Bivariate Measures of Association

Measures of association/ correlation provide information about the strength and direction of relationships.

	Strength of Relationship		
Statistically significant?	Weak	Moderate	Strong
Not statistically significant	✔	✔	✔
Statistically significant	✔	✔	✔

Nominal Measures of Association

Measure	Requirements	Range	Interpretation
Phi	2x2 nominal crosstab	0-1	Indirect (0-.10=weak, .11-.30=moderate, .30+=strong)
Cramer's V	Bigger than 2x2 nominal crosstab	0-1	Indirect (0-.10=weak, .11-.30=moderate, .30+=strong)
Lambda	2x2 nominal crosstab or bigger	0-1	PRE

Ordinal and Scale Measures of Association

Measure	Requirements	Range	Interpretation
Gamma	Ordinal crosstab	-1 to 1	PRE
Spearman's Rho	Scales	-1 to 1	Indirect, or, direct if squared

Indirect Interpretation:
0-.30 = weak
.31-.60 = moderate
.61+ = strong

Interval-Ratio Measure of Association

Measure	Requirements	Range	Interpretation
Pearson's R	2 interval ratio variables	-1 to 1	Indirect, or, direct if squared

Indirect Interpretation:
0-.30 = weak
.31-.60 = moderate
.61+ = strong

?

What if you have one nominal and one ordinal variable?

?

What if you have one ordinal and one interval-ratio variable?

?

What if you have one nominal and one interval-ratio variable?

Is there a relationship between city size and crime rate?

	City Size			
Crime Rate	Small	Medium	Large	Totals
Low	21	17	8	46
High	29	33	42	104
Total	50	50	50	150

Is there a relationship between city size and crime rate?

	City Size			
Crime Rate	Small	Medium	Large	Totals
Low	21 (42%)	17 (34%)	8 (16%)	46 (30.7%)
High	29 (58%)	33 (66%)	42 (84%)	104 (69.3%)
Total	50 (100%)	50 (100%)	50 (100%)	150 (100%)

Is there a relationship between city size and crime rate?

	City Size			
Crime Rate	Small	Medium	Large	Totals
Low	21 (42%)	17 (34%)	8 (16%)	46 (30.7%)
High	29 (58%)	33 (66%)	42 (84%)	104 (69.3%)
Total	50 (100%)	50 (100%)	50 (100%)	150 (100%)

Gamma = 0.40

Is attendance at basketball games related to the number of points scored per game (by home team)?

Game	Points Scored	Attendance
1	54	378
2	57	350
3	59	320
4	80	478
5	82	451
6	75	250
7	73	489
8	53	451
9	67	410
10	78	215
11	67	113
12	56	250
13	85	450
14	101	489
15	99	472

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8	53	451
9	67	410
10	78	215
11	67	113
12	56	250
13	85	450
14	101	489
15	99	472

$r = 0.40$

$r^2 = 0.16$

How consistent are people in their voting habits?

	2004 Election		
2008 Election	Democrat	Republican	Totals
Democrat	117	23	140
Republican	17	178	195
Total	134	201	335

How consistent are people in their voting habits?

	2004 Election		
2008 Election	Democrat	Republican	Totals
Democrat	117 (87.3%)	23 (11.4%)	140 (41.8%)
Republican	17 (12.7%)	178 (88.6%)	195 (58.2%)
Total	134 (100%)	201 (100%)	335 (100%)

How consistent are people in their voting habits?

	2004 Election		
2008 Election	Democrat	Republican	Totals
Democrat	117 (87.3%)	23 (11.4%)	140 (41.8%)
Republican	17 (12.7%)	178 (88.6%)	195 (58.2%)
Total	134 (100%)	201 (100%)	335 (100%)

Phi = 0.75

Lambda = 0.71

Is staff turnover greater at organizations with more experienced directors?

	Director experienced?		
Turnover	No	Yes	Totals
Low	4	9	13
Moderate	9	8	17
High	15	5	20
Total	28	22	50

Is staff turnover greater at organizations with more experienced directors?

	Director experienced?		
Turnover	No	Yes	Totals
Low	4 (14.3%)	9 (40.9%)	13 (26%)
Moderate	9 (32.1%)	8 (36.4%)	17 (34%)
High	15 (53.6%)	5 (22.7%)	20 (40%)
Total	28 (100%)	22 (100%)	50 (100%)

Is staff turnover greater at organizations with more experienced directors?

	Director experienced?		
Turnover	No	Yes	Totals
Low	4 (14.3%)	9 (40.9%)	13 (26%)
Moderate	9 (32.1%)	8 (36.4%)	17 (34%)
High	15 (53.6%)	5 (22.7%)	20 (40%)
Total	28 (100%)	22 (100%)	50 (100%)

Cramer's V= 0.36

Lambda = 0.13

Is age related to the number of hours of television watched every day?

Age	Hours of daily TV
34	1
41	3
52	2
67	5
40	5
22	3
31	4
23	4
64	6
55	2
66	5
22	0
19	7
21	1
58	0

Is age related to the number of hours of television watched every day?

Age	Hours of daily TV
34	1
41	3
52	2
67	5
40	5
22	3
31	4
23	4
64	6
55	2
66	5
22	0
19	7
21	1
58	0

$r = 0.16$

$r^2 = 0.03$

For new foreign (non-English-speaking) immigrants, does length of residence affect the extent of contact with country of origin?

	Length of Residence		
Contact	Less than five years	Five or more years	Totals
Rare	5	20	25
Frequent	20	5	25
Total	25	25	50

For new foreign (non-English-speaking) immigrants, does length of residence affect the extent of contact with country of origin?

	Length of Residence		
Contact	Less than five years	Five or more years	Totals
Rare	5 (20%)	20 (80%)	25 (50%)
Frequent	20 (80%)	5 (20%)	25 (50%)
Total	25 (100%)	25 (100%)	50 (100%)

For new foreign (non-English-speaking) immigrants, does length of residence affect the extent of contact with country of origin?

	Length of Residence		
Contact	Less than five years	Five or more years	Totals
Rare	5 (20%)	20 (80%)	25 (50%)
Frequent	20 (80%)	5 (20%)	25 (50%)
Total	25 (100%)	25 (100%)	50 (100%)

Gamma = -0.88

Is there a relationship between the pre- and post-test scores?

Case	Performance Evaluation (Scale) – Pretest	Performance Evaluation (Scale) – Posttest
A	17	78
B	17	85
C	15	82
D	13	92
E	13	75
F	13	72
G	11	70
H	10	75
I	10	92
J	10	70
K	9	32
L	8	55
M	7	21
N	5	45
O	2	25

Is there a relationship between the pre- and post-test scores?

Case	Performance Evaluation (Scale) – Pretest	Performance Evaluation (Scale) – Posttest
A	17	78
B	17	85
C	15	82
D	13	92
E	13	75
F	13	72
G	11	70
H	10	75
I	10	92
J	10	70
K	9	32
L	8	55
M	7	21
N	5	45
O	2	25

Rho = 0.77

Does income predict happiness?

	Income			
Happiness	Low	Moderate	High	Totals
Not happy	101	82	36	219
Pretty happy	40	227	100	367
Very happy	216	198	203	617
Total	357	507	339	1203

Does income predict happiness?

	Income			
Happiness	Low	Moderate	High	Totals
Not happy	101 (28.3%)	82 (16.2%)	36 (7.1%)	219 (18.2%)
Pretty happy	40 (11.2%)	227 (44.8%)	100 (19.7%)	367 (30.5%)
Very happy	216 (60.5%)	198 (39.1%)	203 (40%)	617 (51.3%)
Total	357 (100%)	507 (100%)	339 (100%)	1203 (100%)

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Not happy	101 (28.3%)	82 (16.2%)	36 (7.1%)	219 (18.2%)
Pretty happy	40 (11.2%)	227 (44.8%)	100 (19.7%)	367 (30.5%)
Very happy	216 (60.5%)	198 (39.1%)	203 (40%)	617 (51.3%)
Total	357 (100%)	507 (100%)	339 (100%)	1203 (100%)

Gamma = 0.08

Among residents at a housing development for senior citizens, is there a correlation between the number of activities completed a week and the number of visitors a week?

Case	Number of Activities	Number of Visitors
A	10	14
B	11	12
C	12	10
D	10	9
E	15	8
F	9	7
G	7	10
H	3	15
I	10	12
J	9	2

Among residents at a housing development for senior citizens, is there a correlation between the number of activities completed a week and the number of visitors a week?

Case	Number of Activities	Number of Visitors
A	10	14
B	11	12
C	12	10
D	10	9
E	15	8
F	9	7
G	7	10
H	3	15
I	10	12
J	9	2

$r = -0.31$

$r^2 = 0.10$

Does living arrangement contribute to a sense of isolation among senior citizens?

	Living Arrangement		
Sense of Isolation	Housing Development	Integrated Neighborhood	Totals
Low	80	30	110
High	20	120	140
Total	100	150	250

Does living arrangement contribute to a sense of isolation among senior citizens?

	Living Arrangement		
Sense of Isolation	Housing Development	Integrated Neighborhood	Totals
Low	80 (80%)	30 (20%)	110 (44%)
High	20 (20%)	120 (80%)	140 (56%)
Total	100 (100%)	150 (100%)	250 (100%)

Does living arrangement contribute to a sense of isolation among senior citizens?

	Living Arrangement		
Sense of Isolation	Housing Development	Integrated Neighborhood	Totals
Low	80 (80%)	30 (20%)	110 (44%)
High	20 (20%)	120 (80%)	140 (56%)
Total	100 (100%)	150 (100%)	250 (100%)

Phi = 0.59

Lambda = 0.54

	Strength of Relationship		
Statistically significant?	Weak	Moderate	Strong
Not statistically significant	✔	✔	✔
Statistically significant	✔	✔	✔