

# ***LOGISTIC REGRESSION***

***COM 631/731***

***4/16/16 (v.2)***

***Violet Cox***

## I. MODEL

### **BLOCK 1**

#### **Community Connections**

Q1: Which best describes where you live? (six-point rural-ness measure)

Q2: How long lived there

Q9: How significant your community is to you

Q39: Collected neighbor's mail

### **BLOCK 2**

#### **Sense of Community**

Q 27: Feel part of community

Q28: Identify strongly with community

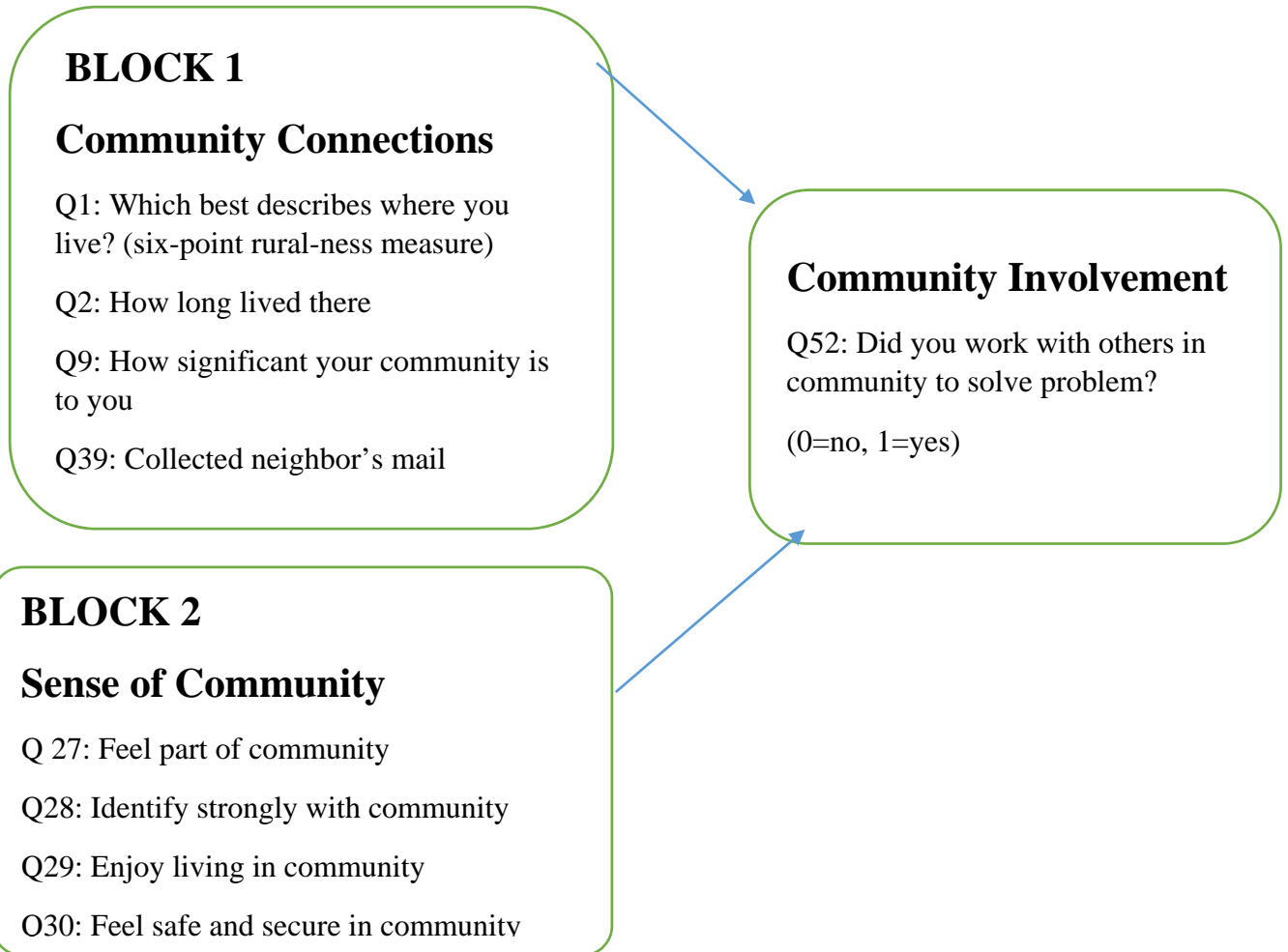
Q29: Enjoy living in community

O30: Feel safe and secure in community

#### **Community Involvement**

Q52: Did you work with others in community to solve problem?

(0=no, 1=yes)



## II. RUNNING SPSS

Running the Logistic Regression

Analyze  $\longrightarrow$  Regression  $\longrightarrow$  Binary Logistic

**DEPENDENT:** Insert Dependent variable

**COVARIATES:** Insert independent variables from Block 1

The screenshot displays the IBM SPSS Statistics interface. The main window shows the 'Variable View' for a dataset named 'atcom.sav'. A 'Logistic Regression' dialog box is open, showing the following settings:

- Dependent:** Q52:Worked w/others on community problems [q52]
- Covariates:** q1, q2, q9, q39
- Method:** Enter

The background table lists variables with their properties:

Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role	
1	ID	Numeric	3	0		None	None	8	Right	Scale	Input
2	time\$	Numeric	6	0		None	None	8	Right	Scale	Input
3	timeans\$	Numeric	4	0		None	None	8	Right	Scale	Input
4	q1	Numeric	1	0	Q1:Where live	{1, 1=centra	7 - 99, 0	8	Right	Scale	Input
5	q2	Numeric	1	0	Q2:Time lived						Input
6	q3	String	255	0	Q3:Deciding						Input
7	q4	Numeric	2	0	Q4:Commun						Input
8	q5	Numeric	2	0	Q5:Neighb						Input
9	q6	Numeric	2	0	Q6:Value fan						Input
10	q7	Numeric	2	0	Q7:Value wo						Input
11	q8	Numeric	2	0	Q8:Value frie						Input
12	q9	Numeric	2	0	Q9:Value nei						Input
13	q10	Numeric	2	0	Q10:Value re						Input
14	q11	Numeric	2	0	Q11:Value et						Input
15	q12	Numeric	2	0	Q12:Value bl						Input
16	q13	Numeric	2	0	Q13:Value hd						Input
17	q14	Numeric	2	0	Q14:Value of						Input
18	q15	Numeric	2	0	Q15:Value p						Input
19	q16	Numeric	2	0	Q16:Often ta						Input
20	q17	Numeric	2	0	Q17:Talk wi						Input
21	q18	Numeric	2	0	Q18:Greet pe						Input
22	q19	Numeric	2	0	Q19:Hear ne						Input
23	q20	Numeric	2	0	Q20:Hear ne						Input
24	q21	Numeric	2	0	Q21:Comfort voicing complaints public meeting	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
25	q22	Numeric	2	0	Q22:People afraid to speak up	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
26	q23	Numeric	2	0	Q23:Public officials receptive	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
27	q24	Numeric	2	0	Q24:Talk pol w/neighbors election time	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
28	q25	Numeric	2	0	Q25:Talk pol w/family, friends election time	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
29	q26	Numeric	2	0	Q26:Feel lost if moved from neighborhood	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
30	q27	Numeric	2	0	Q27:Feel part of community	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
31	q28	Numeric	2	0	Q28:Feel strong ID w/community	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
32	q29	Numeric	2	0	Q29:Enjoy living in neighborhood	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
33	q30	Numeric	2	0	Q30:Feel safe, secure in neighborhood	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
34	q31	Numeric	2	0	Q31:Public officials don't care what I think	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
35	q32	Numeric	2	0	Q32:Have little influence over local gov	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
36	q33	Numeric	2	0	Q33:Don't have say about what gov does	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
37	q34	Numeric	2	0	Q34:No neigh homes visited	{0, 0=None}...	11 - 99	8	Right	Scale	Input
38	q35	Numeric	2	0	Q35:No neighbors know	{0, 0=None}...	11 - 99	8	Right	Scale	Input
39	q36	Numeric	1	0	Q36: % friends living in same community	{0, 0=None}	6 - 9	8	Right	Scale	Input

**CLICK: NEXT**

## COVARIATES: Insert independent variables from Block 2

natcom.sav [DataSet1] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	ID	Numeric	3	0		None	None	8	Right	Scale	Input
2	time\$	Numeric	6	0		None	None	8	Right	Scale	Input
3	timeans\$	Numeric	4	0		None	None	8	Right	Scale	Input
4	q1	Numeric	1	0	Q1:Where live	{1, 1=centra...	7 - 99, 0	8	Right	Scale	Input
5	q2	Numeric	1	0	Q2:Time lived						Input
6	q3	String	255	0	Q3:Deciding						Input
7	q4	Numeric	2	0	Q4:Communi						Input
8	q5	Numeric	2	0	Q5:Neighbor						Input
9	q6	Numeric	2	0	Q6:Value far						Input
10	q7	Numeric	2	0	Q7:Value wo						Input
11	q8	Numeric	2	0	Q8:Value frie						Input
12	q9	Numeric	2	0	Q9:Value nei						Input
13	q10	Numeric	2	0	Q10:Value rel						Input
14	q11	Numeric	2	0	Q11:Value et						Input
15	q12	Numeric	2	0	Q12:Value b						Input
16	q13	Numeric	2	0	Q13:Value ho						Input
17	q14	Numeric	2	0	Q14:Value oi						Input
18	q15	Numeric	2	0	Q15:Value p						Input
19	q16	Numeric	2	0	Q16:Or ren ta						Input
20	q17	Numeric	2	0	Q17:Talk wri						Input
21	q18	Numeric	2	0	Q18:Greet pe						Input
22	q19	Numeric	2	0	Q19:Hear nei						Input
23	q20	Numeric	2	0	Q20:Hear nei						Input
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28	q25	Numeric	2	0	Q25:Talk pol w/family, friends election time	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
29	q26	Numeric	2	0	Q26:Feel lost if moved from neighborhood	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
30	q27	Numeric	2	0	Q27:Feel part of community	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
31	q28	Numeric	2	0	Q28:Feel strong ID w/community	{0, 0=Compl...	11 - 99	8	Right	Scale	Input
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37	q34	Numeric	2	0	Q34:No neigh homes visited	{0, 0=None}	11 - 99	8	Right	Scale	Input
38	q35	Numeric	2	0	Q35:No neighbors know	{0, 0=None}	11 - 99	8	Right	Scale	Input
39	q36	Numeric	1	0	Q36:% friends living in same community	{0, 0=none}	6 - 9	8	Right	Scale	Input

Logistic Regression

Dependent: Q52:Worked w/others on community problems [q52]

Covariates: q27, q28, q29, q30

Method: Enter

Selection Variable:

OK Paste Reset Cancel Help

Data View Variable View

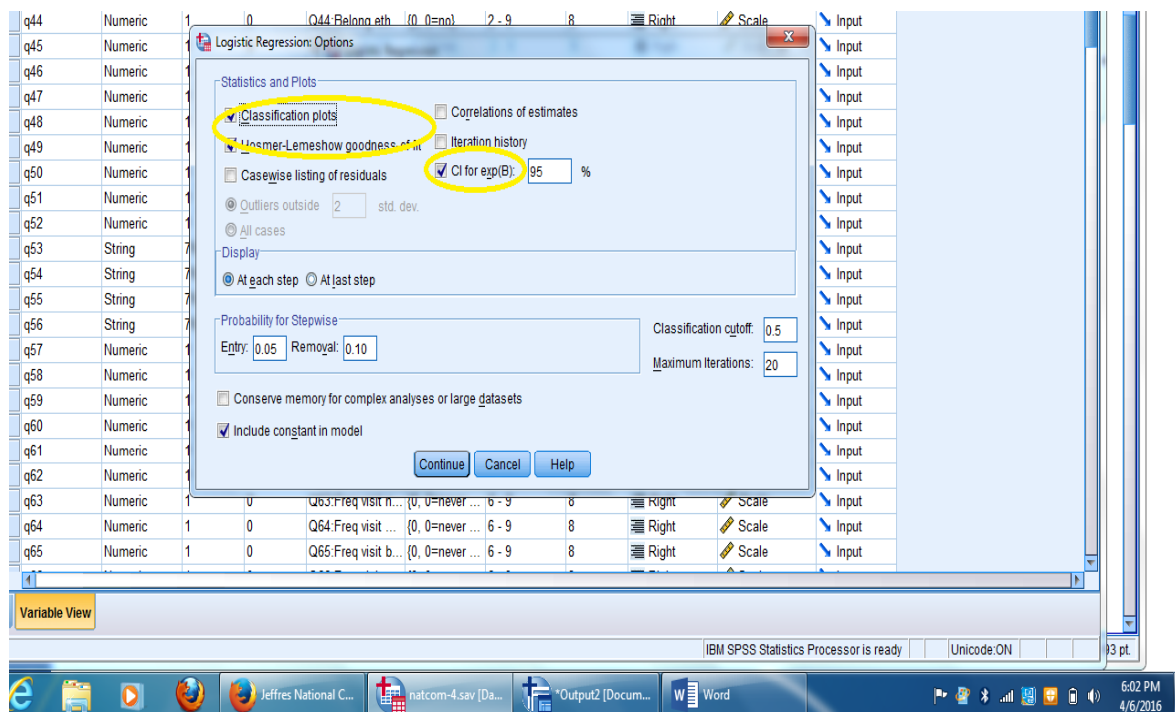
Windows: Presentations, Jeffres National C..., Skype, Inbox - k.neuend..., Write: Fwd: Com..., \*Output1 [Docum..., natcom.sav [Da

**OPTIONS:** Select Classification Plots, Hosmer-Lemeshow, and CI for Exp (B) at 95%.

**CLICK:** Continue

**CLICK:** OK

[Grab your reader's attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]



### III. SPSS OUTPUT

```
LOGISTIC REGRESSION VARIABLES q52
  /METHOD=ENTER q1 q2 q9 q39
  /METHOD=ENTER q27 q28 q29 q30
  /CLASSPLOT
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

#### Logistic Regression

##### Notes

Output Created		30-MAR-2016 14:02:22
Comments		
Input	Data	C:\Users\1002678\AppData\Local\Temp atcom-1.sav
	Active Dataset	DataSet1
	File Label	CP05
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data	477
	File	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing
Syntax		LOGISTIC REGRESSION VARIABLES q52 /METHOD=ENTER q1 q2 q9 q39 /METHOD=ENTER q27 q28 q29 q30 /CLASSPLOT /PRINT=GOODFIT CI(95) /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
Resources	Processor Time	00:00:00.08
	Elapsed Time	00:00:00.13

**Case Processing Summary**

Unweighted Cases <sup>a</sup>		N	Percent
Selected Cases	Included in Analysis	439	92.0
	Missing Cases	38	8.0
	Total	477	100.0
Unselected Cases		0	.0
Total		477	100.0

a. If weight is in effect, see classification table for the total number of cases.

**Dependent Variable Encoding**

Original Value	Internal Value
0=no	0
1=yes	1

## Block 0: Beginning Block

Classification Table<sup>a,b</sup>

Observed			Predicted		
			Q52:Worked w/others on community problems		Percentage Correct
			0=no	1=yes	
Step 0	Q52:Worked w/others on community problems	0=no	260	0	100.0
		1=yes	179	0	.0
Overall Percentage					59.2

a. Constant is included in the model.

b. The cut value is .500

Note: Class calls this the “stupid table.”



## Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	-.373	.097	14.773	1	.000	.688

## Variables not in the Equation

	Score	df	Sig.
Step 0 Variables q1	.005	1	.942
q2	4.438	1	.035
q9	1.155	1	.282
q39	18.685	1	.000
Overall Statistics	26.578	4	.000

**Block 1: Method = Enter****Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	27.343	4	.000
	Block	27.343	4	.000
	Model	27.343	4	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	566.208 <sup>a</sup>	.060	.081

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

**Hosmer and Lemeshow Test**

Step	Chi-square	df	Sig.
1	9.027	8	.340

**Contingency Table for Hosmer and Lemeshow Test**

		Q52:Worked w/others on community problems = 0=no		Q52:Worked w/others on community problems = 1=yes		Total
		Observed	Expected	Observed	Expected	
Step 1	1	35	34.578	9	9.422	44
	2	28	32.295	16	11.705	44
	3	30	30.611	14	13.389	44
	4	28	28.966	16	15.034	44
	5	34	26.911	10	17.089	44
	6	24	25.216	21	19.784	45
	7	26	22.544	17	20.456	43
	8	22	22.154	23	22.846	45
	9	18	20.047	26	23.953	44
	10	15	16.679	27	25.321	42

**Classification Table<sup>a</sup>**

Observed		Predicted			
		Q52:Worked w/others on community problems		Percentage Correct	
		0=no	1=yes		
Step 1	Q52:Worked w/others on community problems	0=no	209	51	80.4
		1=yes	108	71	39.7
Overall Percentage					63.8

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)
								Lower
Step 1 <sup>a</sup>	q1	.043	.057	.568	1	.451	1.044	.934
	q2	-.133	.055	5.766	1	.016	.876	.786
	q9	-.049	.047	1.090	1	.297	.953	.870
	q39	.967	.209	21.354	1	.000	2.630	1.745
	Constant	-.211	.408	.268	1	.605	.810	

Variables in the Equation

		95% C.I. for EXP(B)
		Upper
Step 1 <sup>a</sup>	q1	1.167
	q2	.976
	q9	1.044
	q39	3.963
	Constant	

a. Variable(s) entered on step 1: q1, q2, q9, q39.



**Block 2: Method = Enter****Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	25.752	4	.000
	Block	25.752	4	.000
	Model	53.095	8	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	540.457 <sup>a</sup>	.114	.154

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

**Hosmer and Lemeshow Test**

Step	Chi-square	df	Sig.
1	9.919	8	.271

**Contingency Table for Hosmer and Lemeshow Test**

		Q52:Worked w/others on community problems = 0=no		Q52:Worked w/others on community problems = 1=yes		Total
		Observed	Expected	Observed	Expected	
Step 1	1	39	38.322	5	5.678	44
	2	35	34.382	9	9.618	44
	3	30	31.757	14	12.243	44
	4	24	28.916	20	15.084	44
	5	26	26.817	18	17.183	44
	6	28	24.768	16	19.232	44
	7	30	22.659	14	21.341	44
	8	21	20.820	23	23.180	44
	9	16	18.273	28	25.727	44
	10	11	13.287	32	29.713	43

**Classification Table<sup>a</sup>**

Observed		Predicted			
		Q52:Worked w/others on community problems		Percentage Correct	
		0=no	1=yes		
Step 1	Q52:Worked w/others on community problems	0=no	207	53	79.6
		1=yes	93	86	48.0
Overall Percentage					66.7

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)
								Lower
Step 1 <sup>a</sup>	q1	.060	.059	1.029	1	.310	1.062	.945
	q2	-.161	.057	7.834	1	.005	.852	.761
	q9	-.058	.057	1.026	1	.311	.944	.843
	q39	.954	.219	18.947	1	.000	2.595	1.689
	q27	.225	.065	11.912	1	.001	1.252	1.102
	q28	.041	.054	.566	1	.452	1.042	.936
	q29	-.267	.076	12.463	1	.000	.766	.660
	q30	.008	.056	.018	1	.893	1.008	.903
	Constant	.184	.482	.146	1	.702	1.202	

Variables in the Equation

		95% C.I. for EXP(B)
		Upper
Step 1 <sup>a</sup>	q1	1.193
	q2	.953
	q9	1.056
	q39	3.988
	q27	1.423
	q28	1.159
	q29	.888
	q30	1.125
	Constant	

a. Variable(s) entered on step 1: q27, q28, q29, q30.





## IV. TABLING RESULTS

**Table 1:** Prediction of Working with others in community to solve a problem

	<i>r</i>	Final Exp (B)	Block Chi-Sq	Model Chi-Sq	Model -2LL	Cox & Snell R <sup>2</sup>	Nag. R <sup>2</sup>	Hosmer & Lem. Chi-Sq
<b>Block 1: Comm. Con</b>			27.34***	27.34***	566.21	.06	.08	9.03
Q1: where you live	-.01	1.06						
Q2: How long live there	-.10*	.85**						
Q9: How sig. comm. is to you	-.05	.94						
Q39: Collected neigh mail while away	.21**	2.60***						
<b>Block 2: Sense of Comm</b>			25.75***	53.10***	540.46	.11	.15	9.92
Q27: Feel part of comm.	.12**	1.25**						
Q28: Id. Strongly with comm.	.09 <sup>a</sup>	1.04						
Q29: Enjoy living in comm.	-.07	.77**						
Q30: Feel safe and secure in comm	-.03	1.01						

<sup>a</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

## V. WRITE UP OF RESULTS

Logistic regression was used to predict the odds that people work together to solve a common problem in their community, based on a set of variables concerning community connections and sense of community. Binary logistics was used. The independent variables were placed into two blocks. Block 1 was titled Community Connections. This included variables related to how connected an individual was to community location. Block 2 was titled Sense of Community. This contained variables related to personal identification with the community.

Table 1 provides a summary of the findings. Both blocks revealed significant Chi-squares: Block 1 (Community Connections)  $\chi^2 = 27.34$ ,  $p < .001$ . Block 2 (Sense of Community),  $\chi^2 = 25.75$ ,  $p < .001$ . Each Exp (B) indicates an increase or a decrease in the odds of the occurrence of the dependent variable, assuming all other variables in the model are controlled for. Within each of the two blocks, two independent variables have significant unique contributions to the prediction of working with others in the community to solve a problem. In Block 1 the variable Q2 “how long a person lived in a community” had a final Exp (B) of .85, which means that there is a 15% decrease in the odds of a person working with others to solve community problems when the other independent variables are controlled for. Also in Block 1 the variable Q39 “collected neighbor’s mail while away” had a final Exp (B) of 2.60, which means that there is an increase in the odds of 160% in community connections when the other variables are controlled for. In Block 2 (Sense of Community), the variable Q27 “feel part of the community” had a final Exp (B) of 1.25 suggesting there will be a predicted increase of 25% in

the odds when all of the other variables are controlled for. Finally, the variable Q29 “enjoy living in the community” yielded an Exp (B) of .77 which supports the prediction of a 23% decrease in the odds that people would join together in solving a community problem when all other independent variables are controlled for. Table 1 also reveals that the Hosmer-Lemeshow Test, a test for the goodness of fit (how well the model fit the data), does not reveal any significance, indicating a good fit for the model overall. And, the Cox and Snell  $R^2$  is .06 for Block 1 and .11 for the full Block 1/Block 2 model, indicating that the eight variables in the two blocks explain approximately 11% of the variance in the dependent variable. This is further confirmed by the Nagelkerke  $R^2$  of .15 for the full model, estimating that 15% of the variance of the dependent variable is explained by the eight variables.

**TABLE 2: Classification Results**

Observed		Predicted		
		Q52:Worked w/others on community problems		Percentage Correct
		0=no	1=yes	
Q52:Worked w/others on community problems	0=no	207	53	79.6
	1=yes	93	86	48.0
Overall Percentage				66.7

### Press' Q Calculation

**Formula:**  $[N-(nK)]^2 / N(K-1)$

Where N=total sample size

n=number of observations correctly classified

K=number of groups

In this model:

$$N=439$$

$$n = 293[207+86]$$

$$K = 2$$

$$\text{Press' Q} = [439-(293*2)]^2 / 439(2-1)$$

$$= [439-586]^2 / 439$$

$$= 21,609 / 439$$

$$\text{Press' Q} = 49.2$$

$$df = 1$$

Chi-square critical = 10.83; p = .001

Table 2 shows that the extant model correctly classifies 67% of the cases. This is supported by the Press' Q and Critical Chi-square statistics. Press' Q was calculated at 49.2, while the Critical Chi-square for p=.001 is 10.83. Since the calculated Press' Q is greater than the Critical Chi Square, the accuracy of the predictions in this model is significantly greater than what could be expected by chance