



APPENDIX AVAILABLE ON REQUEST

Research Report 143

Measurement and Modeling of Exposure to Selected Air Toxics for Health Effects Studies and Verification by Biomarkers

Roy M. Harrison et al.

Appendix 22. Assessment of Collinearity in Model 4

Note: Appendices Available on the Web appear in a different order than in the original Investigators' Report. HEI has not changed these documents.

Correspondence may be addressed to Dr. Roy Harrison, University of Birmingham, Division of Environmental Health and Risk Management, Edgbaston Park Road School of Geography, Earth, and Environmental Sciences, Birmingham B15 2TT, United Kingdom, r.m.harrison@bham.ac.uk

Although this document was produced with partial funding by the United States Environmental Protection Agency under Assistance Award CR-83234701 to the Health Effects Institute, it has not been subjected to the Agency's peer and administrative review and therefore may not necessarily reflect the views of the Agency, and no official endorsement by it should be inferred. The contents of this document also have not been reviewed by private party institutions, including those that support the Health Effects Institute; therefore, it may not reflect the views or policies of these parties, and no endorsement by them should be inferred.

This document was reviewed by the HEI Health Review Committee but did not undergo the HEI scientific editing and production process.

© 2009 Health Effects Institute, 101 Federal Street, Suite 500, Boston, MA 02110-1817

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.1. Correlation of n-Hexane variables entered into Model 4

		Correlations			
		stqgrgpts	Time_ constant_ETS	Visited_ hospital	Additional_ other_heating
stqgrgpts	Pearson Correlation	1	.038	.057	-.025
	Sig. (2-tailed)		.428	.231	.602
	N	445	445	445	445
Time_constant_ETS	Pearson Correlation	.038	1	.071	.048
	Sig. (2-tailed)	.428		.136	.311
	N	445	445	445	445
Visited_hospital	Pearson Correlation	.057	.071	1	-.013
	Sig. (2-tailed)	.231	.136		.783
	N	445	445	445	445
Additional_other_heating	Pearson Correlation	-.025	.048	-.013	1
	Sig. (2-tailed)	.602	.311	.783	
	N	445	445	445	445

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.2. Correlation of Benzene variables entered into Model 4

Correlations											
		Benzene Modelled	stqgrgpts	stqcrgrg	urban	Time_Const_Freq_ETS	Visited_hospital	Use_All_trains	Time_car	Gas_main_heating	Additional_other_heating
Benzene Modelled	Pearson Correlation	1									
	Sig. (2-tailed)		.162**	.188**	-.271**	.403**	-.044	-.080	.189**	-.178**	.432**
	N	441	441	441	441	441	441	441	441	441	441
stqgrgpts	Pearson Correlation	.162**	1	.389**	-.235**	-.014	.057	.064	.002	.051	-.025
	Sig. (2-tailed)	.001		.000	.000	.767	.231	.179	.964	.288	.602
	N	441	445	445	445	445	445	445	445	445	445
stqcrgrg	Pearson Correlation	.188**	.389**	1	-.145**	.016	.012	-.092	.113*	.036	-.023
	Sig. (2-tailed)	.000	.000		.002	.729	.805	.052	.017	.453	.629
	N	441	445	445	445	445	445	445	445	445	445
urban	Pearson Correlation	-.271**	-.235**	-.145**	1	-.034	-.034	.239**	-.071	-.355**	-.064
	Sig. (2-tailed)	.000	.000	.002		.472	.469	.000	.136	.000	.177
	N	441	445	445	445	445	445	445	445	445	445
Time_Const_Freq_ETS	Pearson Correlation	.403**	-.014	.016	-.034	1	.055	-.073	.029	-.176**	.007
	Sig. (2-tailed)	.000	.767	.729	.472		.250	.126	.545	.000	.876
	N	441	445	445	445	445	445	445	445	445	445
Visited_hospital	Pearson Correlation	-.044	.057	.012	-.034	.055	1	-.053	.027	.073	-.013
	Sig. (2-tailed)	.361	.231	.805	.469	.250		.267	.576	.125	.783
	N	441	445	445	445	445	445	445	445	445	445
Use_All_trains	Pearson Correlation	-.080	.064	-.092	.239**	-.073	-.053	1	-.106*	-.017	-.027
	Sig. (2-tailed)	.095	.179	.052	.000	.126	.267		.026	.722	.566
	N	441	445	445	445	445	445	445	445	445	445
Time_car	Pearson Correlation	.189**	.002	.113*	-.071	.029	.027	-.106*	1	-.084	.178**
	Sig. (2-tailed)	.000	.964	.017	.136	.545	.576	.026		.076	.000
	N	441	445	445	445	445	445	445	445	445	445
Gas_main_heating	Pearson Correlation	-.178**	.051	.036	-.355**	-.176**	.073	-.017	-.084	1	-.099*
	Sig. (2-tailed)	.000	.288	.453	.000	.000	.125	.722	.076		.036
	N	441	445	445	445	445	445	445	445	445	445
Additional_other_heating	Pearson Correlation	.432**	-.025	-.023	-.064	.007	-.013	-.027	.178**	-.099*	1
	Sig. (2-tailed)	.000	.602	.629	.177	.876	.783	.566	.000	.036	
	N	441	445	445	445	445	445	445	445	445	445

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.3. Correlation of Toluene variables entered into Model 4

		Correlations											
		Toluene Modellef	Open_plan_kitchen	Incense_burning	stqgrgpts	stqcrgrg	London	Visited_hospital	Drawing_painting	Time_All_Nails_Glue	Additional_Gas_heating	Xmas_wrapping	Work_factory
Toluene Modellef	Pearson Correlation	1	.112*	.142**	.246**	.182**	-.001	.059	.095*	-.032	-.038	-.044	-.015
	Sig. (2-tailed)		.019	.003	.000	.000	.987	.214	.046	.507	.427	.353	.754
	N	441	441	441	441	441	441	441	441	441	441	441	441
Open_plan_kitchen	Pearson Correlation	.112*	1	-.051	-.157**	-.145**	-.101*	-.083	-.056	-.059	-.090	.158**	-.056
	Sig. (2-tailed)	.019		.280	.001	.002	.033	.081	.242	.215	.057	.001	.242
	N	441	445	445	445	445	445	445	445	445	445	445	445
Incense_burning	Pearson Correlation	.142**	-.051	1	-.062	-.013	.105*	-.033	-.022	-.023	-.036	-.017	-.022
	Sig. (2-tailed)	.003	.280		.193	.785	.027	.492	.645	.626	.454	.722	.645
	N	441	445	445	445	445	445	445	445	445	445	445	445
stqgrgpts	Pearson Correlation	.246**	-.157**	-.062	1	.389**	-.108*	.057	-.032	-.034	.093	-.025	-.032
	Sig. (2-tailed)	.000	.001	.193	.000	.002	.231	.499	.474	.474	.051	.602	.499
	N	441	445	445	445	445	445	445	445	445	445	445	445
stqcrgrg	Pearson Correlation	.182**	-.145**	-.013	.389**	1	-.100*	.012	-.030	-.031	-.048	-.023	-.030
	Sig. (2-tailed)	.000	.002	.785	.000	.035	.805	.532	.508	.309	.629	.532	.532
	N	441	445	445	445	445	445	445	445	445	445	445	445
London	Pearson Correlation	-.001	-.101*	.105*	-.108*	-.100*	1	-.012	-.038	-.041	-.062	-.030	-.038
	Sig. (2-tailed)	.987	.033	.027	.022	.035		.803	.420	.392	.189	.533	.420
	N	441	445	445	445	445	445	445	445	445	445	445	445
Visited_hospital	Pearson Correlation	.059	-.083	-.033	.057	.012	-.012	1	.120*	.011	-.028	-.013	-.017
	Sig. (2-tailed)	.214	.081	.492	.231	.805	.803		.011	.821	.561	.783	.721
	N	441	445	445	445	445	445	445	445	445	445	445	445
Drawing_painting	Pearson Correlation	.095*	-.056	-.022	-.032	-.030	-.038	.120*	1	.199**	-.018	-.009	-.011
	Sig. (2-tailed)	.046	.242	.645	.499	.532	.420	.011		.000	.697	.853	.811
	N	441	445	445	445	445	445	445	445	445	445	445	445
Time_All_Nails_Glue	Pearson Correlation	-.032	-.059	-.023	-.034	-.031	-.041	.011	.199**	1	.051	-.009	-.012
	Sig. (2-tailed)	.507	.215	.626	.474	.508	.392	.821	.000		.283	.845	.800
	N	441	445	445	445	445	445	445	445	445	445	445	445
Additional_Gas_heating	Pearson Correlation	-.038	-.090	-.036	.093	-.048	-.062	-.028	-.018	.051	1	-.014	-.018
	Sig. (2-tailed)	.427	.057	.454	.051	.309	.189	.561	.697	.283		.764	.697
	N	441	445	445	445	445	445	445	445	445	445	445	445
Xmas_wrapping	Pearson Correlation	-.044	.158**	-.017	-.025	-.023	-.030	-.013	-.009	-.009	-.014	1	-.009
	Sig. (2-tailed)	.353	.001	.722	.602	.629	.533	.783	.853	.845	.764		.853
	N	441	445	445	445	445	445	445	445	445	445	445	445
Work_factory	Pearson Correlation	-.015	-.056	-.022	-.032	-.030	-.038	-.017	-.011	-.012	-.018	-.009	1
	Sig. (2-tailed)	.754	.242	.645	.499	.532	.420	.721	.811	.800	.697	.853	
	N	441	445	445	445	445	445	445	445	445	445	445	445

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.4. Correlation of Ethylbenzene variables entered into Model 4

		Correlations								
		Ethylbenzene Modelled	stqgrgpts	stqcrgrg	Time_paint	Visited_hospital	carpet_fumigated	New_carpet	Additional_other_heating	Work_factory
Ethylbenzene Modelled	Pearson Correlation	1	.190**	.146**	-.017	-.005	-.048	.218**	.367**	-.044
	Sig. (2-tailed)		.000	.002	.718	.922	.318	.000	.000	.357
	N	441	441	441	441	441	441	441	441	441
stqgrgpts	Pearson Correlation	.190**	1	.389**	-.003	.057	-.032	-.092	-.025	-.032
	Sig. (2-tailed)	.000		.000	.958	.231	.499	.053	.602	.499
	N	441	445	445	445	445	445	445	445	445
stqcrgrg	Pearson Correlation	.146**	.389**	1	-.028	.012	-.030	-.156**	-.023	-.030
	Sig. (2-tailed)	.002	.000		.553	.805	.532	.001	.629	.532
	N	441	445	445	445	445	445	445	445	445
Time_paint	Pearson Correlation	-.017	-.003	-.028	1	.000	-.011	.034	-.008	-.011
	Sig. (2-tailed)	.718	.958	.553		.992	.821	.474	.861	.821
	N	441	445	445	445	445	445	445	445	445
Visited_hospital	Pearson Correlation	-.005	.057	.012	.000	1	-.017	-.055	-.013	-.017
	Sig. (2-tailed)	.922	.231	.805	.992		.721	.247	.783	.721
	N	441	445	445	445	445	445	445	445	445
carpet_fumigated	Pearson Correlation	-.048	-.032	-.030	-.011	-.017	1	-.060	-.009	-.011
	Sig. (2-tailed)	.318	.499	.532	.821	.721		.209	.853	.811
	N	441	445	445	445	445	445	445	445	445
New_carpet	Pearson Correlation	.218**	-.092	-.156**	.034	-.055	-.060	1	-.046	-.060
	Sig. (2-tailed)	.000	.053	.001	.474	.247	.209		.332	.209
	N	441	445	445	445	445	445	445	445	445
Additional_other_heating	Pearson Correlation	.367**	-.025	-.023	-.008	-.013	-.009	-.046	1	-.009
	Sig. (2-tailed)	.000	.602	.629	.861	.783	.853	.332		.853
	N	441	445	445	445	445	445	445	445	445
Work_factory	Pearson Correlation	-.044	-.032	-.030	-.011	-.017	-.011	-.060	-.009	1
	Sig. (2-tailed)	.357	.499	.532	.821	.721	.811	.209	.853	
	N	441	445	445	445	445	445	445	445	445

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.5. Correlation of p-xylene variables entered into Model 4

		Correlations							
		p-Xylene Modelled	stqgrgptlm	stqcrgrg	Time_paint	Visited_hospital	carpet_fumigated	Additional_other_heating	Work_factory
p-Xylene Modelled	Pearson Correlation	1	.043	.227**	-.010	.027	-.052	.618**	-.025
	Sig. (2-tailed)		.367	.000	.828	.573	.279	.000	.601
	N	441	441	441	441	441	441	441	441
stqgrgptlm	Pearson Correlation	.043	1	.376**	.004	.073	-.029	-.022	-.029
	Sig. (2-tailed)	.367		.000	.940	.126	.546	.641	.546
	N	441	445	445	445	445	445	445	445
stqcrgrg	Pearson Correlation	.227**	.376**	1	-.028	.012	-.030	-.023	-.030
	Sig. (2-tailed)	.000	.000		.553	.805	.532	.629	.532
	N	441	445	445	445	445	445	445	445
Time_paint	Pearson Correlation	-.010	.004	-.028	1	.000	-.011	-.008	-.011
	Sig. (2-tailed)	.828	.940	.553		.992	.821	.861	.821
	N	441	445	445	445	445	445	445	445
Visited_hospital	Pearson Correlation	.027	.073	.012	.000	1	-.017	-.013	-.017
	Sig. (2-tailed)	.573	.126	.805	.992		.721	.783	.721
	N	441	445	445	445	445	445	445	445
carpet_fumigated	Pearson Correlation	-.052	-.029	-.030	-.011	-.017	1	-.009	-.011
	Sig. (2-tailed)	.279	.546	.532	.821	.721		.853	.811
	N	441	445	445	445	445	445	445	445
Additional_other_heating	Pearson Correlation	.618**	-.022	-.023	-.008	-.013	-.009	1	-.009
	Sig. (2-tailed)	.000	.641	.629	.861	.783	.853		.853
	N	441	445	445	445	445	445	445	445
Work_factory	Pearson Correlation	-.025	-.029	-.030	-.011	-.017	-.011	-.009	1
	Sig. (2-tailed)	.601	.546	.532	.821	.721	.811	.853	
	N	441	445	445	445	445	445	445	445

** . Correlation is significant at the 0.01 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.6. Correlation of m-xylene variables entered into Model 4

		Correlations						
		m-Xylene Modelled	stqcrgrg	Time_paint	Time_Indirect_paint	Visited_hospital	carpet_fumigated	Work_factory
m-Xylene Modelled	Pearson Correlation	1	.104*	.005	-.016	-.021	-.033	-.034
	Sig. (2-tailed)		.029	.918	.731	.663	.488	.479
	N	441	441	441	441	441	441	441
stqcrgrg	Pearson Correlation	.104*	1	-.028	-.013	.012	-.030	-.030
	Sig. (2-tailed)	.029		.553	.781	.805	.532	.532
	N	441	445	445	445	445	445	445
Time_paint	Pearson Correlation	.005	-.028	1	.864**	.000	-.011	-.011
	Sig. (2-tailed)	.918	.553		.000	.992	.821	.821
	N	441	445	445	445	445	445	445
Time_Indirect_paint	Pearson Correlation	-.016	-.013	.864**	1	-.008	-.005	-.005
	Sig. (2-tailed)	.731	.781	.000		.874	.915	.915
	N	441	445	445	445	445	445	445
Visited_hospital	Pearson Correlation	-.021	.012	.000	-.008	1	-.017	-.017
	Sig. (2-tailed)	.663	.805	.992	.874		.721	.721
	N	441	445	445	445	445	445	445
carpet_fumigated	Pearson Correlation	-.033	-.030	-.011	-.005	-.017	1	-.011
	Sig. (2-tailed)	.488	.532	.821	.915	.721		.811
	N	441	445	445	445	445	445	445
Work_factory	Pearson Correlation	-.034	-.030	-.011	-.005	-.017	-.011	1
	Sig. (2-tailed)	.479	.532	.821	.915	.721	.811	
	N	441	445	445	445	445	445	445

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Coefficients(a)

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constant)		
m-Xylene Modelled	.966	1.035
stqcrgrg	.966	1.035
Time_paint	.249	4.021
Time_Indirect_paint	.249	4.017
Visited_hospital	.996	1.004
carpet_fumigated	.998	1.002
Work_factory	.998	1.002

a Dependent Variable: m-Xylene Measured

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.7. Correlation of Pyridine variables entered into Model 4

Correlations

		Pyridine Modelled	ETS	Time_ETS	Time_constant_ETS	Time_frequent_ETS
Pyridine Modelled	Pearson Correlation	1	.338**	.599**	.079	.816**
	Sig. (2-tailed)		.000	.000	.097	.000
	N	441	441	441	441	441
ETS	Pearson Correlation	.338**	1	.596**	.256**	.369**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	441	445	445	445	445
Time_ETS	Pearson Correlation	.599**	.596**	1	.563**	.661**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	441	445	445	445	445
Time_constant_ETS	Pearson Correlation	.079	.256**	.563**	1	.062
	Sig. (2-tailed)	.097	.000	.000		.188
	N	441	445	445	445	445
Time_frequent_ETS	Pearson Correlation	.816**	.369**	.661**	.062	1
	Sig. (2-tailed)	.000	.000	.000	.188	
	N	441	445	445	445	445

** . Correlation is significant at the 0.01 level (2-tailed).

Coefficients(a)

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	ETS	.636	1.573
	Time_ETS	.216	4.627
	Time_constant_ETS	.481	2.079
	Time_frequent_ETS	.242	4.137
	Pyridine Modelled	.307	3.259

a Dependent Variable: Pyridine Measured

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.8. Correlation of o-xylene variables entered into Model 4

		Correlations						
		stqcrgrg	Time_paint	Time_Indirect_paint	Visited_hospital	carpet_fumigated	Work_factory	o-Xylene Modelled
stqcrgrg	Pearson Correlation	1	-.028	-.013	.012	-.030	-.030	.197**
	Sig. (2-tailed)		.553	.781	.805	.532	.532	.000
	N	445	445	445	445	445	445	441
Time_paint	Pearson Correlation	-.028	1	.864**	.000	-.011	-.011	.026
	Sig. (2-tailed)	.553		.000	.992	.821	.821	.582
	N	445	445	445	445	445	445	441
Time_Indirect_paint	Pearson Correlation	-.013	.864**	1	-.008	-.005	-.005	-.028
	Sig. (2-tailed)	.781	.000		.874	.915	.915	.554
	N	445	445	445	445	445	445	441
Visited_hospital	Pearson Correlation	.012	.000	-.008	1	-.017	-.017	.004
	Sig. (2-tailed)	.805	.992	.874		.721	.721	.934
	N	445	445	445	445	445	445	441
carpet_fumigated	Pearson Correlation	-.030	-.011	-.005	-.017	1	-.011	-.063
	Sig. (2-tailed)	.532	.821	.915	.721		.811	.185
	N	445	445	445	445	445	445	441
Work_factory	Pearson Correlation	-.030	-.011	-.005	-.017	-.011	1	-.046
	Sig. (2-tailed)	.532	.821	.915	.721	.811		.331
	N	445	445	445	445	445	445	441
o-Xylene Modelled	Pearson Correlation	.197**	.026	-.028	.004	-.063	-.046	1
	Sig. (2-tailed)	.000	.582	.554	.934	.185	.331	
	N	441	441	441	441	441	441	441

** . Correlation is significant at the 0.01 level (2-tailed).

Coefficients(a)

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	stqcrgrg	.948	1.055
	Time_paint	.246	4.058
	Time_Indirect_paint	.247	4.054
	Visited_hospital	.996	1.004
	carpet_fumigated	.997	1.003
	Work_factory	.997	1.003
	o-Xylene Modelled	.938	1.066

a Dependent Variable: o-Xylene Measured

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.9. Correlation of 1,3,5-Trimethylbenzene variables entered into Model 4

		Correlations					
		1,3,5- Trimethylbenz ene Modelled	stqcrgrg	Time_direct_ paint	Kitchen_ garage	Use_gas_ cooker	Work_factory
1,3,5-Trimethylbenzene Modelled	Pearson Correlation	1	.169**	.133**	.119*	.232**	-.097*
	Sig. (2-tailed)		.000	.005	.012	.000	.041
	N	441	441	441	441	441	441
stqcrgrg	Pearson Correlation	.169**	1	-.033	.446**	-.034	-.030
	Sig. (2-tailed)	.000		.485	.000	.472	.532
	N	441	445	445	445	445	445
Time_direct_paint	Pearson Correlation	.133**	-.033	1	-.028	.364**	-.013
	Sig. (2-tailed)	.005	.485		.558	.000	.789
	N	441	445	445	445	445	445
Kitchen_garage	Pearson Correlation	.119*	.446**	-.028	1	-.024	-.025
	Sig. (2-tailed)	.012	.000	.558		.617	.601
	N	441	445	445	445	445	445
Use_gas_cooker	Pearson Correlation	.232**	-.034	.364**	-.024	1	.006
	Sig. (2-tailed)	.000	.472	.000	.617		.894
	N	441	445	445	445	445	445
Work_factory	Pearson Correlation	-.097*	-.030	-.013	-.025	.006	1
	Sig. (2-tailed)	.041	.532	.789	.601	.894	
	N	441	445	445	445	445	445

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.10. Correlation of Styrene variables entered into Model 4

Correlations

		Styrene Modelled	Wood_burning	carpet_fumigated
Styrene Modelled	Pearson Correlation	1	.009	-.047
	Sig. (2-tailed)		.859	.322
	N	441	441	441
Wood_burning	Pearson Correlation	.009	1	-.015
	Sig. (2-tailed)	.859		.747
	N	441	445	445
carpet_fumigated	Pearson Correlation	-.047	-.015	1
	Sig. (2-tailed)	.322	.747	
	N	441	445	445

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.11. Correlation of p-isopropyltoluene variables entered into Model 4

		Correlations								
		Incense_burning	Redecoration	Time_direct_paint	Chiropodist	Drawing_painting	Additional_Gas_heating	Not_cooker_hood	Inv_Time_since_antimould	p-Isopropyltoluene Modelled
Incense_burning	Pearson Correlation	1	.069	-.025	.122**	-.022	-.036	.025	-.018	.013
	Sig. (2-tailed)		.148	.606	.010	.645	.454	.601	.700	.787
	N	445	445	445	445	445	445	445	445	441
Redecoration	Pearson Correlation	.069	1	.130**	-.074	-.095*	.194**	-.167**	-.080	.044
	Sig. (2-tailed)	.148		.006	.120	.044	.000	.000	.093	.353
	N	445	445	445	445	445	445	445	445	441
Time_direct_paint	Pearson Correlation	-.025	.130**	1	-.010	-.013	-.021	-.022	-.011	.043
	Sig. (2-tailed)	.606	.006		.836	.789	.663	.639	.823	.370
	N	445	445	445	445	445	445	445	445	441
Chiropodist	Pearson Correlation	.122**	-.074	-.010	1	-.009	-.014	-.015	-.007	-.033
	Sig. (2-tailed)	.010	.120	.836		.853	.764	.746	.877	.492
	N	445	445	445	445	445	445	445	445	441
Drawing_painting	Pearson Correlation	-.022	-.095*	-.013	-.009	1	-.018	-.020	-.010	.082
	Sig. (2-tailed)	.645	.044	.789	.853		.697	.675	.842	.087
	N	445	445	445	445	445	445	445	445	441
Additional_Gas_heating	Pearson Correlation	-.036	.194**	-.021	-.014	-.018	1	-.032	-.015	-.173**
	Sig. (2-tailed)	.454	.000	.663	.764	.697		.495	.745	.000
	N	445	445	445	445	445	445	445	445	441
Not_cooker_hood	Pearson Correlation	.025	-.167**	-.022	-.015	-.020	-.032	1	-.017	.170**
	Sig. (2-tailed)	.601	.000	.639	.746	.675	.495		.726	.000
	N	445	445	445	445	445	445	445	445	441
Inv_Time_since_antimould	Pearson Correlation	-.018	-.080	-.011	-.007	-.010	-.015	-.017	1	.072
	Sig. (2-tailed)	.700	.093	.823	.877	.842	.745	.726		.130
	N	445	445	445	445	445	445	445	445	441
p-Isopropyltoluene Modelled	Pearson Correlation	.013	.044	.043	-.033	.082	-.173**	.170**	.072	1
	Sig. (2-tailed)	.787	.353	.370	.492	.087	.000	.000	.130	
	N	441	441	441	441	441	441	441	441	441

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.12. Correlation of 1,2,4-Trimethylbenzene variables entered into Model 4

		Correlations					
		stqcrgrg	Time_direct_ paint	Kitchen_ garage	Use_gas_ cooker	Work_factory	1,2,4- Trimethylbenz ene Modelled
stqcrgrg	Pearson Correlation	1	-.033	.446**	-.034	-.030	.307**
	Sig. (2-tailed)		.485	.000	.472	.532	.000
	N	445	445	445	445	445	441
Time_direct_paint	Pearson Correlation	-.033	1	-.028	.364**	-.013	-.042
	Sig. (2-tailed)	.485		.558	.000	.789	.379
	N	445	445	445	445	445	441
Kitchen_garage	Pearson Correlation	.446**	-.028	1	-.024	-.025	.224**
	Sig. (2-tailed)	.000	.558		.617	.601	.000
	N	445	445	445	445	445	441
Use_gas_cooker	Pearson Correlation	-.034	.364**	-.024	1	.006	-.081
	Sig. (2-tailed)	.472	.000	.617		.894	.088
	N	445	445	445	445	445	441
Work_factory	Pearson Correlation	-.030	-.013	-.025	.006	1	-.074
	Sig. (2-tailed)	.532	.789	.601	.894		.123
	N	445	445	445	445	445	441
1,2,4-Trimethylbenzene Modelled	Pearson Correlation	.307**	-.042	.224**	-.081	-.074	1
	Sig. (2-tailed)	.000	.379	.000	.088	.123	
	N	441	441	441	441	441	441

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.13. Correlation of e-ethenylpyridine variables entered into Model 4

Correlations

		3- Ethenylpyridi ne Modelled	ETS	Time_ETS	Time_ constant_ETS	Time_Const_ Freq_ETS
3-Ethenylpyridine Modelled	Pearson Correlation	1	.390**	.639**	.120*	.739**
	Sig. (2-tailed)		.000	.000	.012	.000
	N	441	441	441	441	441
ETS	Pearson Correlation	.390**	1	.596**	.256**	.437**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	441	445	445	445	445
Time_ETS	Pearson Correlation	.639**	.596**	1	.563**	.836**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	441	445	445	445	445
Time_constant_ETS	Pearson Correlation	.120*	.256**	.563**	1	.566**
	Sig. (2-tailed)	.012	.000	.000		.000
	N	441	445	445	445	445
Time_Const_Freq_ETS	Pearson Correlation	.739**	.437**	.836**	.566**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	441	445	445	445	445

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Coefficients(a)

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	ETS	.632	1.581
	Time_ETS	.216	4.640
	Time_constant_ETS	.412	2.424
	3-Ethenylpyridine Modelled	.291	3.434
	Time_Const_Freq_ETS	.162	6.181

a Dependent Variable: 3-Ethenylpyridine Measured

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.14. Correlation of Naphthalene variables entered into Model 4

		Correlations						
		Incense_ burning	stqhmephc	Inverse_ Time_ blqktncl	Inverse_ Time_ blqktncl	Gas_main_ heating	Packing_ Unpacking_ Clothes_Loft	Inv_Time_ Unpack_ Clothes
Incense_burning	Pearson Correlation	1	-.065	.010	-.040	-.109*	-.014	-.017
	Sig. (2-tailed)		.173	.839	.395	.022	.772	.720
	N	445	445	445	445	445	445	445
stqhmephc	Pearson Correlation	-.065	1	-.108*	-.061	-.015	.057	.180**
	Sig. (2-tailed)	.173		.022	.197	.747	.227	.000
	N	445	445	445	445	445	445	445
Inverse_Time_blqktncl	Pearson Correlation	.010	-.108*	1	.151**	.177**	-.016	-.020
	Sig. (2-tailed)	.839	.022		.001	.000	.740	.682
	N	445	445	445	445	445	445	445
Inverse_Time_blqktncl	Pearson Correlation	-.040	-.061	.151**	1	-.061	-.013	-.016
	Sig. (2-tailed)	.395	.197	.001		.197	.781	.731
	N	445	445	445	445	445	445	445
Gas_main_heating	Pearson Correlation	-.109*	-.015	.177**	-.061	1	-.081	-.100*
	Sig. (2-tailed)	.022	.747	.000	.197		.087	.035
	N	445	445	445	445	445	445	445
Packing_Unpacking_ Clothes_Loft	Pearson Correlation	-.014	.057	-.016	-.013	-.081	1	.591**
	Sig. (2-tailed)	.772	.227	.740	.781	.087		.000
	N	445	445	445	445	445	445	445
Inv_Time_Unpack_ Clothes	Pearson Correlation	-.017	.180**	-.020	-.016	-.100*	.591**	1
	Sig. (2-tailed)	.720	.000	.682	.731	.035	.000	
	N	445	445	445	445	445	445	445

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

APPENDIX 22: ASSESSMENT OF COLLINEARITY IN MODEL 4

Table A22.15. Correlation of 1,3-Butadiene variables entered into Model 4

Correlations

		Solvent_use	Time_ETS	Time_Const_Freq_ETS	Visited_Petrol_Station	Use_Bus	Time_travelling	Kitchen_garage	Additional_Gas_heating	Time_wrapping_presents	Inv_Time_since_antimould
Solvent_use	Pearson Correlation	1	-.006	-.004	-.033	-.064	-.001	.024	.053	-.165**	-.015
	Sig. (2-tailed)		.893	.939	.485	.179	.988	.617	.260	.000	.755
	N	445	445	445	445	445	442	445	445	445	445
Time_ETS	Pearson Correlation	-.006	1	.836**	.025	.041	-.052	-.034	-.037	.052	.135**
	Sig. (2-tailed)	.893		.000	.605	.387	.271	.468	.436	.276	.004
	N	445	445	445	445	445	442	445	445	445	445
Time_Const_Freq_ETS	Pearson Correlation	-.004	.836**	1	.017	.072	-.026	-.019	-.053	.061	-.001
	Sig. (2-tailed)	.939	.000		.715	.131	.590	.685	.262	.198	.976
	N	445	445	445	445	445	442	445	445	445	445
Visited_Petrol_Station	Pearson Correlation	-.033	.025	.017	1	-.076	.095*	.112*	.105*	-.016	-.018
	Sig. (2-tailed)	.485	.605	.715		.108	.047	.018	.027	.731	.709
	N	445	445	445	445	445	442	445	445	445	445
Use_Bus	Pearson Correlation	-.064	.041	.072	-.076	1	.167**	-.089	-.066	.055	-.010
	Sig. (2-tailed)	.179	.387	.131	.108		.000	.059	.161	.245	.826
	N	445	445	445	445	445	442	445	445	445	445
Time_travelling	Pearson Correlation	.001	-.052	-.026	.095*	.167**	1	.015	-.051	-.060	.017
	Sig. (2-tailed)	.988	.271	.590	.047	.000		.756	.282	.209	.717
	N	442	442	442	442	442	442	442	442	442	442
Kitchen_garage	Pearson Correlation	.024	-.034	-.019	.112*	-.089	.015	1	-.040	-.019	-.021
	Sig. (2-tailed)	.617	.468	.685	.018	.059	.756		.394	.687	.661
	N	445	445	445	445	445	442	445	445	445	445
Additional_Gas_heating	Pearson Correlation	.053	-.037	-.053	.105*	-.066	-.051	-.040	1	-.014	-.015
	Sig. (2-tailed)	.260	.436	.262	.027	.161	.282	.394		.764	.745
	N	445	445	445	445	445	442	445	445	445	445
Time_wrapping_presents	Pearson Correlation	.165**	.052	.061	-.016	.055	-.060	-.019	-.014	1	-.007
	Sig. (2-tailed)	.000	.276	.198	.731	.245	.209	.687	.764		.878
	N	445	445	445	445	445	442	445	445	445	445
Inv_Time_since_antimould	Pearson Correlation	-.015	.135**	-.001	-.018	-.010	.017	-.021	-.015	-.007	1
	Sig. (2-tailed)	.755	.004	.976	.709	.826	.717	.661	.745	.878	
	N	445	445	445	445	445	442	445	445	445	445

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Coefficients(a)

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constant)		
Solvent_use	.948	1.055
Time_ETS	.269	3.719
Time_Const_Freq_ETS	.273	3.669
Petrol_Station	.951	1.052
Use_Bus	.930	1.075
Time_travelling	.931	1.074
Utility_garage	.978	1.022
Additional_Gas_heating	.969	1.033
Time_wrapping_presents	.946	1.057
Inv_Time_since_antimould	.926	1.080

a Dependent Variable: 1,3-BUTADIENE Measured