APPENDIX 1

A simulated observational study of the relationship between serum cholesterol and age, sex and race. The following measurements were made on 100 subjects:

age	age in years
race	coded race: 1= white, 2= black, 3= Asian
female	coded sex: 0= male, 1= female
chol	serum cholesterol (mg/dl)

From those variables, the following additional variables were computed

race.female	= race * female
white	= 1 if white (race=1); 0 otherwise
black	= 1 if black (race=2); 0 otherwise
asian	= 1 if Asian (race=3); 0 otherwise
white.female	= white * female
black.female	= black * female
asian.female	= asian * female

Presented below are:

1) Selected descriptive statistics
2) Results of selected regression analyses
3) For each regression analysis, results of selected tests of multiple parameters

Descriptive statistics

Univariate descriptives:

	msng	n	freq	%	mean	std dev	min	25%-ile	median	75%-ile	maximum
age	0	100			60.53	5.92	50.67	55.17	61.05	65.42	69.78
chol	0	100			190.91	11.35	159.60	181.89	191.29	199.27	213.13
race	0	100									
Asian			34	34%							
Black			33	33%							
White			33	33%							
sex	0	100									
Female			41	41%							
Male			59	59%							

Frequencies by race and sex:

	White	Black	Asian
Male	19	20	20
Female	14	13	14

APPENDIX 1 (cont.)

Regression models

MODEL A: chol on age, female, race and female-race interaction

```
Residual Standard Error = 7.8560,  Multiple R-Square = 0.5401
N = 100,  F-statistic = 27.8900 on 4 and 95 df, p-value = 0.0000
```

	coef	std.err	t.stat	p.value	95% CIlo	95% CIhi
Intercept	116.5246	8.4132	13.8502	0.0000	99.822	133.2269
age	1.3119	0.1354	9.6927	0.0000	1.043	1.5806
female	-1.6327	4.2231	-0.3866	0.6999	-10.017	6.7513
race	-0.8262	1.2600	-0.6557	0.5136	-3.328	1.6752
race.female	-3.2766	1.9464	-1.6835	0.0956	-7.141	0.5874

Selected hypothesis tests on multiple parameters from Model A

```
Test female= 0.0
     race.female= 0.0
  F-statistic = 14.3000 on 2 and 95 df, p-value = 0.0000

Test race= 0.0
     race.female= 0.0
  F-statistic = 4.0080 on 2 and 95 df, p-value = 0.0213
```

APPENDIX 1 (cont.)

MODEL B: chol on age, female, black, asian and female-black, female-asian interactions

```
Residual Standard Error = 7.4510,  Multiple R-Square = 0.5949
N = 100,  F-statistic = 22.7600 on 6 and 93 df, p-value = 0.0000
                coef std.err   t.stat p.value 95% CIlo  95% CIhi
   Intercept  117.731  7.9783  14.7564  0.0000  101.888  133.5747
         age    1.264  0.1303   9.6987  0.0000    1.005    1.5226
      female   -6.696  2.6245  -2.5515  0.0124  -11.908   -1.4846
       black    1.571  2.3908   0.6570  0.5128   -3.177    6.3184
       asian   -1.563  2.3905  -0.6539  0.5148   -6.310    3.1838
black.female    2.812  3.7803   0.7438  0.4589   -4.695   10.3186
asian.female   -6.568  3.6926  -1.7786  0.0786  -13.900    0.7653
```

Selected hypothesis tests on multiple parameters from Model B

```
Test black= 0.0
     asian= 0.0
  F-statistic = 0.8739 on 2 and 93 df, p-value = 0.4207

Test black.female= 0.0
     asian.female= 0.0
  F-statistic = 3.3390 on 2 and 93 df, p-value = 0.0398

Test female= 0.0
     black.female= 0.0
     asian.female= 0.0
  F-statistic = 11.4900 on 3 and 93 df, p-value = 0.0000

Test black= 0.0
     asian= 0.0
     black.female= 0.0
     asian.female= 0.0
  F-statistic = 5.3750 on 4 and 93 df, p-value = 0.0006
```

APPENDIX 1 (cont.)

MODEL C: chol on age, female, white, asian and female-white, female-asian interactions

```
Residual Standard Error = 7.4510,  Multiple R-Square = 0.5949
N = 100,  F-statistic = 22.7600 on 6 and 93 df, p-value = 0.0000
                coef std.err   t.stat p.value 95% CIlo 95% CIhi
   Intercept  119.302  7.8397  15.2176  0.0000  103.734  134.870
         age    1.264  0.1303   9.6987  0.0000    1.005    1.523
      female   -3.885  2.7242  -1.4260  0.1572   -9.294    1.525
       white   -1.571  2.3908  -0.6570  0.5128   -6.318    3.177
       asian   -3.134  2.3706  -1.3221  0.1894   -7.842    1.573
white.female   -2.812  3.7803  -0.7438  0.4589  -10.319    4.695
asian.female   -9.379  3.7497  -2.5013  0.0141  -16.825   -1.933
```

Selected hypothesis tests on multiple parameters from Model B

```
Test white= 0.0
     asian= 0.0
  F-statistic = 0.8739 on 2 and 93 df, p-value = 0.4207

Test white.female= 0.0
     asian.female= 0.0
  F-statistic = 3.3390 on 2 and 93 df, p-value = 0.0398

Test female= 0.0
     white.female= 0.0
     asian.female= 0.0
  F-statistic = 11.4900 on 3 and 93 df, p-value = 0.0000

Test white= 0.0
     asian= 0.0
     white.female= 0.0
     asian.female= 0.0
  F-statistic = 5.3750 on 4 and 93 df, p-value = 0.0006
```

APPENDIX 2

A simulated randomized clinical trial of a new drug to treat blood pressure. 150 subjects were randomized to one of three doses. The following measurements were made:

male	coded sex: 0= female, 1= male
dose	dose administered (mg/day)
sbp	systolic blood pressure at end of study (mm Hg)

From those variables, the following variables were computed

dose0	1 if subject in dose 0 group; 0 otherwise
dose10	1 if subject in dose 10 group; 0 otherwise
dose20	1 if subject in dose 20 group; 0 otherwise

Presented below are:

1) Selected descriptive statistics
2) Results of selected regression analyses
3) For each regression analysis, results of selected tests of multiple parameters

Descriptive statistics

Univariate descriptives:

	msng	n	freq	%	mean	std dev	min	25%-ile	median	75%-ile	maximum
sbp	0	150			139.496	16.582	103.304	128.994	137.818	150.313	192.355
sex	0	150									
Female			75	50%							
Male			75	50%							
dose	0	150									
0			50	33%							
10			50	33%							
20			50	33%							

Frequencies by sex and dose

	Dose 0	Dose 10	Dose 20
Female	30	25	20
Male	20	25	30

Chi square test for association between sex and dose:
X-square = 4, df = 2, p-value = 0.1353

APPENDIX 2 (cont.)

Regression models

MODEL D: sbp on dose

```
Residual Standard Error = 16.4900,  Multiple R-Square = 0.01832
N = 150,  F-statistic = 2.7610 on 1 and 148 df, p-value = 0.0987

              coef std.err  t.stat p.value  95% CIlo 95% CIhi
Intercept  142.2349  2.1282  66.832  0.0000  138.0293 146.4406
     dose   -0.2739  0.1649  -1.662  0.0987   -0.5997   0.0518
```

MODEL E: sbp on dose10, dose20

```
Residual Standard Error = 16.4900,  Multiple R-Square = 0.02465
N = 150,  F-statistic = 1.8570 on 2 and 147 df, p-value = 0.1597

              coef std.err   t.stat p.value 95% CIlo 95% CIhi
Intercept  141.3051   2.332  60.6010  0.0000  136.697  145.913
   dose10    0.0502   3.298   0.0152  0.9879   -6.467    6.567
   dose20   -5.4788   3.298  -1.6615  0.0988  -11.996    1.038

Test dose10= 0.0
     dose20= 0.0
  F-statistic = 1.8570 on 2 and 147 df, p-value = 0.1597
```

MODEL F: sbp on dose0, dose10

```
Residual Standard Error = 16.4900,  Multiple R-Square = 0.02465
N = 150,  F-statistic = 1.8570 on 2 and 147 df, p-value = 0.1597

            coef std.err t.stat p.value  95% CIlo 95% CIhi
Intercept 135.826   2.332 58.251  0.0000  131.2183   140.43
    dose0   5.479   3.298  1.662  0.0988   -1.0380    12.00
   dose10   5.529   3.298  1.677  0.0957   -0.9878    12.05

Test dose0= 0.0
     dose10= 0.0
  F-statistic = 1.8570 on 2 and 147 df, p-value = 0.1597
```

MODEL G: sbp on male

```
Residual Standard Error = 15.6400,  Multiple R-Square = 0.1167
N = 150,  F-statistic = 19.5600 on 1 and 148 df, p-value = 0.0000
            coef std.err t.stat p.value 95% CIlo 95% CIhi
Intercept 133.85   1.806 74.130       0  130.280   137.42
     male  11.29   2.554  4.423       0    6.248    16.34
```

APPENDIX 2 (cont.)

MODEL H: sbp on male, dose

```
Residual Standard Error = 15.3500,  Multiple R-Square = 0.1543
N = 150,  F-statistic = 13.4100 on 2 and 147 df, p-value = 0.0000

               coef std.err  t.stat p.value 95% CIlo  95% CIhi
Intercept  137.2933  2.2275  61.635  0.0000  132.891  141.6954
     male   12.3541  2.5413   4.861  0.0000    7.332   17.3762
     dose   -0.3975  0.1556  -2.554  0.0117   -0.705   -0.0899
```

MODEL I: sbp on male, dose10, dose20

```
Residual Standard Error = 15.3500,  Multiple R-Square = 0.1606
N = 150,  F-statistic = 9.3120 on 3 and 146 df, p-value = 0.0000
              coef std.err   t.stat p.value 95% CIlo 95% CIhi
Intercept  136.363   2.397  56.8989  0.0000  131.627  141.100
     male   12.354   2.540   4.8631  0.0000    7.333   17.375
   dose10   -1.185   3.080  -0.3848  0.7009   -7.272    4.902
   dose20   -7.950   3.111  -2.5551  0.0116  -14.099   -1.800

Test dose10= 0.0
     dose20= 0.0
  F-statistic = 3.8150 on 2 and 146 df, p-value = 0.0243
```

MODEL J: sbp on male, dose0, dose10

```
Residual Standard Error = 15.3500,  Multiple R-Square = 0.1606
N = 150,  F-statistic = 9.3120 on 3 and 146 df, p-value = 0.0000

             coef std.err t.stat p.value 95% CIlo 95% CIhi
Intercept 128.414   2.652 48.417  0.0000 123.1721   133.66
     male  12.354   2.540  4.863  0.0000   7.3334    17.37
    dose0   7.950   3.111  2.555  0.0116   1.8005    14.10
   dose10   6.764   3.080  2.196  0.0297   0.6771    12.85

Test dose0= 0.0
     dose10= 0.0
  F-statistic = 3.8150 on 2 and 146 df, p-value = 0.0243
```

MODEL K: sbp on male, dose, dose20

```
Residual Standard Error = 15.3500,  Multiple R-Square = 0.1606
N = 150,  F-statistic = 9.3120 on 3 and 146 df, p-value = 0.0000
              coef std.err   t.stat p.value 95% CIlo  95% CIhi
Intercept  135.178   2.515  53.7520  0.0000  130.208  140.1484
     male   12.354   2.540   4.8631  0.0000    7.333   17.3747
    dose0    1.185   3.080   0.3848  0.7009   -4.902    7.2725
   dose20   -6.764   3.080  -2.1962  0.0297  -12.852   -0.6771

Test dose0= 0.0
     dose20= 0.0
  F-statistic = 3.8150 on 2 and 146 df, p-value = 0.0243
```