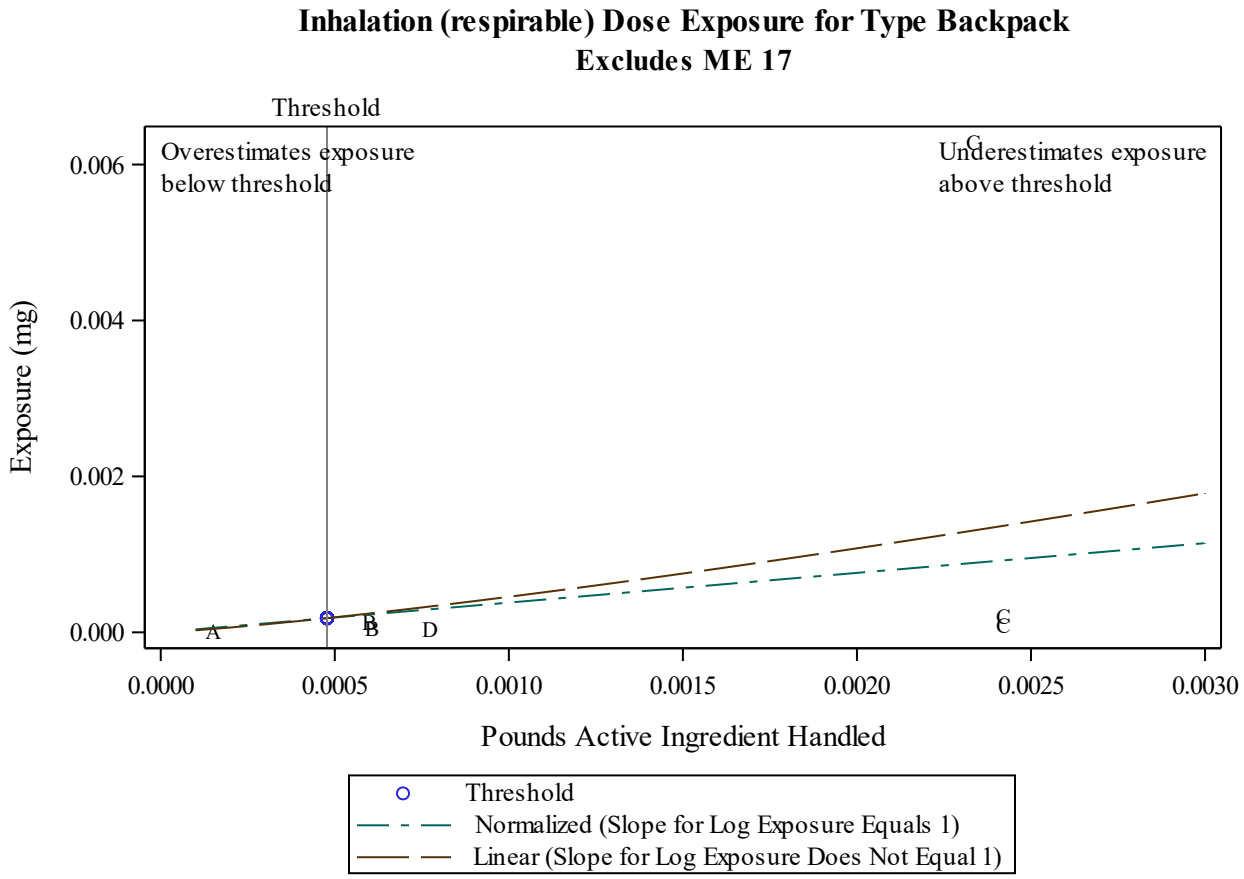
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B93. Threshold plot for Inhalation (respirable) Concentration Exposure (mg/m^3). Group = Type Cart. Excludes ME 17.



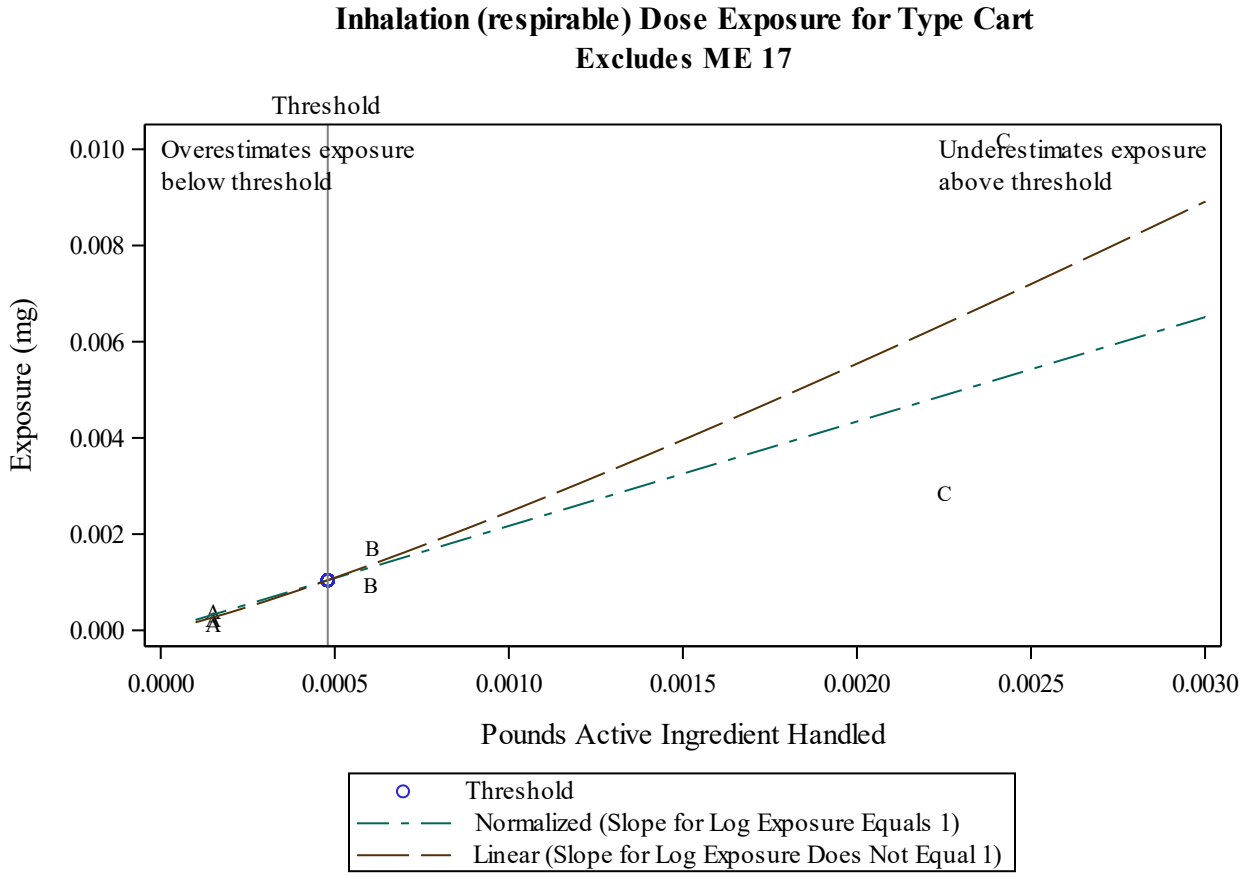
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B94. Threshold plot for Inhalation (respirable) Dose Exposure (mg). Group = All. Excludes ME 17.



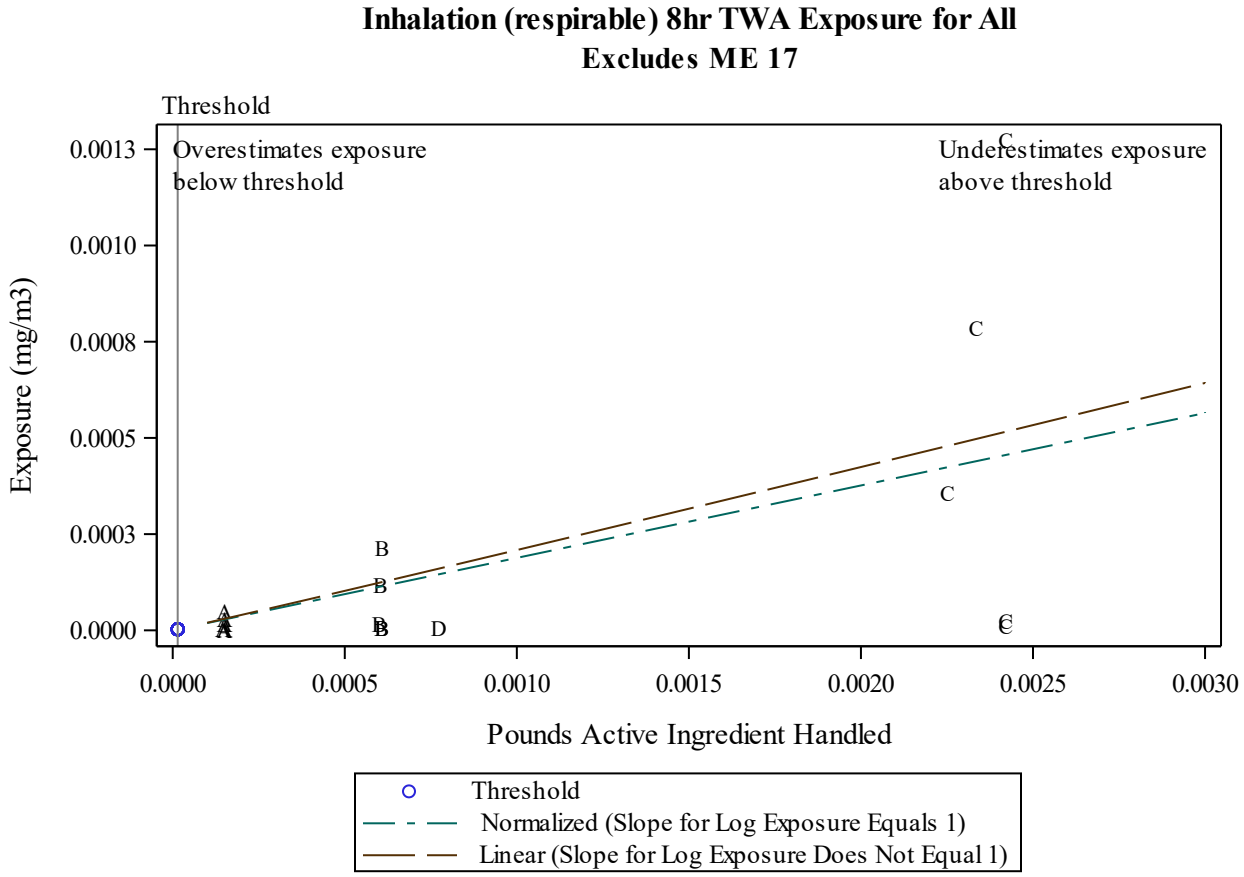
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B95. Threshold plot for Inhalation (respirable) Dose Exposure (mg). Group = Type Backpack. Excludes ME 17.



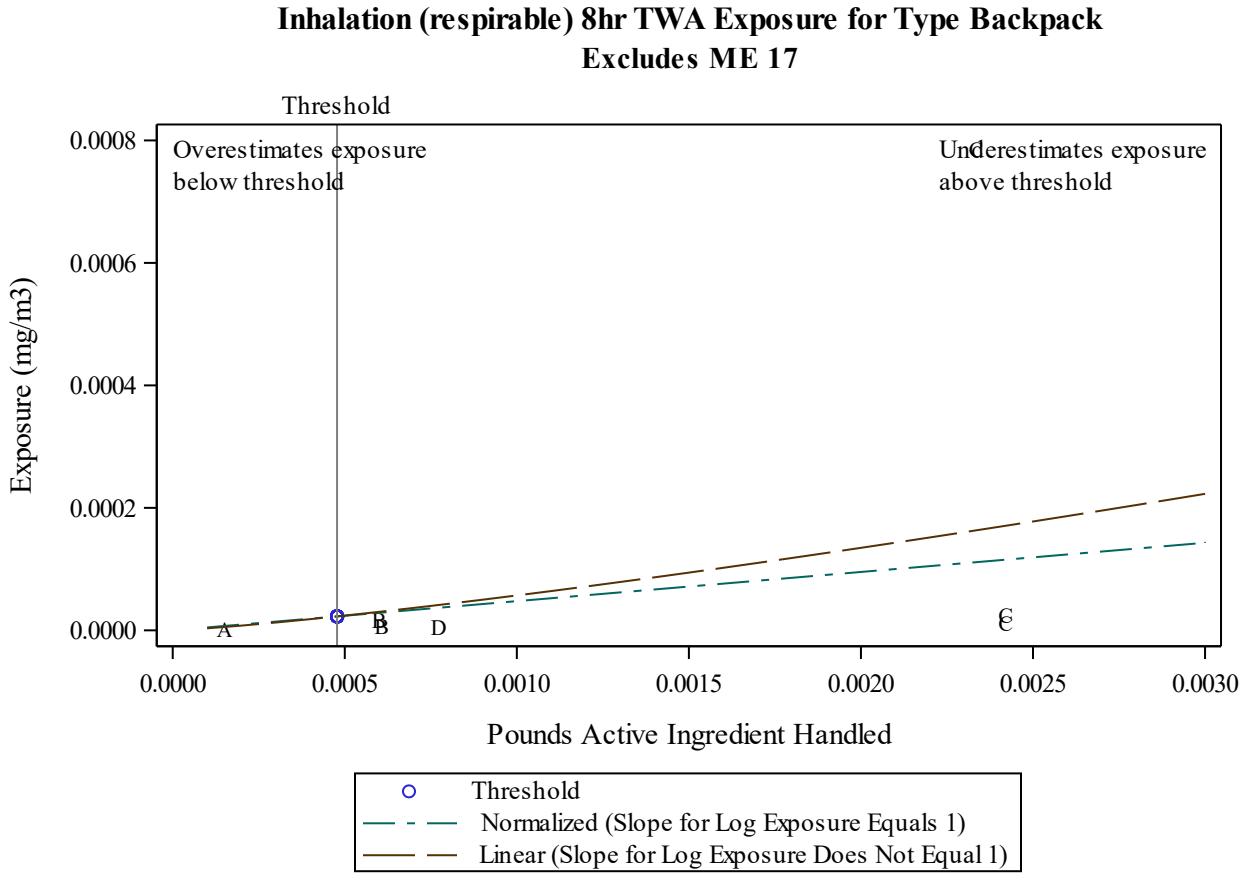
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B96. Threshold plot for Inhalation (respirable) Dose Exposure (mg). Group = Type Cart. Excludes ME 17.



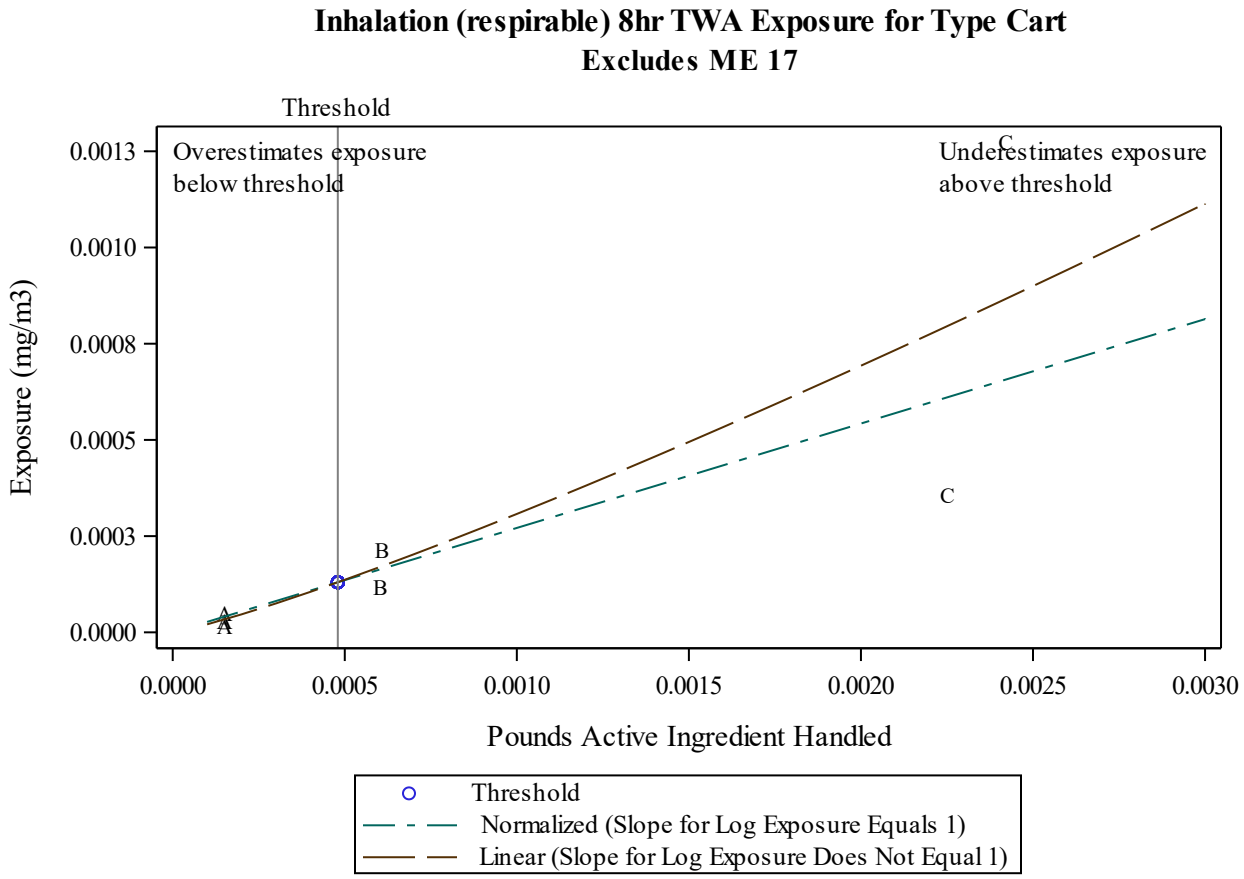
A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B97. Threshold plot for Inhalation (respirable) Time-Weighted Average Exposure (mg/m^3). Group = All. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B98. Threshold plot for Inhalation (respirable) Time-Weighted Average Exposure (mg/m^3). Group = Type Backpack. Excludes ME 17.



A = 0.5 gals 36.3 ppm, B = 1 gal 72.7 ppm, C = 2 gals 145 ppm, D = 0.75 gals 145 ppm

Figure B99. Threshold plot for Inhalation (respirable) Time-Weighted Average Exposure (mg/m³). Group = Type Cart. Excludes ME 17.