

# GeoDa Workshop

## Part 2

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after July 1, 2016  
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- Acknowledgments
  - NSF OCI-1047916
  - AHRQ 1R01HS021752-01AI



- spatial weights
- spatial autocorrelation
- space-time exploration
- averages tool (treatment effect analysis)
- spatial regression



# Spatial Weights



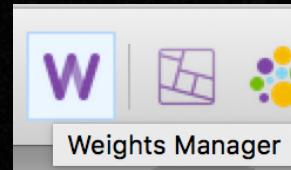
- creating weights
- weights properties
- project file



# Creating Weights



Tools Table Map  
Weights Manager  
Shape ►



Weights Manager

Create Load Remove

Weights Name

Property	Value
----------	-------

Histogram Connectivity Map

## weights manager



Weights File Creation

Weights File ID Variable

Contiguity Weight

Queen contiguity      Order of contiguity     
 Rook contiguity       Include lower orders  
 Precision threshold

Distance Weight

Distance metric     
X-coordinate variable     
Y-coordinate variable     
 Threshold distance   
  
 k-Nearest Neighbors      Number of neighbors

# contiguity weights



Weights File Creation

Weights File ID Variable **CODE**

Contiguity Weight

Queen contiguity      Order of contiguity

Rook contiguity       Include lower orders

Precision threshold     

Distance Weight

Distance metric

X-coordinate variable    2002

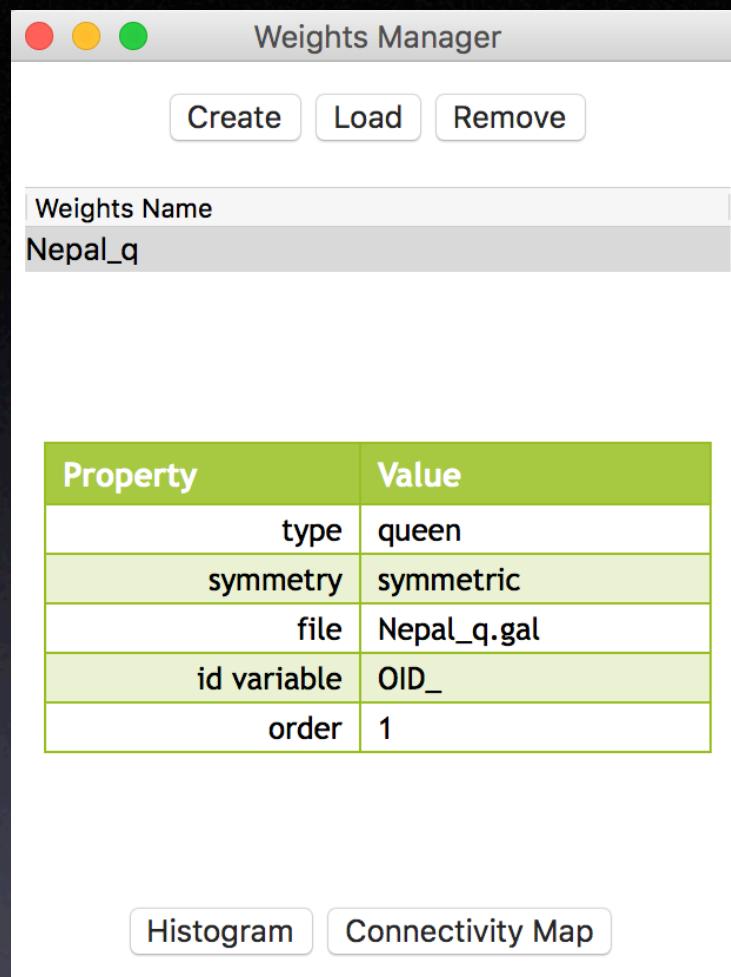
Y-coordinate variable    2002

Threshold distance     

k-Nearest Neighbors      Number of neighbors

precision threshold (NYC example)





## weights in weights manager



Weights File Creation

Weights File ID Variable **OID\_**

Contiguity Weight

Queen contiguity Order of contiguity     
 Rook contiguity  Include lower orders  
 Precision threshold

Distance Weight

Distance metric

X-coordinate variable

Y-coordinate variable

Threshold distance

k-Nearest Neighbors Number of neighbors

Weights File Creation

Weights File ID Variable **OID\_**

Contiguity Weight

Queen contiguity Order of contiguity     
 Rook contiguity  Include lower orders  
 Precision threshold

Distance Weight

Distance metric

X-coordinate variable

Y-coordinate variable

Threshold distance

k-Nearest Neighbors Number of neighbors

# distance-based weights



Weights Manager

Create Load Remove

Weights Name

Nepal\_q  
Nepal\_k6

Property	Value
type	k-NN
symmetry	asymmetric
file	Nepal_k6.gwt
id variable	OID_
distance metric	Euclidean
distance vars	centroids
neighbors	6

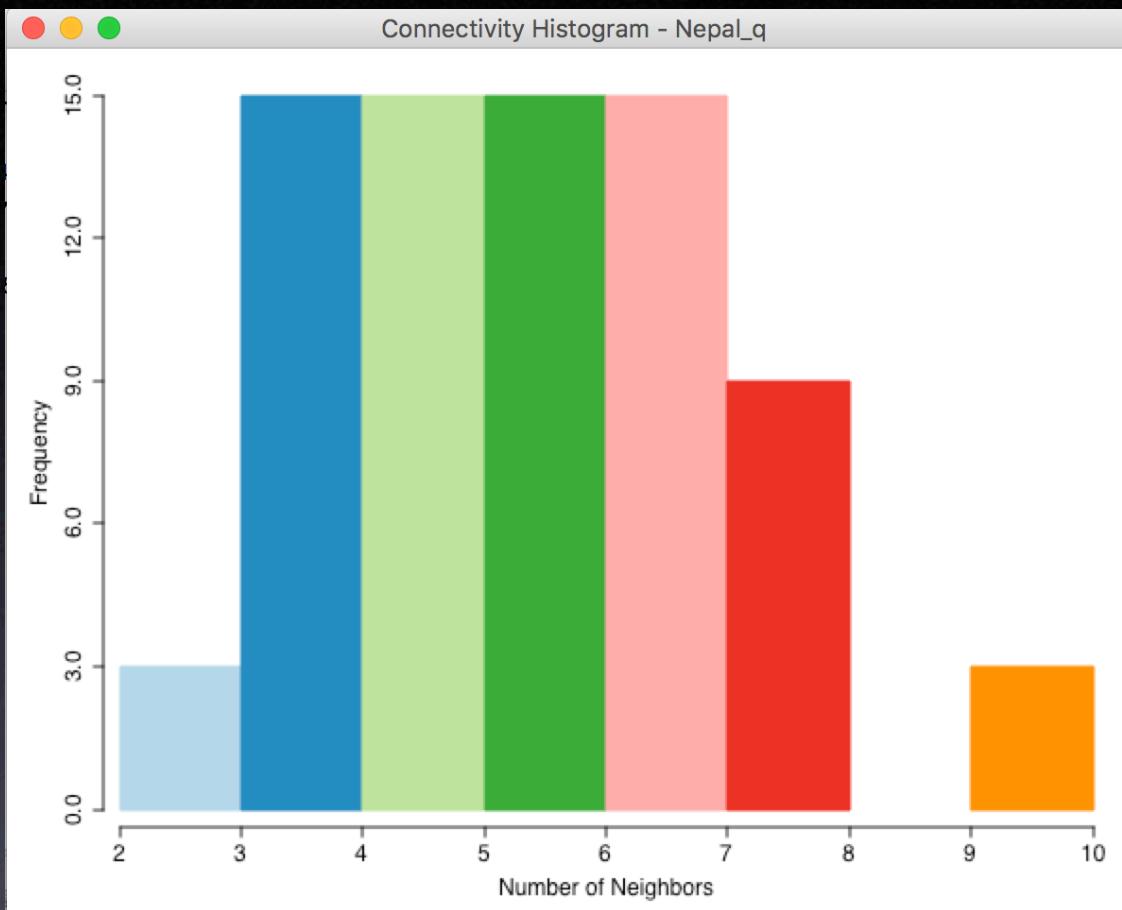
Histogram Connectivity Map

multiple weights in weights manager



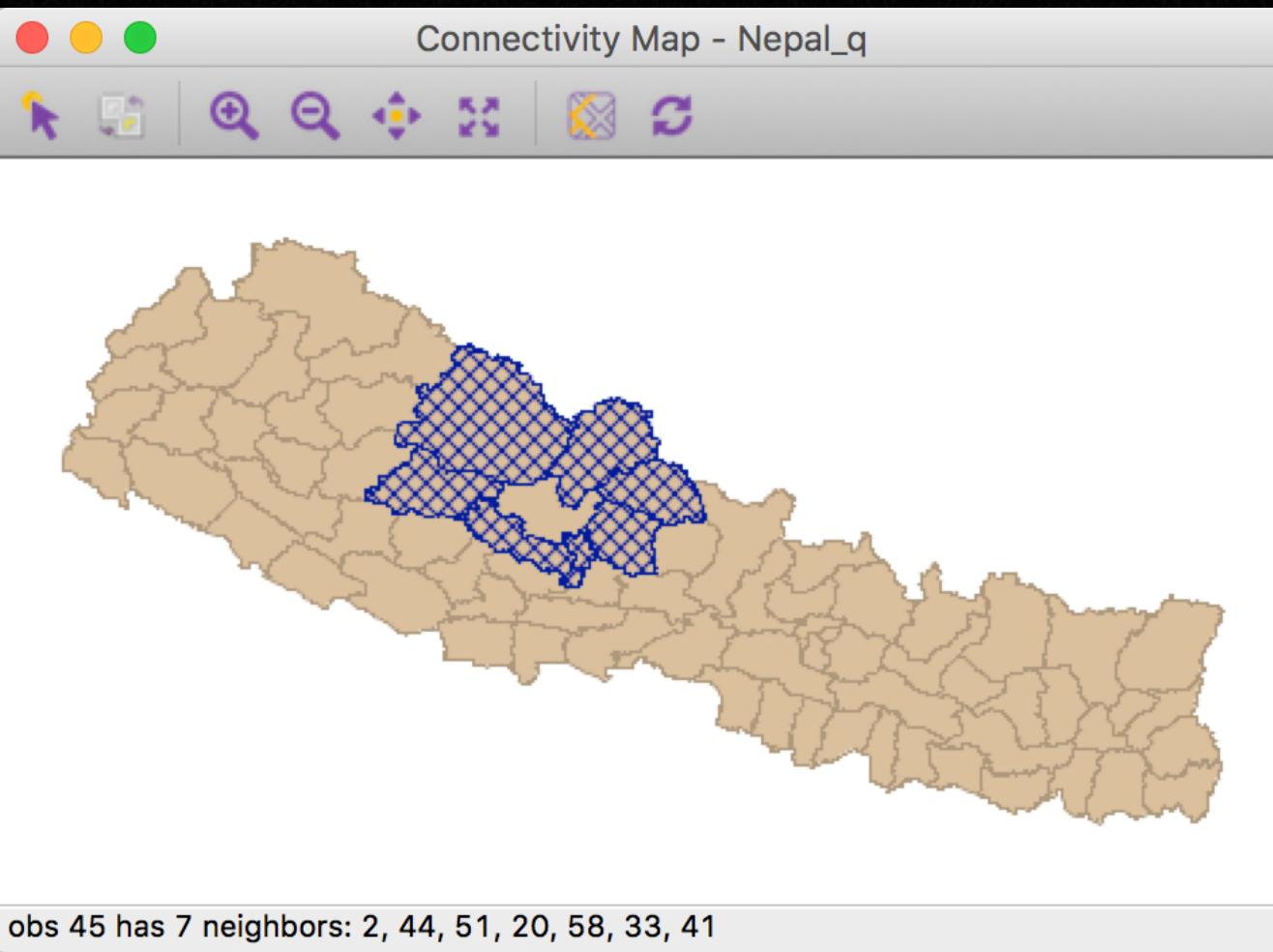
# Weights Properties





## connectivity histogram



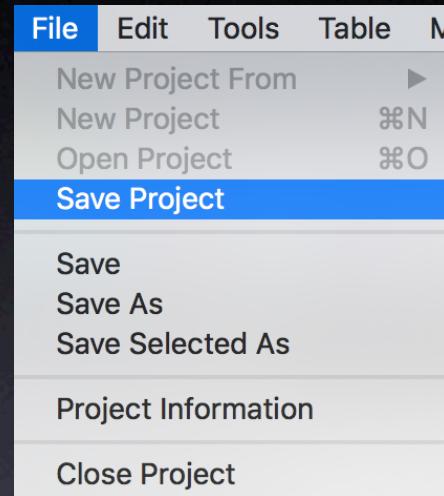


## connectivity map



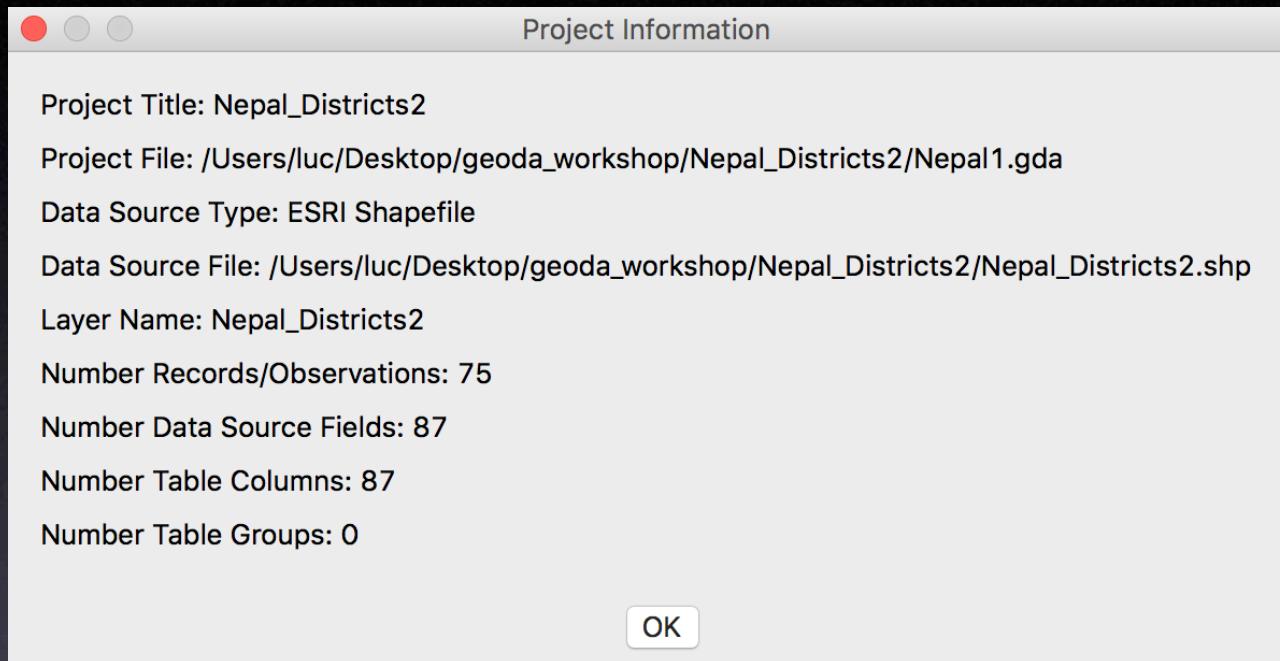
# Project File





# creating a project file





## project information



```
<weights_entries>
  <weights>
    <title>Nepal_q</title>
    <default/>
    <meta_info>
      <weights_type>queen</weights_type>
      <order>1</order>
      <inc_lower_orders>true</inc_lower_orders>
      <path>Nepal_q.gal</path>
      <id_variable>OID_</id_variable>
      <symmetry>symmetric</symmetry>
    </meta_info>
  </weights>
  <weights>
    <title>Nepal_k6</title>
    <meta_info>
      <weights_type>knn</weights_type>
      <dist_metric>euclidean</dist_metric>
      <dist_units>mile</dist_units>
      <dist_values>centroids</dist_values>
      <num_neighbors>6</num_neighbors>
      <path>Nepal_k6.gwt</path>
      <id_variable>OID_</id_variable>
      <symmetry>asymmetric</symmetry>
    </meta_info>
  </weights>
</weights_entries>
```

## weights entries in project file



# Spatial Autocorrelation

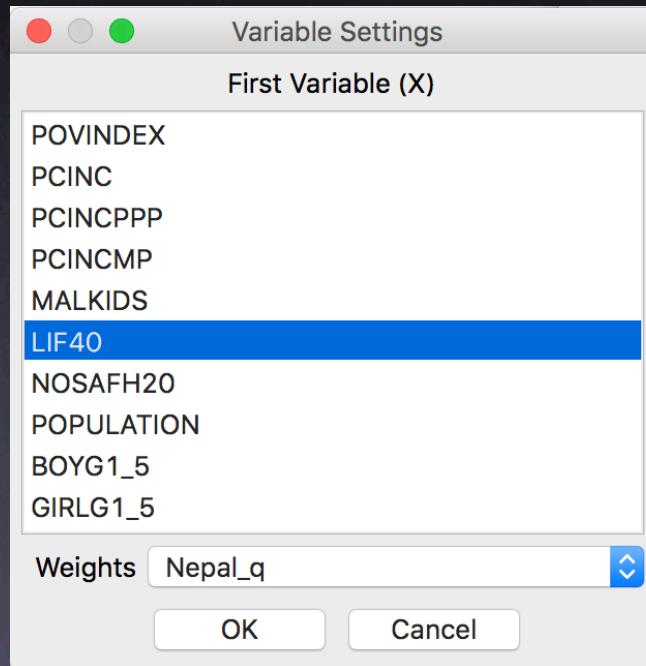
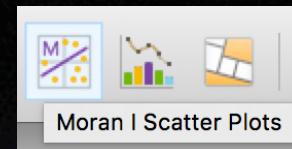
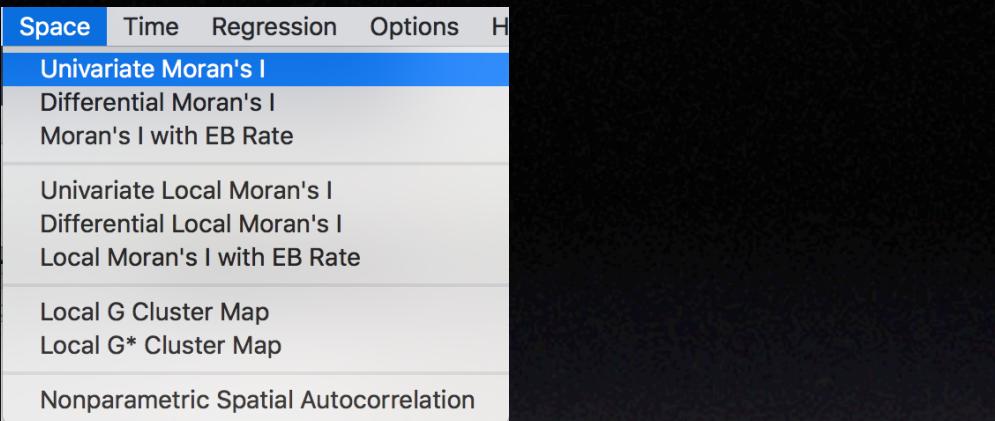


- Moran scatter plot
- spatial correlogram
- local spatial autocorrelation



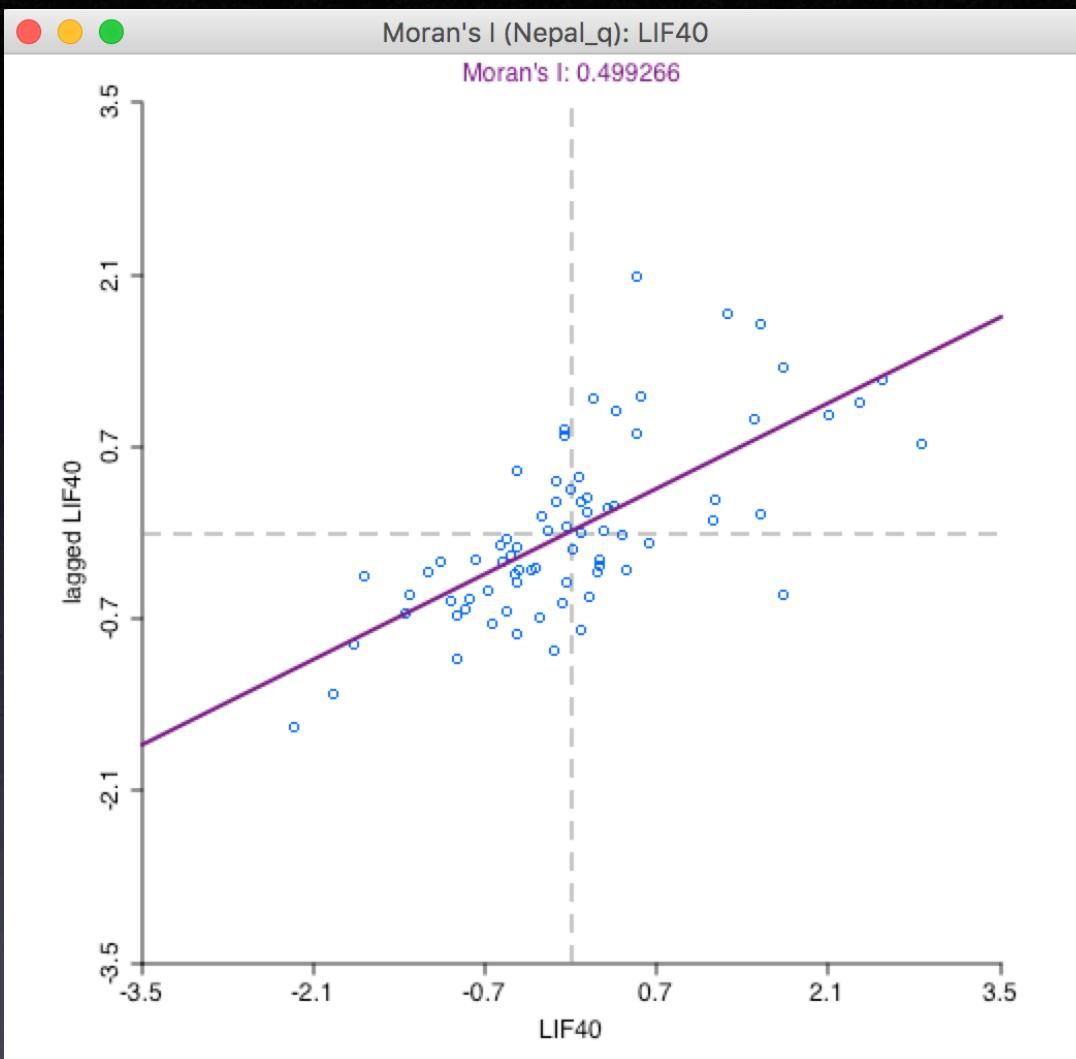
# Moran Scatter Plot





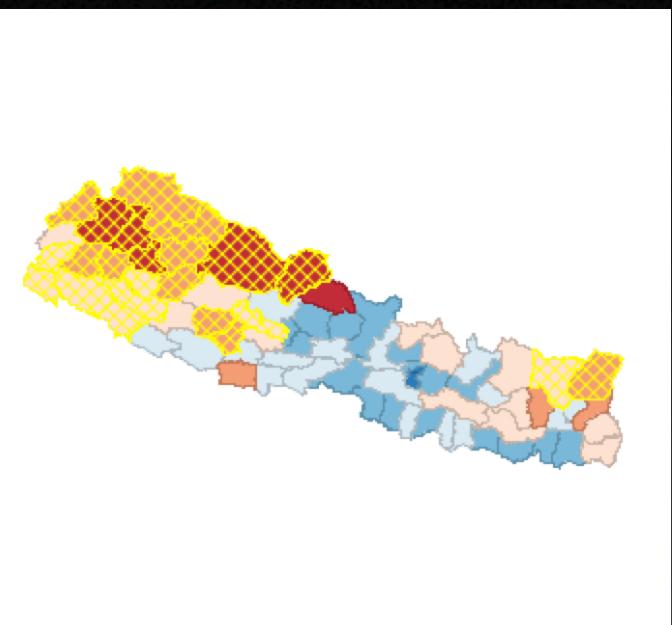
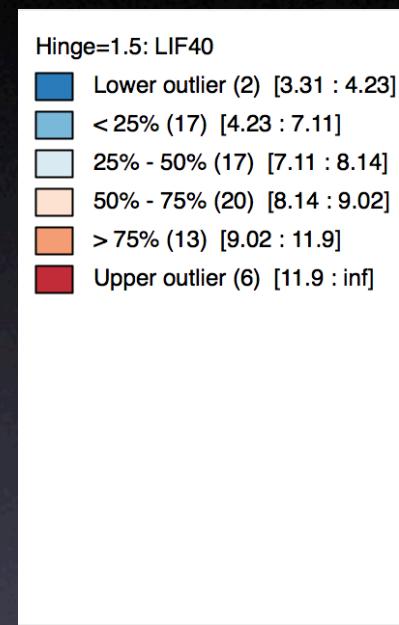
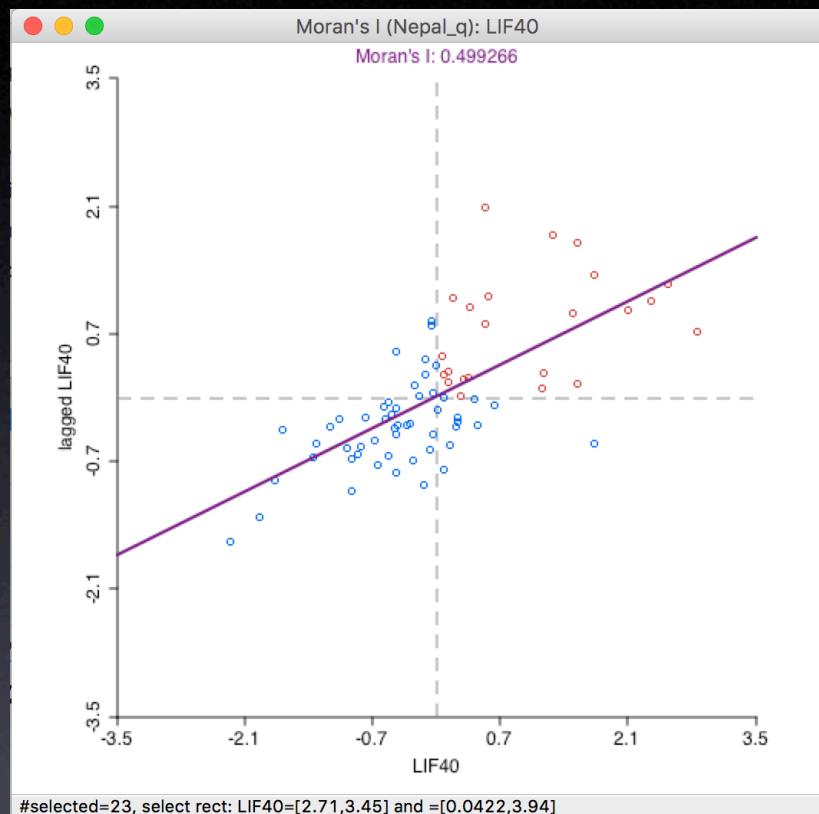
## moran scatter plot setup





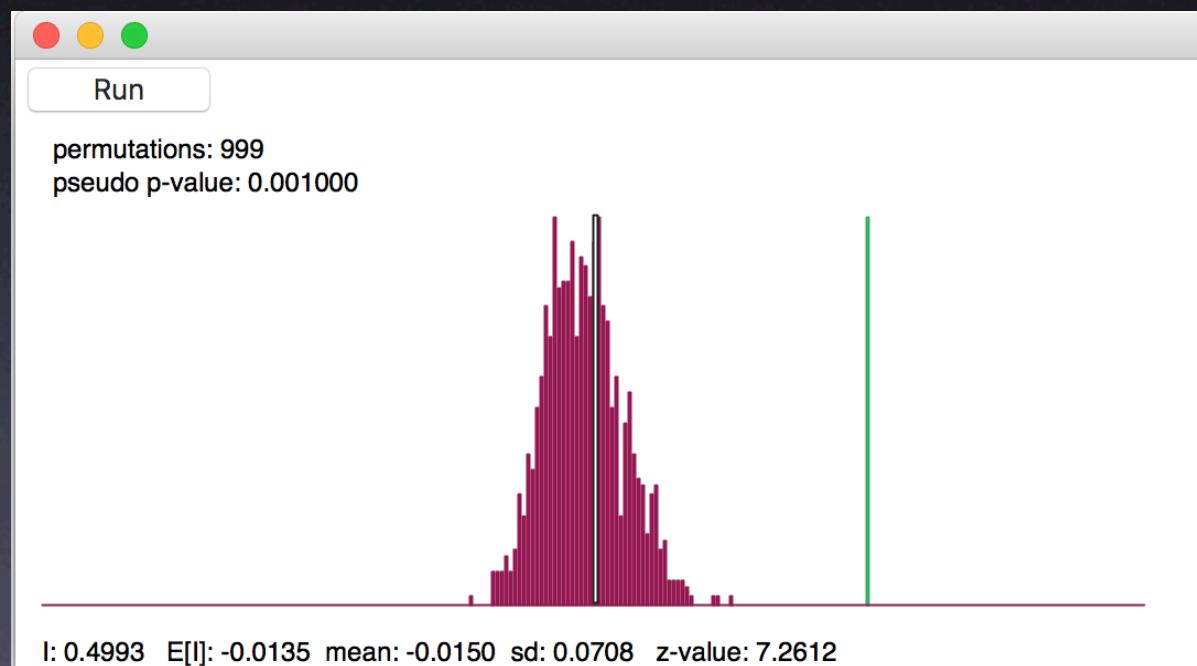
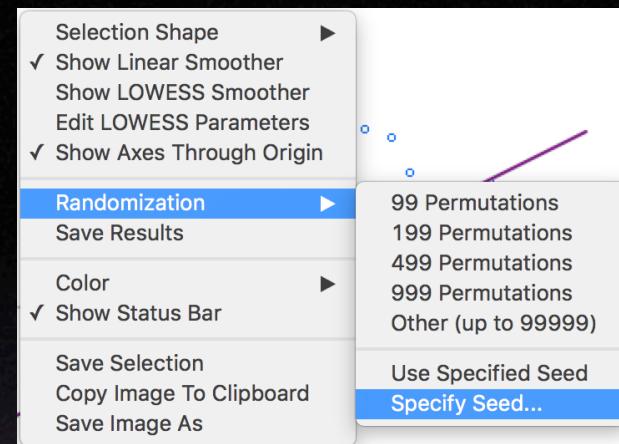
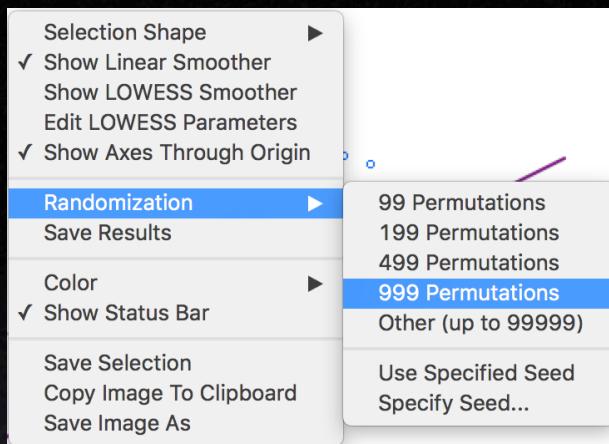
## Moran scatter plot





## Moran scatter plot, high-high locations





## permutation inference



# Spatial Correlogram



Space Time Regression Options Help

- Univariate Moran's I
- Differential Moran's I
- Moran's I with EB Rate
- Univariate Local Moran's I
- Differential Local Moran's I
- Local Moran's I with EB Rate
- Local G Cluster Map
- Local G\* Cluster Map
- Nonparametric Spatial Autocorrelation**

Nonparametric Spatial Autocorrelation

Correlogram Parameters

Variable: LIF40

Distance: Euclidean Distance

Number Bins: 10

Max Distance: [ ]

All Pairs  
Estimated Pairs: 2775

Random Sample  
Iterations: 1000000

Help Apply

Correlogram Parameters

Variable: LIF40

Distance: Euclidean Distance

Number Bins: 10

Max Distance: [ ]

All Pairs  
Estimated Pairs: 2775

Random Sample  
Iterations: 1000000

Help Apply

Correlogram Parameters

Variable: LIF40

Distance: Euclidean Distance

Number Bins: 10

Max Distance: 4.0

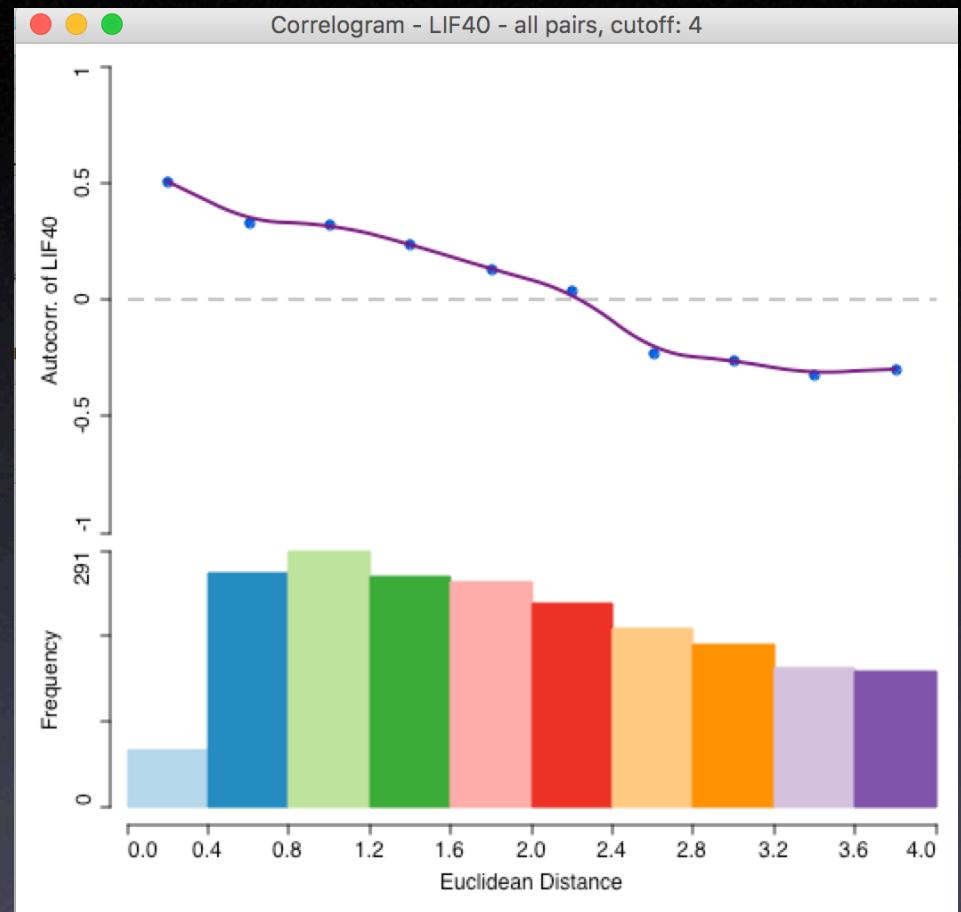
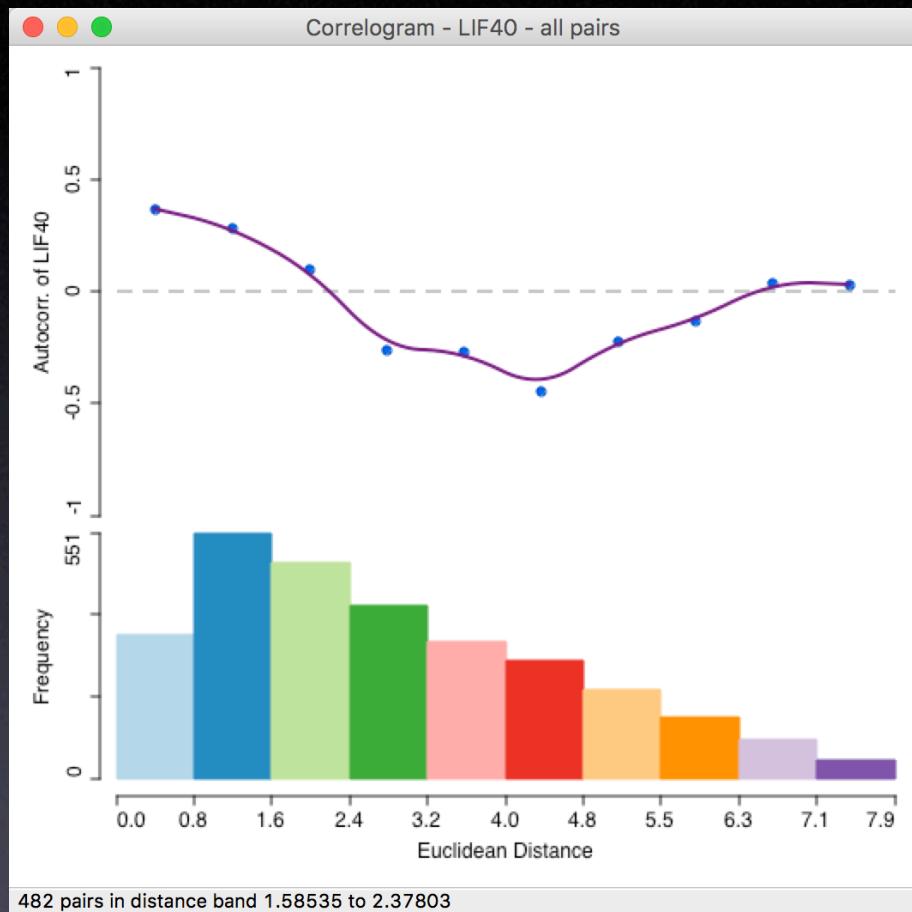
All Pairs  
Estimated Pairs: 1411

Random Sample  
Iterations: 1000000

Help Apply

## spatial correlogram setup



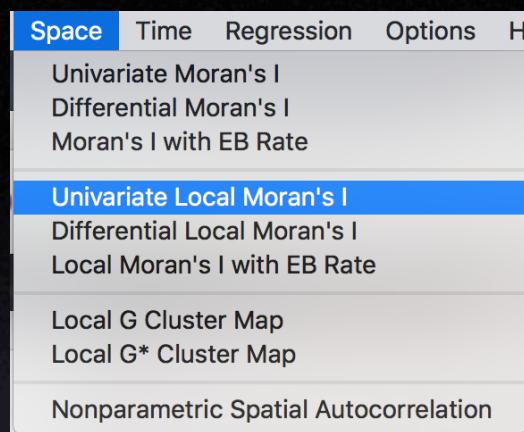


## spatial correlogram

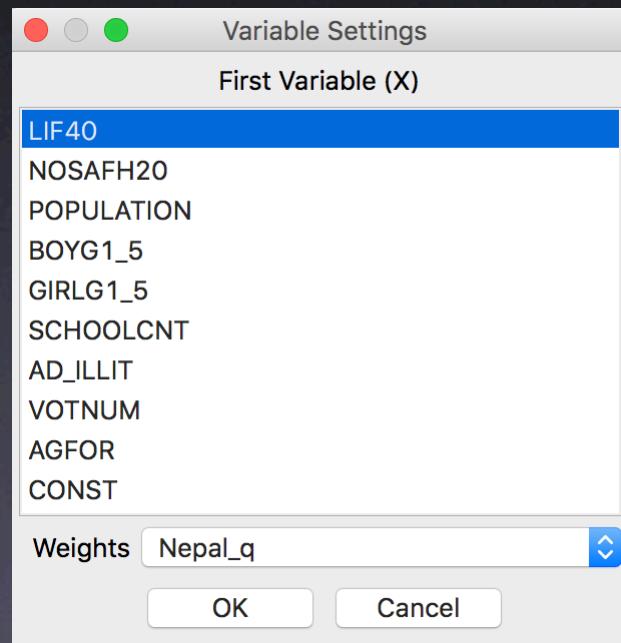
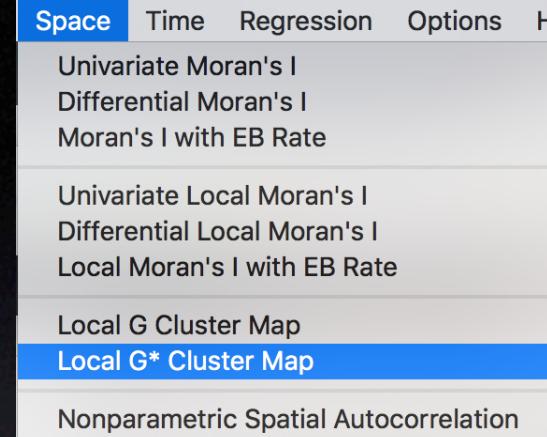


# Local Spatial Autocorrelation



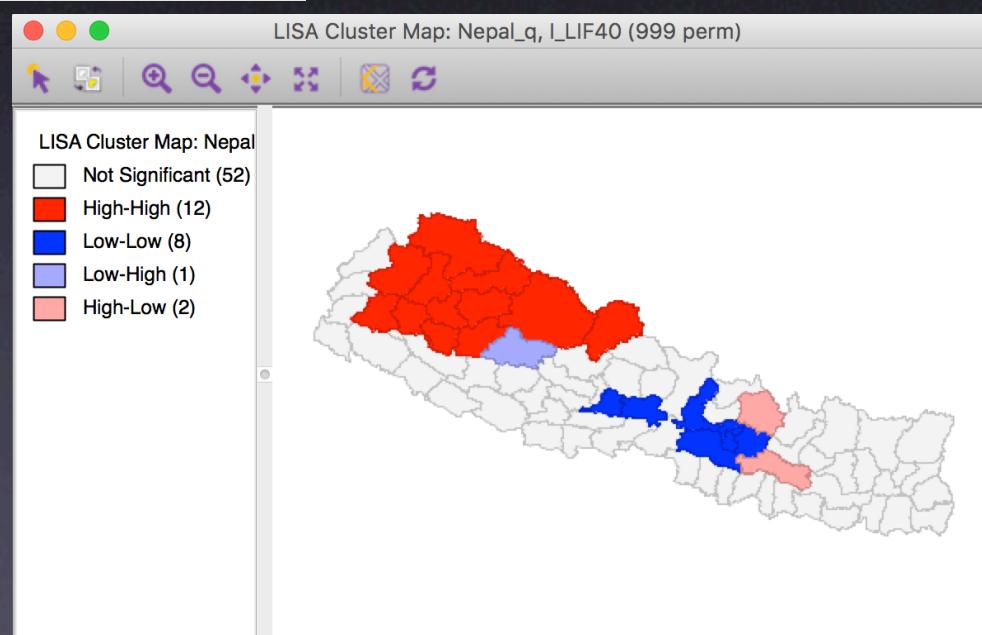
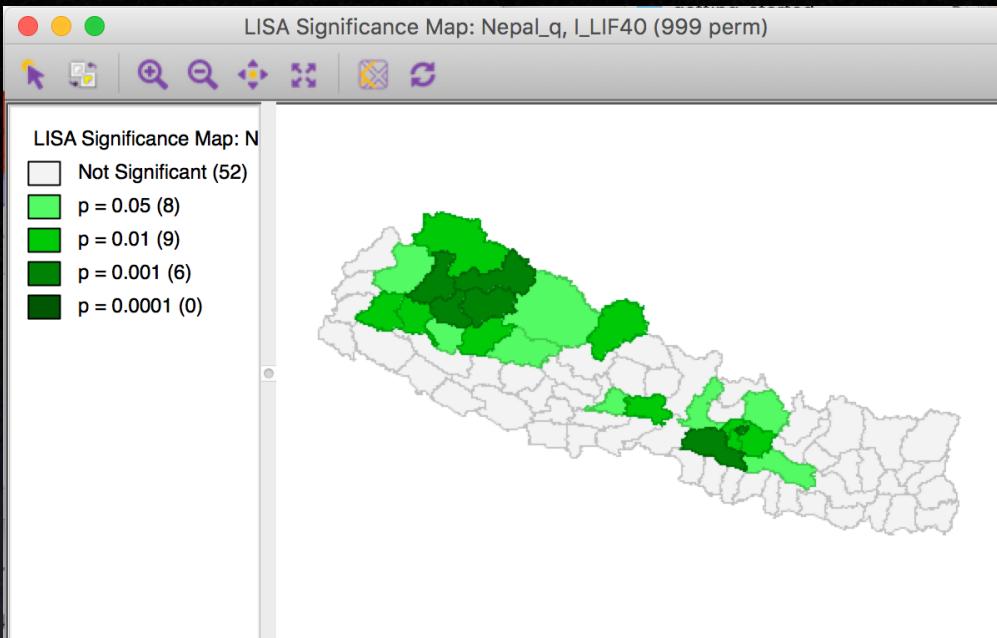


Cluster Maps



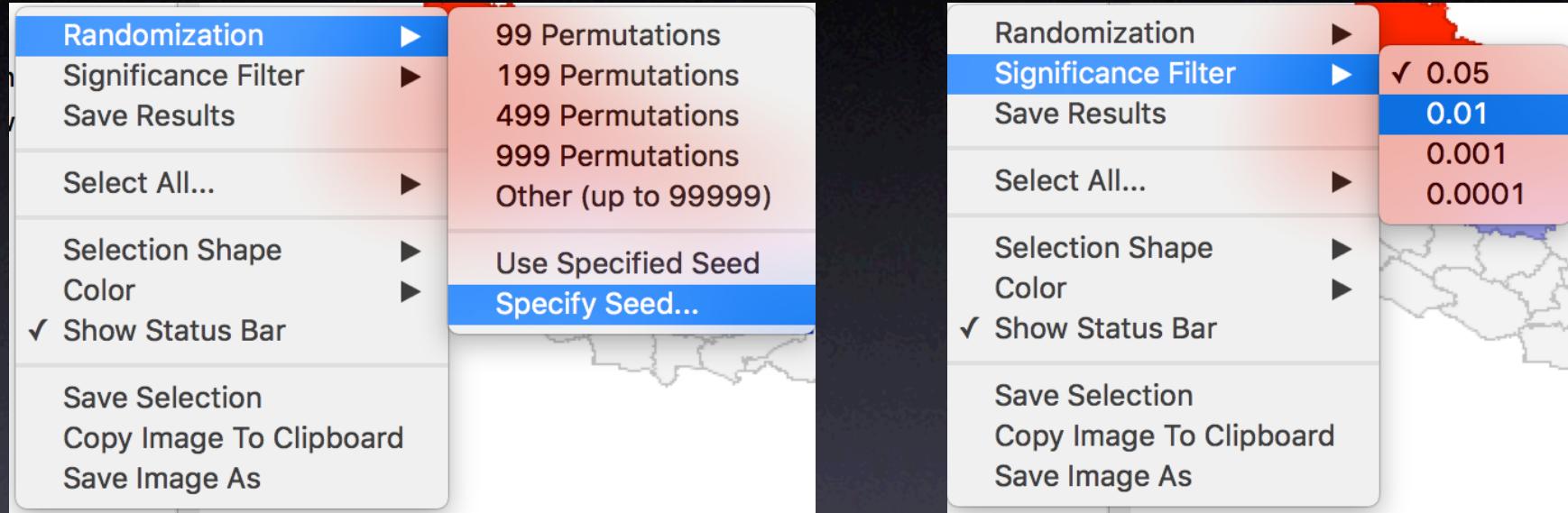
## local spatial autocorrelation setup





local moran significance and cluster map

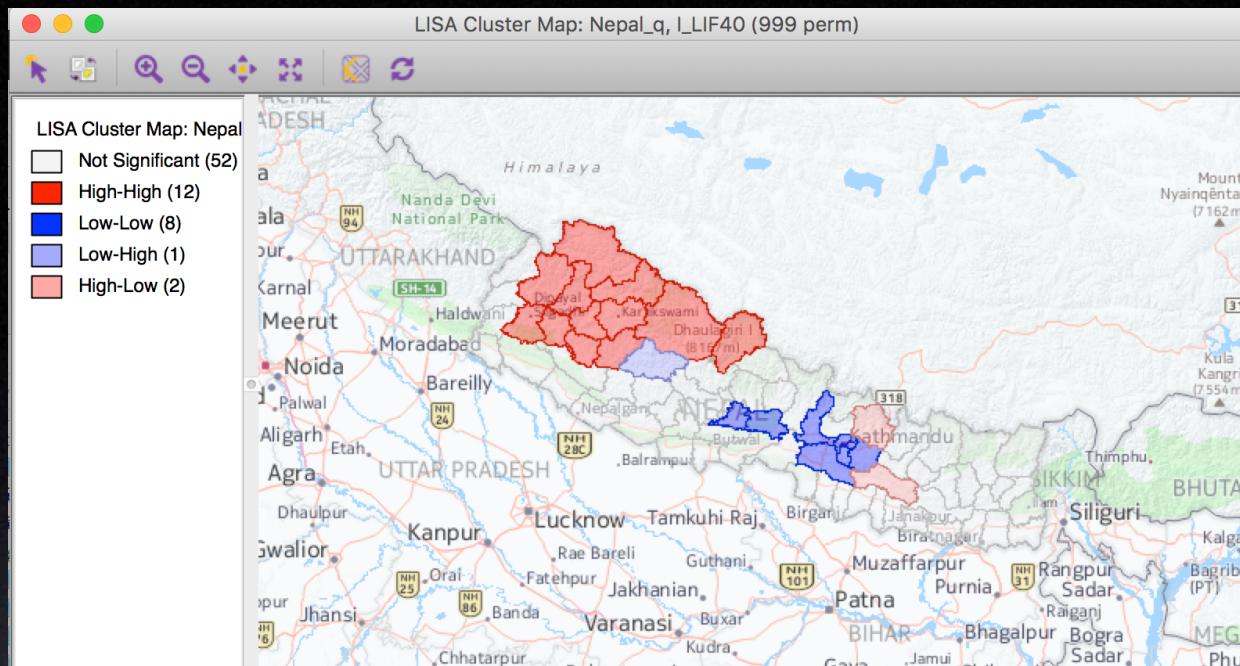




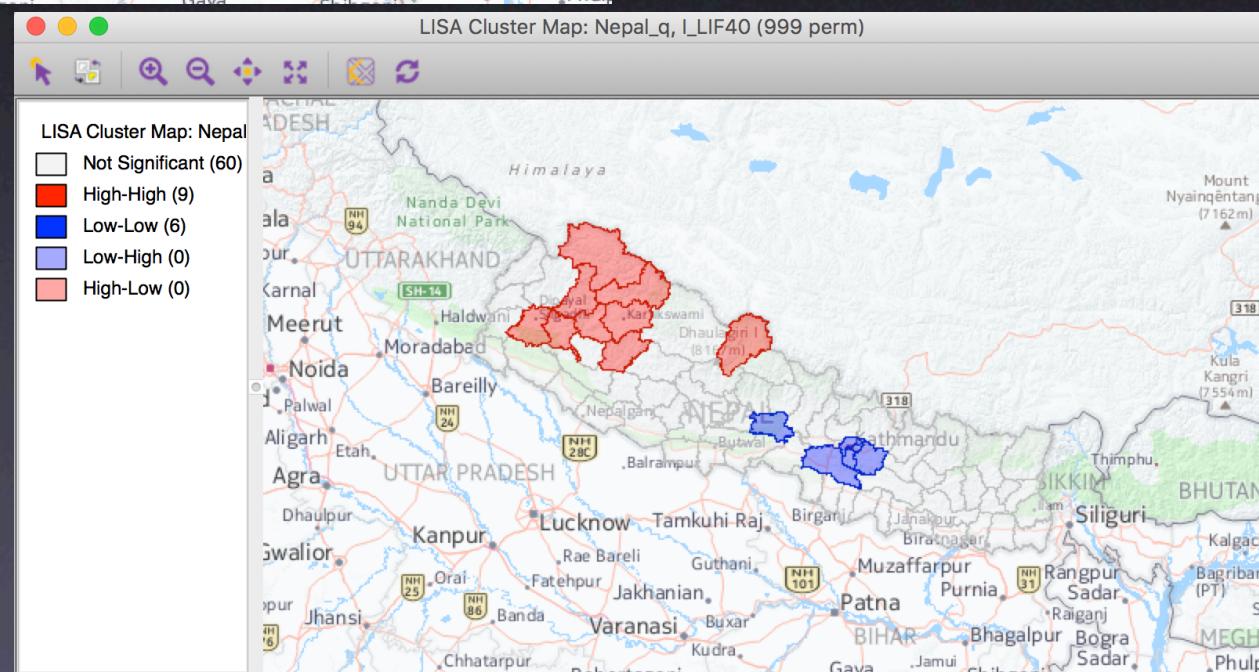
## local spatial autocorrelation options



LISA Cluster Map: Nepal\_q, I\_LIF40 (999 perm)

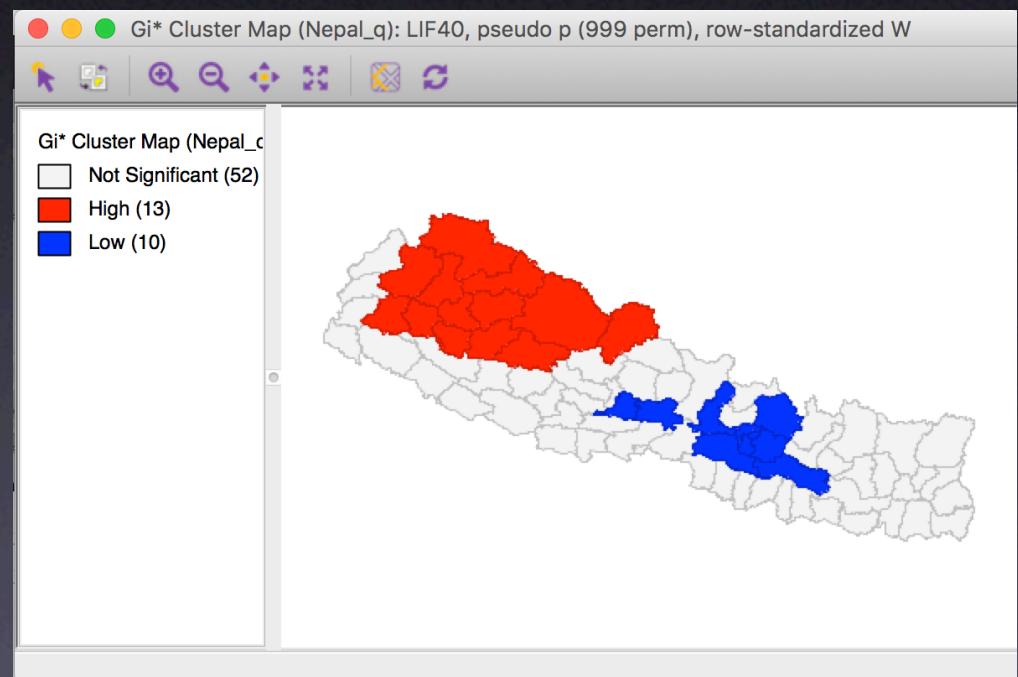
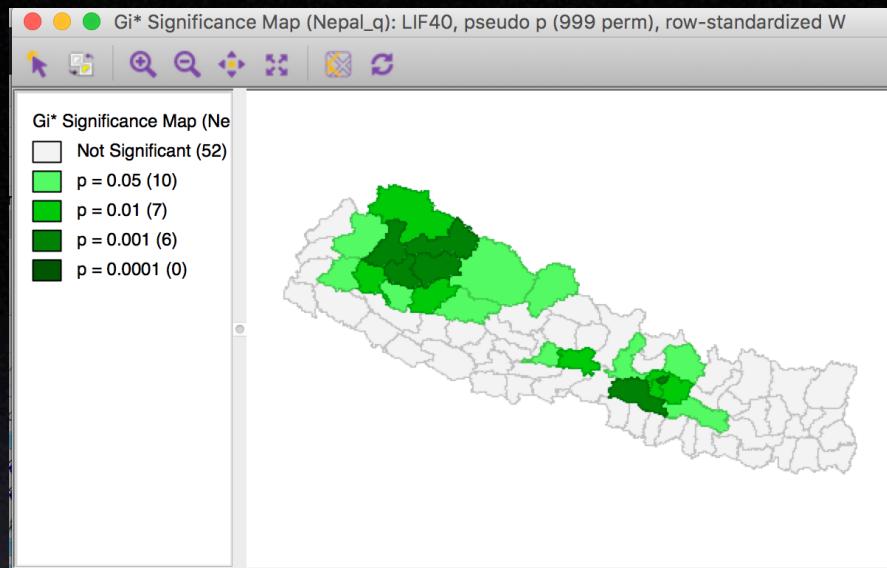


LISA Cluster Map: Nepal\_q, I\_LIF40 (999 perm)



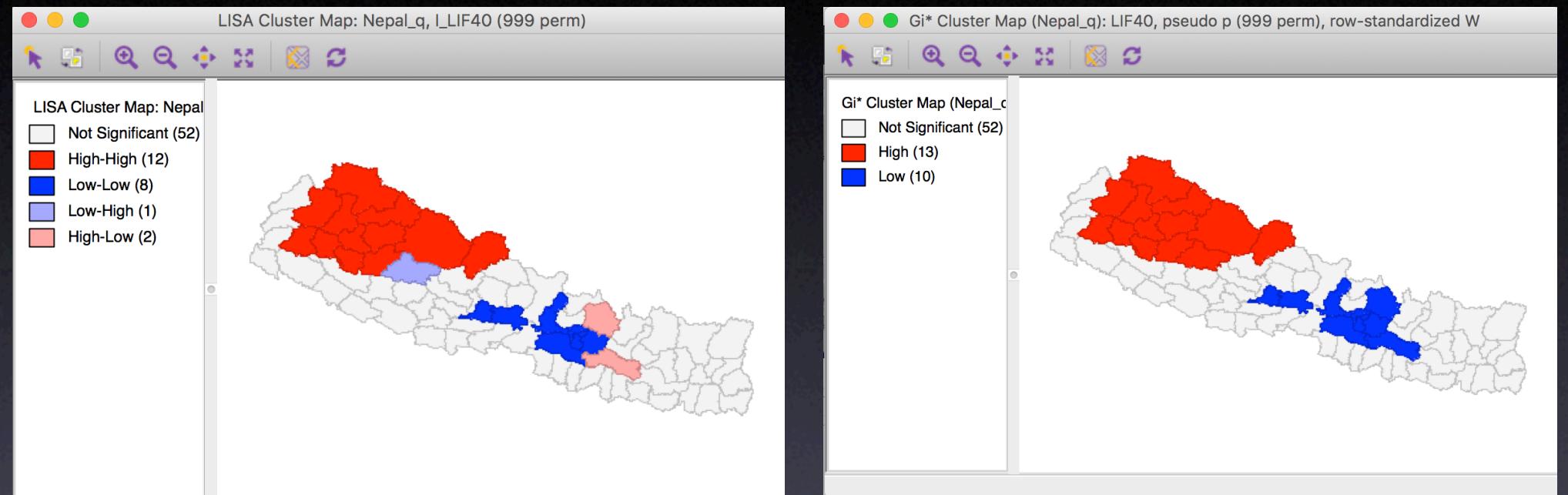
base map included,  $p=0.05$  and  $0.01$





## local G\* significance and cluster map





## local moran vs local G\*



# Space-Time Exploration



- time editor
- time player
- differential spatial autocorrelation



# Time Editor



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Time   Regression

Time Player  
Time Editor

Time

Time Editor

Ungrouped Variables ?

Name	Type
bor_subb	num
NAME	str
CODE	num
SUBBOROUGH	str
HHSIZ02	num
HHSIZ05	num
HHSIZ08	num
KIDS2000	num
KIDS2005	num
KIDS2008	num
RENT2002	num
RENT2005	num
RENT2008	num
RENTPCT02	num
RENTPCT05	num
RENTPCT08	num
YRHOM02	num
YRHOM05	num
YRHOM08	num

New Group Details ?

name:

0 variables to include

Time	Name
------	------

Grouped Variables ?

Move Up   Move Down   Save Space-Time Table/Weights ?

## time editor setup



Time Editor

Ungrouped Variables ?

Name	Type
bor_subb	num
NAME	str
CODE	num
SUBBOROUGH	str
HHSIZ02	num
HHSIZ05	num
HHSIZ08	num
KIDS2000	num
KIDS2005	num
KIDS2008	num
RENT2002	num
RENT2005	num
RENT2008	num
RENTPCT02	num
RENTPCT05	num
RENTPCT08	num
YRHOM02	num
YRHOM05	num
YRHOM08	num

New Group Details ?

name:

0 variables to include

Time	Name
------	------

> < Move Up Move Down Save Space-Time Table/Weights ?

Grouped Variables ? 

select variables to be grouped



Time Editor

Ungrouped Variables ?

Name	Type
bor_subb	num
NAME	str
CODE	num
SUBBOROUGH	str
KIDS2000	num
KIDS2005	num
KIDS2008	num
RENT2002	num
RENT2005	num
RENT2008	num
RENTPCT02	num
RENTPCT05	num
RENTPCT08	num
YRHOM02	num
YRHOM05	num
YRHOM08	num
noHS00	num
noHS05	num
noHS08	num

New Group Details ?

name: HHSIZ  
numeric  
3 of 3 variables to include

Time	Name
2002	HHSIZ02
time 1	HHSIZ05
time 2	HHSIZ08

> <

Move Up Move Down

Save Space-Time Table/Weights ?

edit variable name and time labels



Time Editor

Ungrouped Variables ?

Name	Type
bor_subb	num
NAME	str
CODE	num
SUBBOROUGH	str
KIDS2000	num
KIDS2005	num
KIDS2008	num
RENT2002	num
RENT2005	num
RENT2008	num
RENTPCT02	num
RENTPCT05	num
RENTPCT08	num
YRHOM02	num
YRHOM05	num
YRHOM08	num
noHS00	num
noHS05	num
noHS08	num

New Group Details ?

name:

numeric

0 of 3 variables to include

Time	Name
2002	
2005	
2008	

> <

Move Up Move Down

Grouped Variables ? 

HHSIZ

Save Space-Time Table/Weights ?

grouped variable



```
<variable_order>
  <time_ids>
    <id>2002</id>
    <id>2005</id>
    <id>2008</id>
  </time_ids>
  <var>bor_subb</var>
  <var>NAME</var>
  <var>CODE</var>
  <var>SUBBOROUGH</var>
  <group>
    <name>HHsize</name>
    <var>HHSIZ02</var>
    <var>HHSIZ05</var>
    <var>HHSIZ08</var>
  </group>
```

## grouped time variables in project file



Time Editor

Ungrouped Variables ?

Name	Type
bor_subb	num
NAME	str
CODE	num
SUBBOROUGH	str

New Group Details ?

name:

0 of 3 variables to include

Time	Name
2002	
2005	
2008	

> <

Move Up Move Down

Grouped Variables ? 

HHsize
%KIDS
MedRENT
%Renter
%Owner
%noHS
MedRentBurd
rentBurd30
rentBurd50
%Unempl
%white
%hisp
%asian
%black
yrsNhood
%foreign

Save Space-Time Table/Weights ?

grouped variables from project file



```
STID,CODE,TIME,HHsize,%KIDS,MedRENT  
1,401,2002, 2.303200000000000,28.45  
2,210,2002, 2.307200000000000,26.30  
3,411,2002, 2.670800000000000,30.72  
4,203,2002, 2.479900000000000,45.03  
5,413,2002, 2.888700000000000,42.53  
6,211,2002, 2.595700000000000,31.93  
7,212,2002, 3.086600000000000,41.13  
8,202,2002, 2.023200000000000,24.74  
9,216,2002, 2.646400000000000,51.68
```

 nycvars.csv  
 nycvars.gal

0	165	nycvars	STID
1	1		
2			
2	2		
3	1		
3	1		
2			
4	2		
6	5		

space-time ID, space ID, time ID

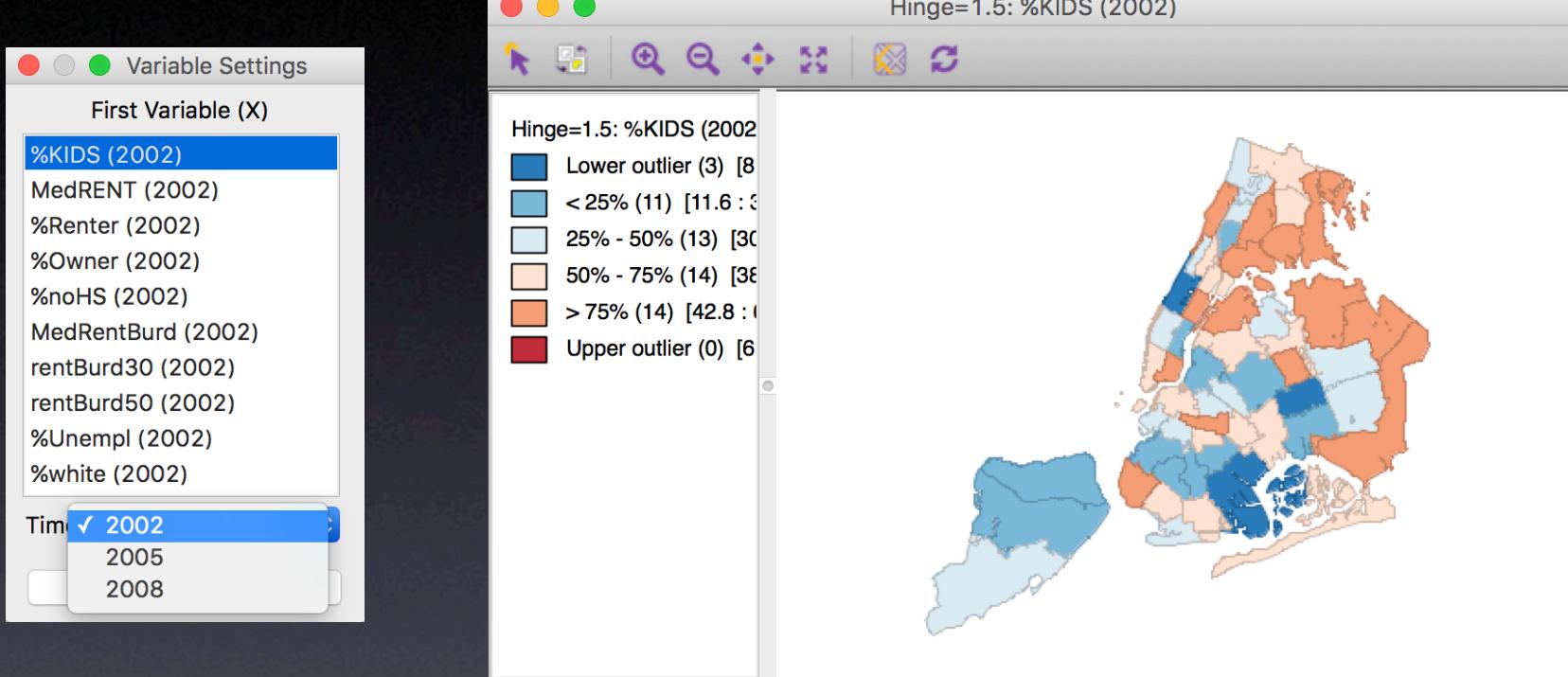
$n = 55 \times 3$ , space-time ID

saved space-time table/weights



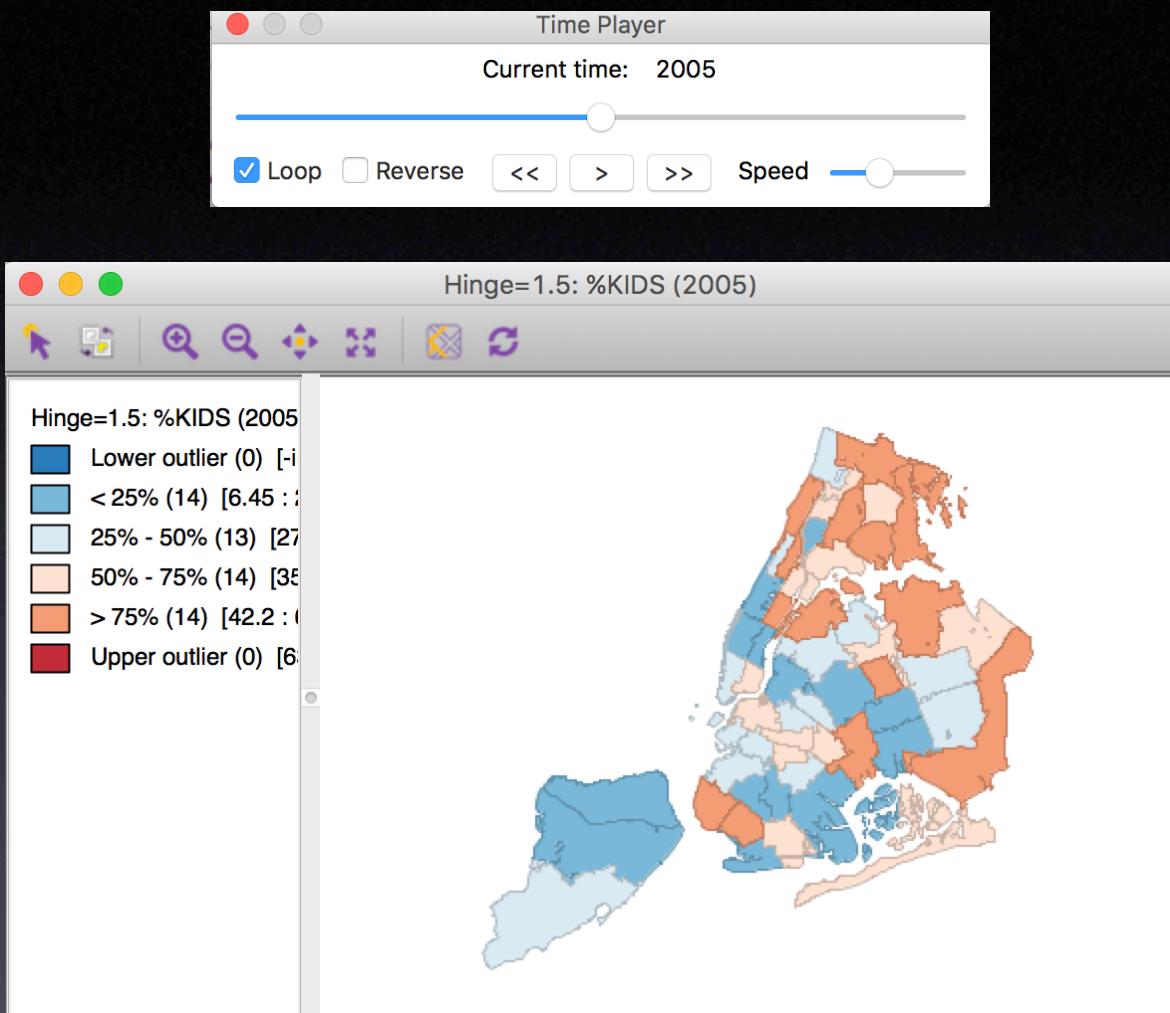
# Time Player





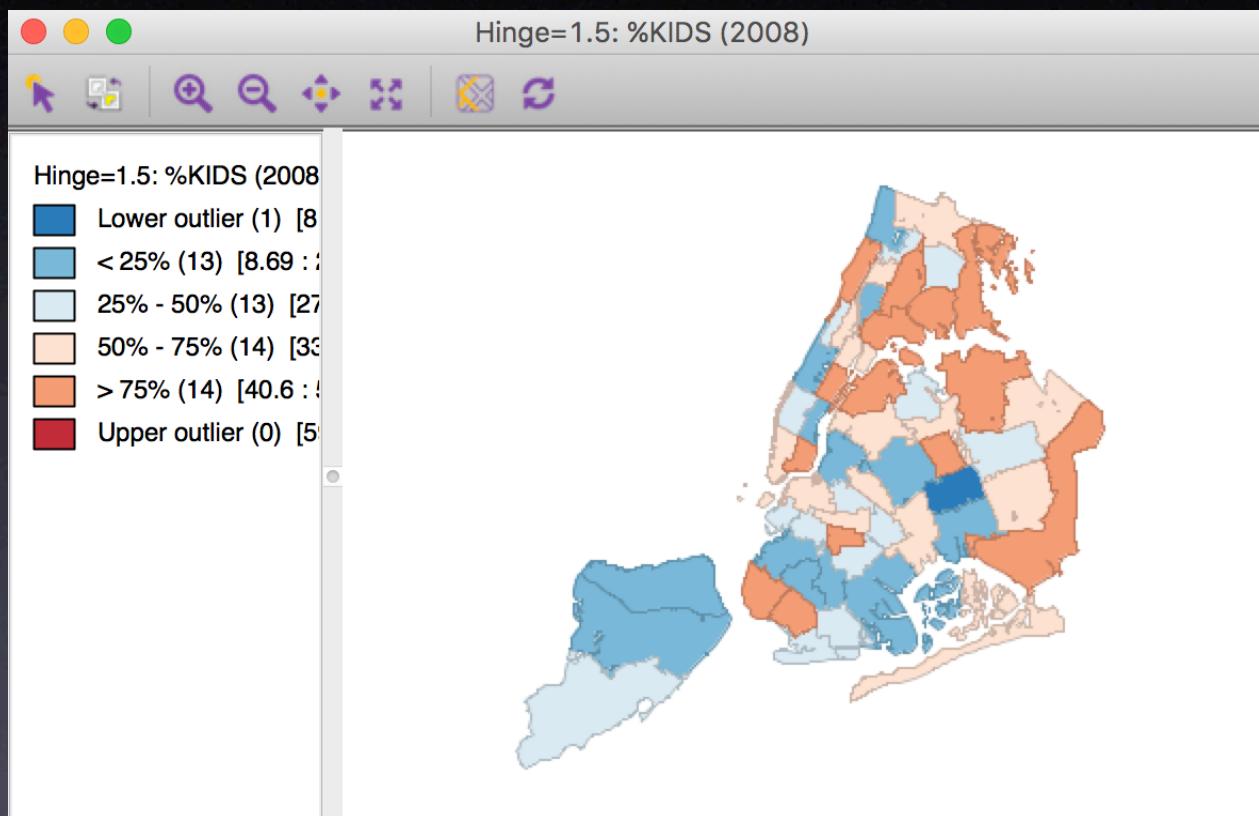
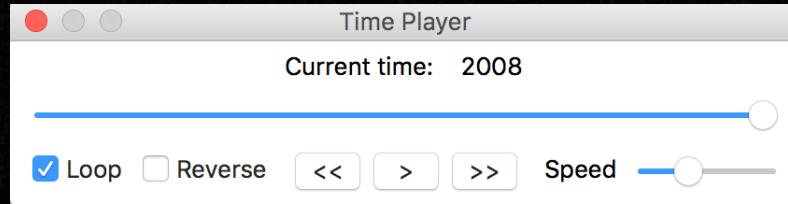
box map with time variable





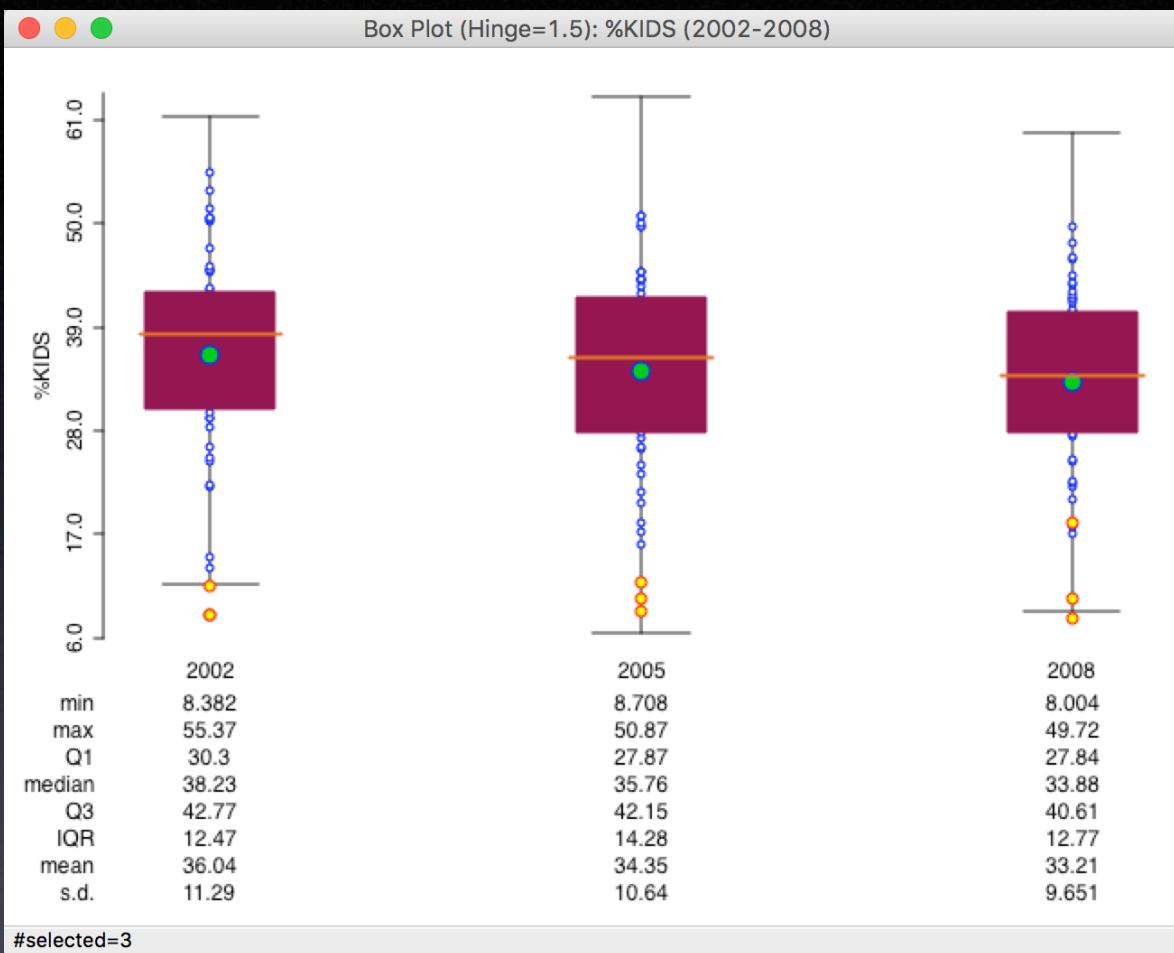
box map 2005





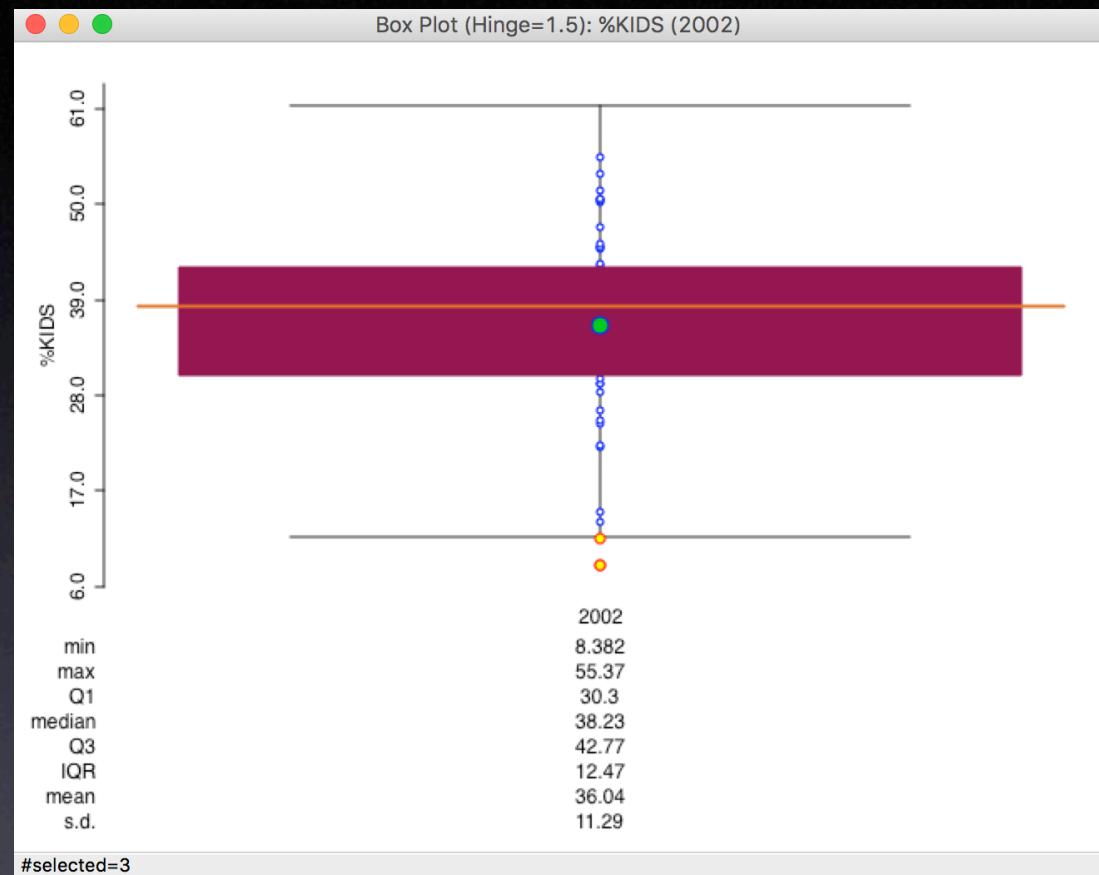
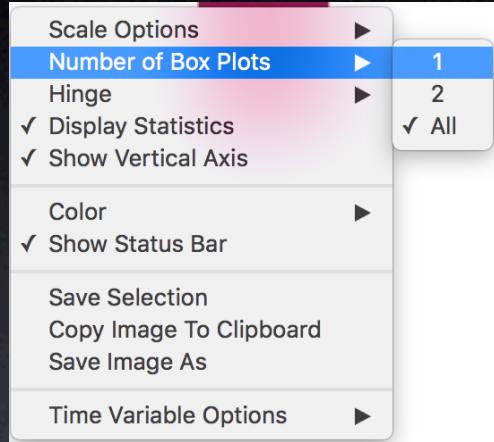
box map 2008





# three period box plot





number of box plots option



# Differential Spatial Autocorrelation

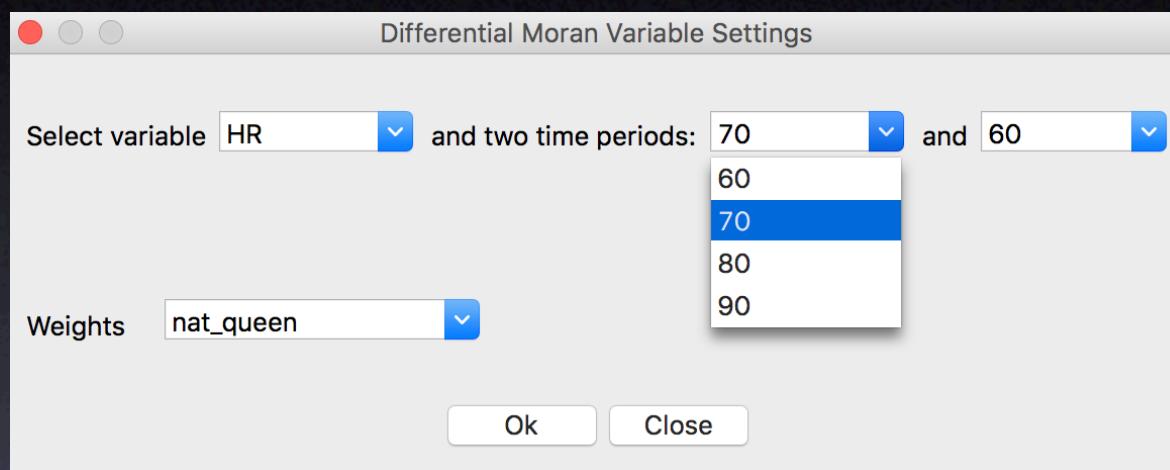


## ● Principle

- spatial autocorrelation on change over time, i.e.,  
on  $y_t - y_{t-1}$
- Moran scatterplot for  $y_t - y_{t-1}$
- Local Moran maps for  $y_t - y_{t-1}$
- replacement of bivariate Moran

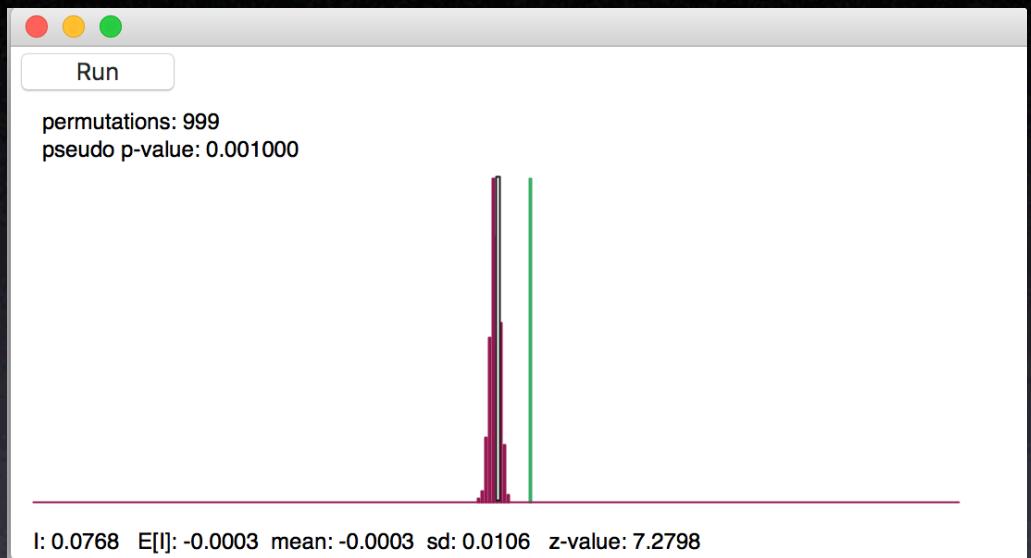
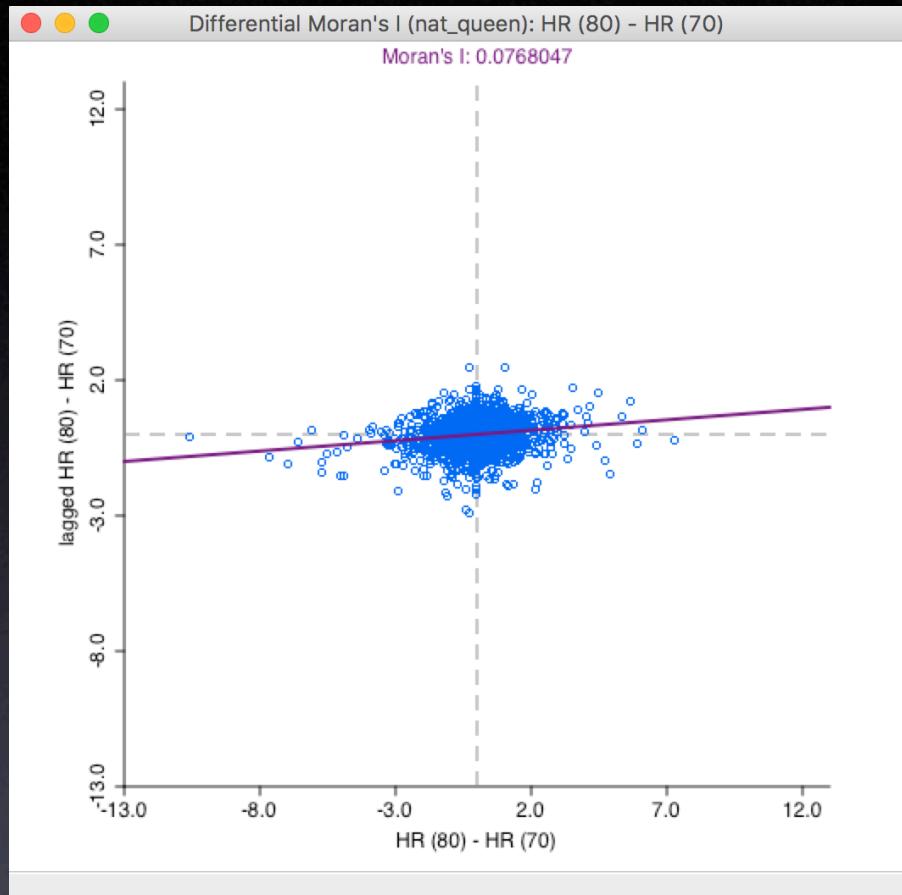


Univariate Moran's I  
Differential Moran's I  
Moran's I with EB Rate



differential Moran's I (scatter plot)  
variable selection using two time periods





## differential Moran scatter plot



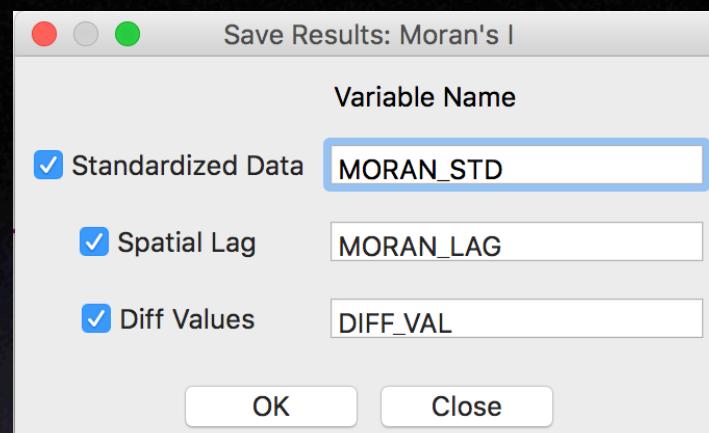
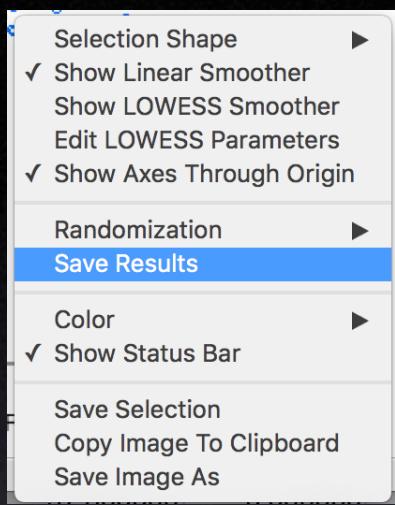


Table - natregimes					
	FH (60)	West	MORAN_STD	MORAN_LAG	DIFF_VAL
35	11.279621	0	1.2198860	0.0255470	8.8558270
58	10.053476	1	2.4456820	0.0914580	17.2087420
99	9.258437	1	0.1456410	0.8732250	1.5356160
40	9.039900	1	0.2101460	0.4930810	1.9751710
63	8.243930	1	1.0605420	0.3052060	7.7700080

save lag and standardized and unstandardized first difference



- Univariate Local Moran's I
- Differential Local Moran's I**
- Local Moran's I with EB Rate
- Local G Cluster Map
- Local G\* Cluster Map

Differential Moran Variable Settings

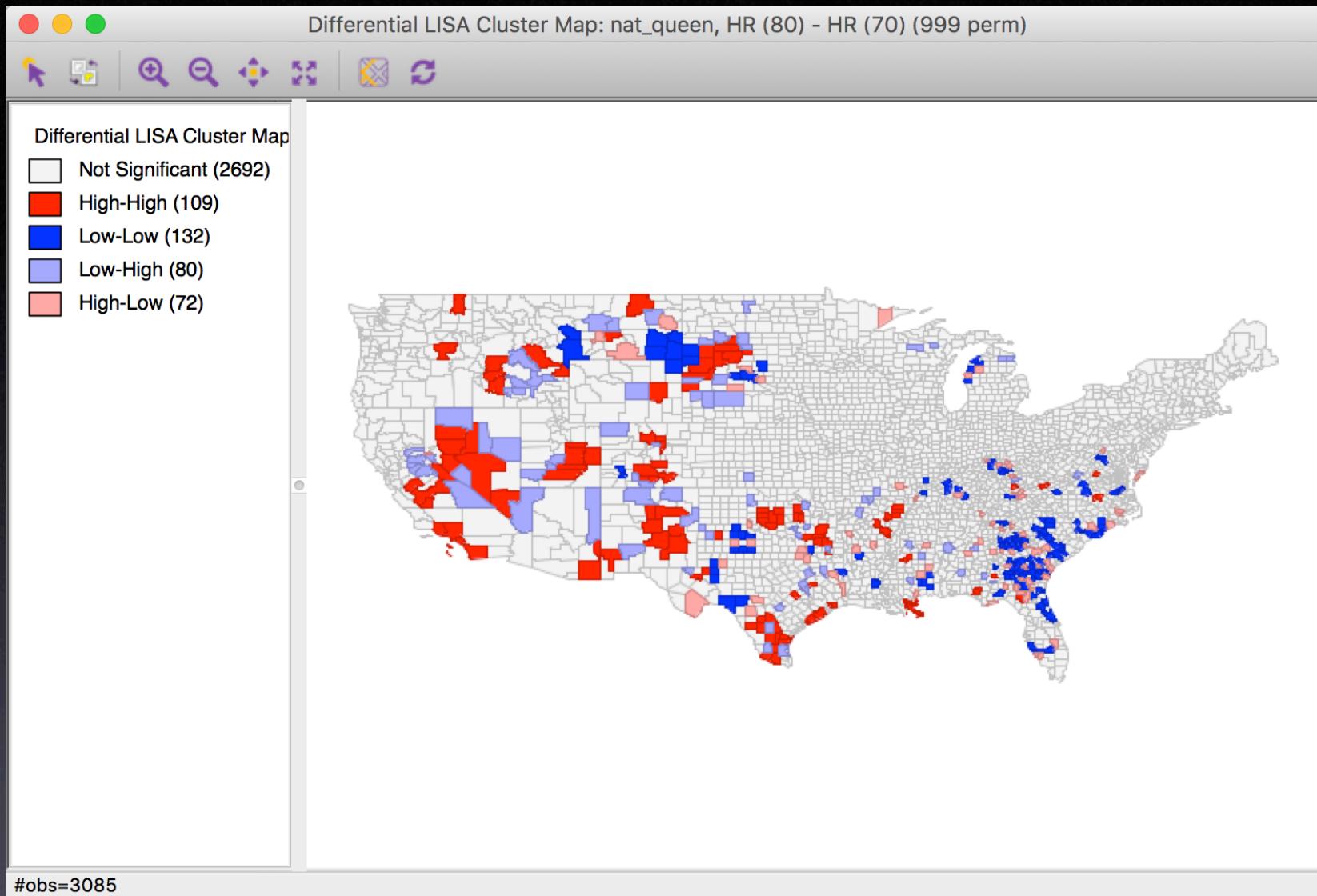
Select variable HR and two time periods: 70 and 60

Weights nat\_queen

Ok Close

## differential local Moran





## differential local Moran cluster map local clustering of the change



# Averages Tool



## ● Principle

- simple treatment effects analysis
- compare mean of a variable in selected vs unselected set of observations
  - cross-section: selected vs unselected
  - all observations: one time period vs another time period
  - selected: one time period vs another time period
- simple F test on difference in means



## ● Difference-in-Differences Test

- dummy variable regression
  - cross-sectional case: selected observations = 1
  - all observations: second time period = 1
  - selected at different points in time
  - selected = 1, second time = 1, interaction = 1



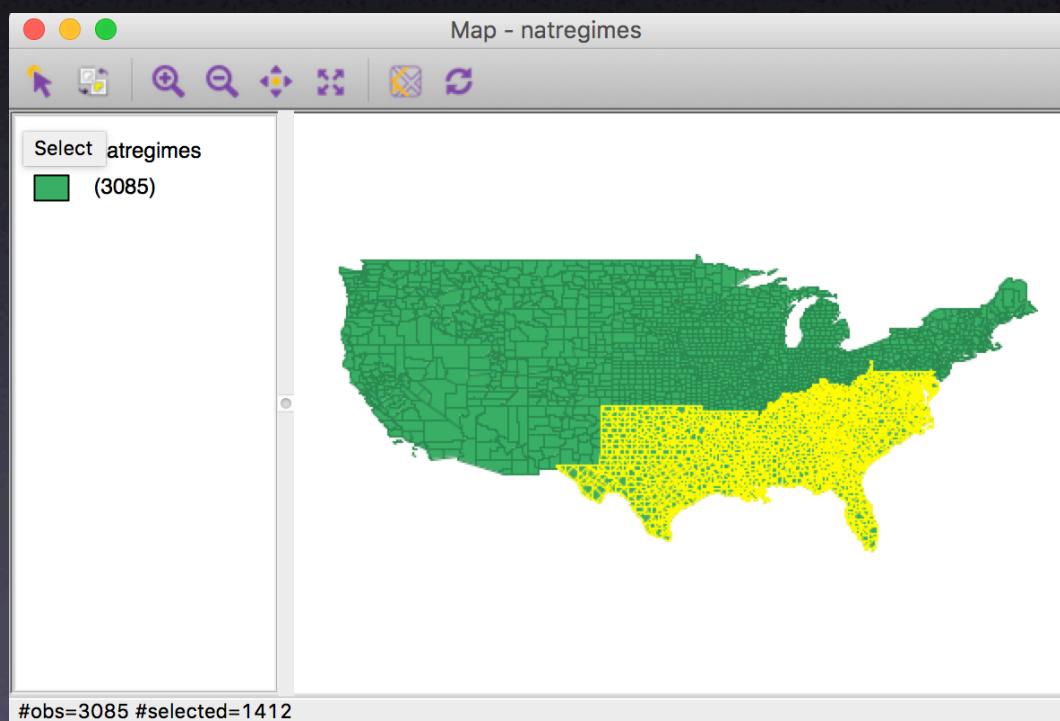
## ● Save Dummy

- creates new data set with dummy variables
- in space-time case a space-time data set is created with a matching space-time spatial weights file (if a weights file is specified)
- this allows for space-time regression in the regression modules using the new data file and matching spatial weights file
- weights file is block-diagonal between time periods





averages chart icon and menu selection

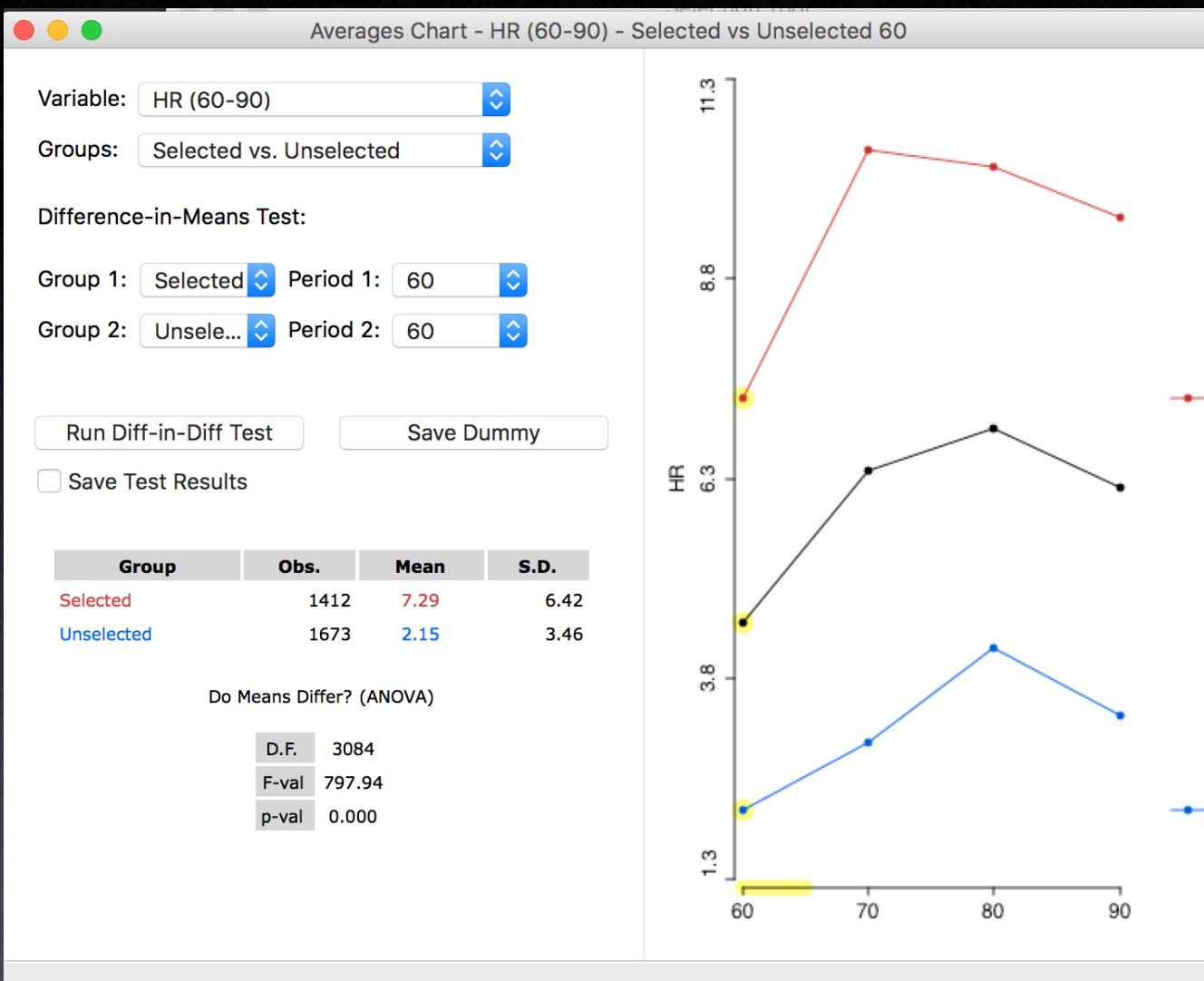


selection: south = 1



# Cross-Section





# selected vs unselected for HR in 60



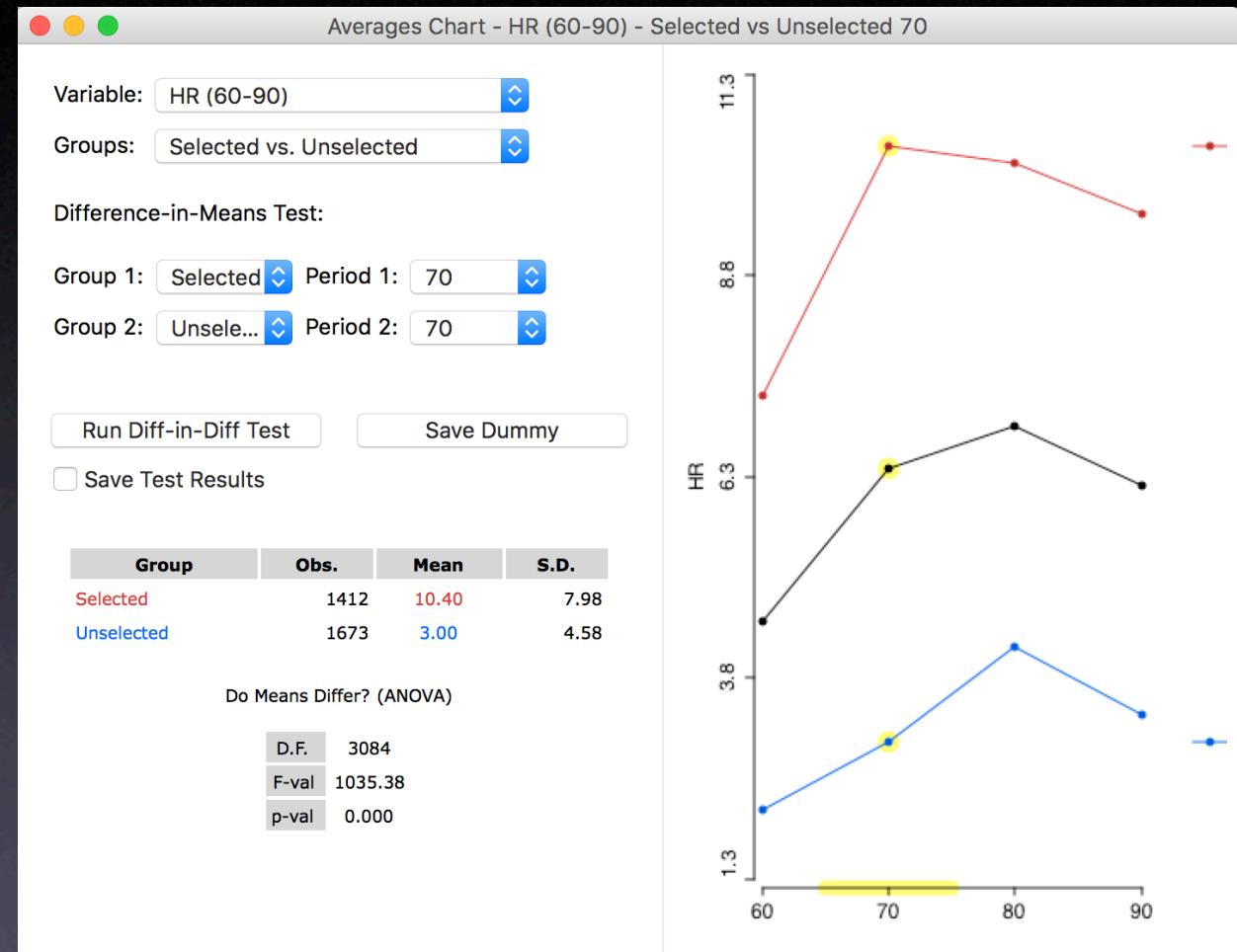
Variable: HR (60-90)

Groups: Selected vs. Unselected

Difference-in-Means Test:

Group 1: Selected Period 1 ✓ 60  
70  
80  
90

Group 2: Unsele... Period 2



select different time period



Diff-in-Diff Regression Report

>>05/05/2016 03:45:52 PM

REGRESSION (DIFF-IN-DIFF, COMPARE REGIMES)

-----

SUMMARY OF OUTPUT: ORDINARY LEAST SQUARES ESTIMATION

Data Set : natregimes

Dependent Variable : HR (60) Number of Observations: 3085

Mean dependent var : 4.50408 Number of Variables : 2

S.D. dependent var : 5.64881 Degrees of Freedom : 3083

R-squared : 0.205604 F-statistic : 797.938

Adjusted R-squared : 0.205347 Prob(F-statistic) : 0

Sum squared residual: 78199.7 Log likelihood : -9363.89

Sigma-square : 25.3648 Akaike info criterion : 18731.8

S.E. of regression : 5.03635 Schwarz criterion : 18743.8

Sigma-square ML : 25.3484

S.E. of regression ML: 5.03472

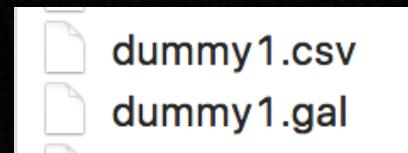
-----

Variable	Coefficient	Std.Error	t-Statistic	Probability
CONSTANT	2.15096	0.123131	17.4689	0.00000
SPACE	5.14118	0.182003	28.2478	0.00000

===== END OF REPORT =====

run diff-in-diff test = dummy variable regression





STID	FIPSNO	PERIOD	HR	SPACE
1,27077	,60,		0.000000000	,0
2,53019	,60,		0.000000000	,0
3,53065	,60,		1.863863416	,0
4,53047	,60,		2.612330199	,0
5,53051	,60,		0.000000000	,0
6,16021	,60,		0.000000000	,0
7,30053	,60,		7.976389886	,0
8,30029	,60,		1.011173467	,0
9,30035	,60,		11.529038766	,0
10,30101	,60,		0.000000000	,0

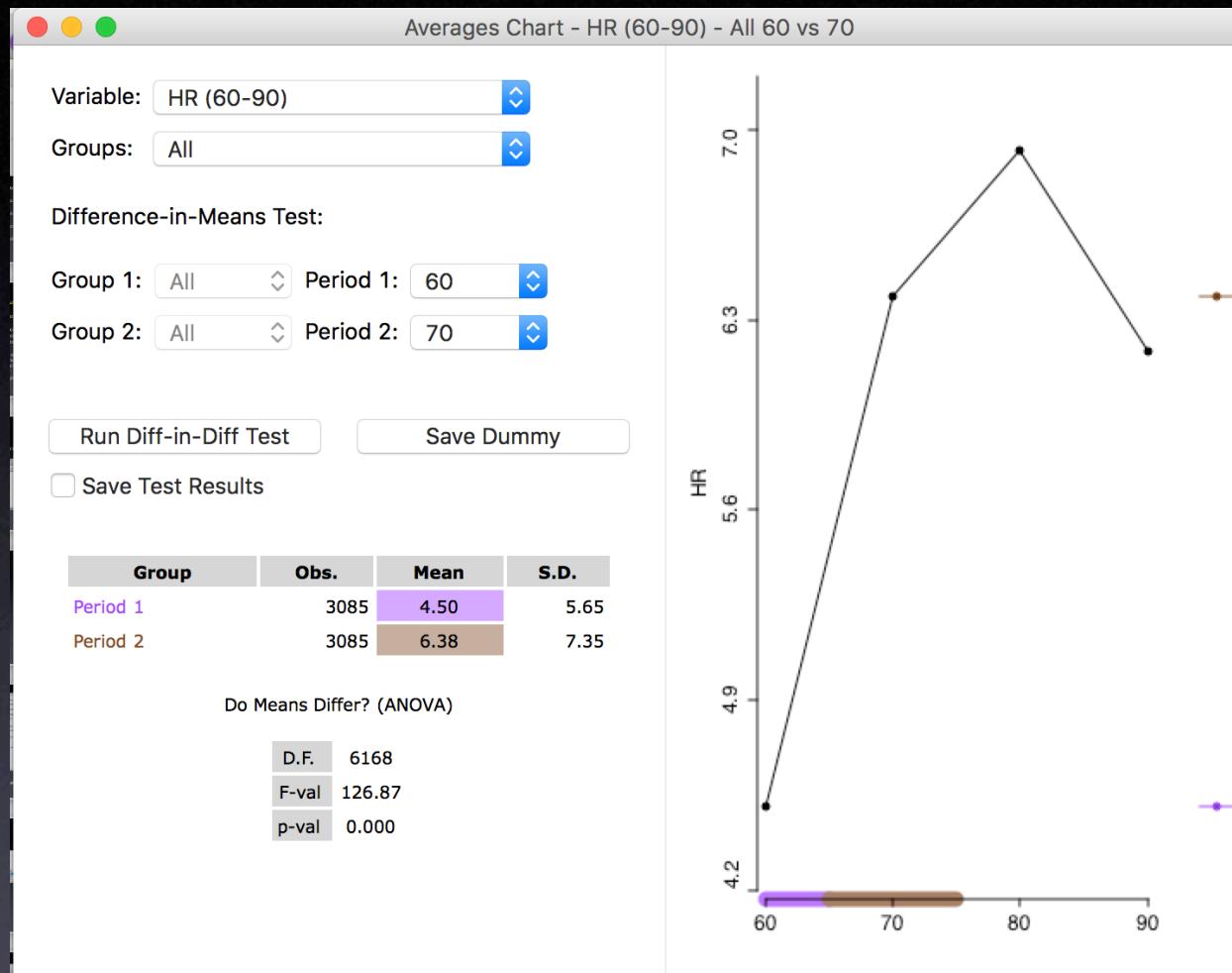
0	3085	dummy1	STID
1	3		
30	22	40	
2	3		
69	2	3	
3	4		
1	62	4	69
4	7		
69	1	27	31
		42	55
		68	
5	4		
2	5	28	62

files created by save dummy



# All Observations - Two Periods





comparison of all observations in two time periods



Diff-in-Diff Regression Report

>>05/05/2016 04:48:20 PM  
REGRESSION (DIFF-IN-DIFF, COMPARE TIME PERIOD)

SUMMARY OF OUTPUT: ORDINARY LEAST SQUARES ESTIMATION

Data Set	:	natregimes			
Dependent Variable	:	HR (60,70)	Number of Observations:	6170	
Mean dependent var	:	5.44426	Number of Variables	:	2
S.D. dependent var	:	6.62262	Degrees of Freedom	:	6168

R-squared : 0.020154 F-statistic : 126.868  
Adjusted R-squared : 0.019995 Prob(F-statistic) : 3.81769e-29  
Sum squared residual: 265156 Log likelihood : -20356.4  
Sigma-square : 42.989 Akaike info criterion : 40716.7  
S.E. of regression : 6.5566 Schwarz criterion : 40730.2  
Sigma-square ML : 42.9751  
S.E of regression ML: 6.55554

Variable	Coefficient	Std.Error	t-Statistic	Probability
CONSTANT	4.50408	0.118046	38.1553	0.00000
TIME	1.88037	0.166942	11.2636	0.00000

===== END OF REPORT =====

run diff-in-diff test = dummy variable regression



```
STID,FIPSNO,PERIOD,HR,TIME  
1,27077,60, 0.000000000,0  
2,53019,60, 0.000000000,0  
3,53065,60, 1.863863416,0  
4,53047,60, 2.612330199,0  
5,53051,60, 0.000000000,0  
6,16021,60, 0.000000000,0  
7,30053,60, 7.976389886,0  
8,30029,60, 1.011173467,0  
9,30035,60, 11.529038766,0
```

```
0 6170 dummy2 STID  
1 3  
30 22 40  
2 3  
69 2 3  
3 4  
1 62 4 69  
4 7  
69 1 27 31 42 55 68  
5 4  
2 5 28 62
```

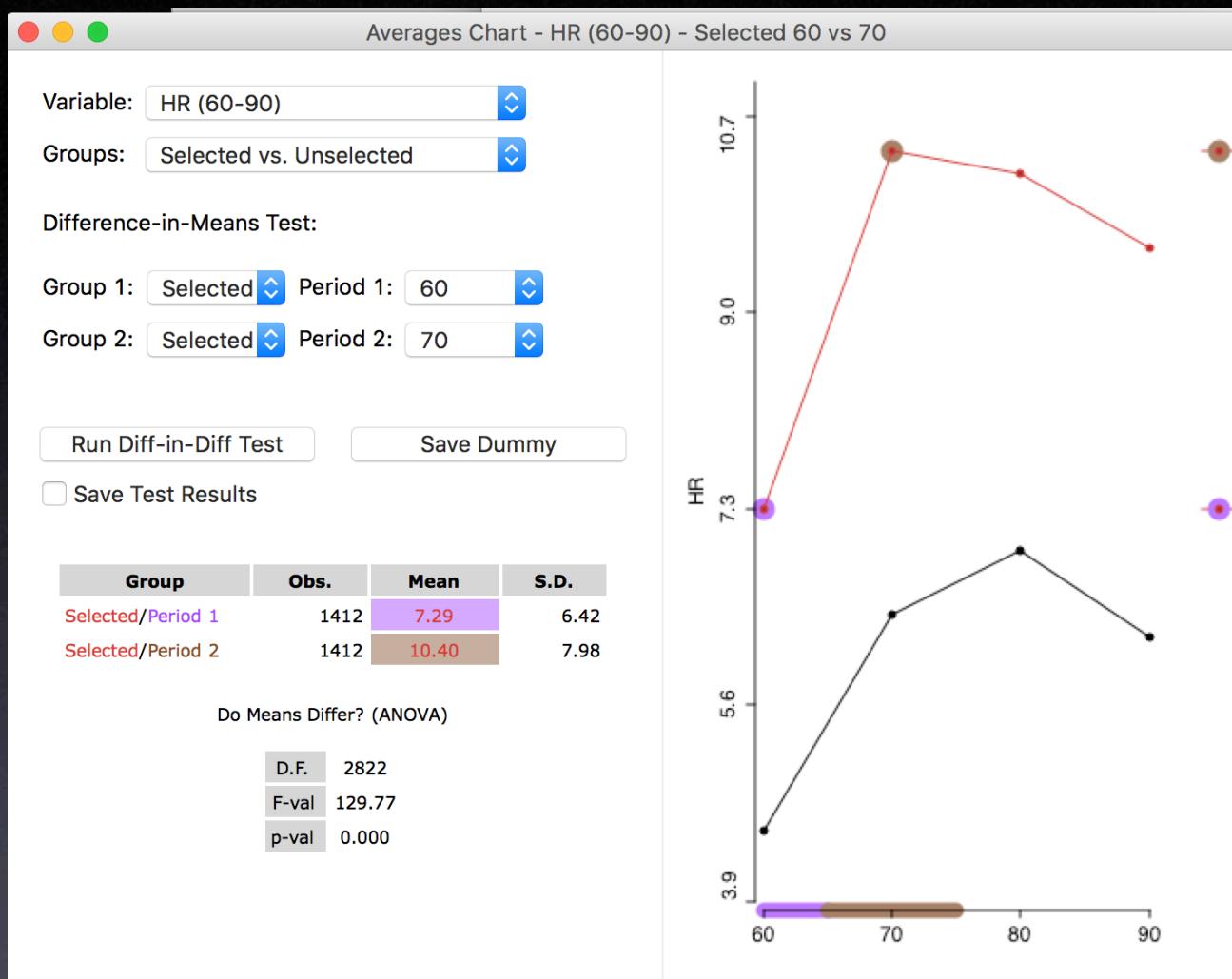
save dummy

space-time data set and gal weights file



# Selected - Two Periods





comparison of selected observations in two time periods



Diff-in-Diff Regression Report

>>05/05/2016 04:55:51 PM  
 REGRESSION (DIFF-IN-DIFF, COMPARE REGIMES AND TIME PERIOD)

-----  
 SUMMARY OF OUTPUT: ORDINARY LEAST SQUARES ESTIMATION  
 Data Set : natregimes  
 Dependent Variable : HR (60,70) Number of Observations: 6170  
 Mean dependent var : 5.44426 Number of Variables : 4  
 S.D. dependent var : 6.62262 Degrees of Freedom : 6166

R-squared : 0.249831 F-statistic : 684.495  
 Adjusted R-squared : 0.249466 Prob(F-statistic) : 0  
 Sum squared residual: 203003 Log likelihood : -19532.4  
 Sigma-square : 32.923 Akaike info criterion : 39072.7  
 S.E. of regression : 5.73786 Schwarz criterion : 39099.7  
 Sigma-square ML : 32.9017  
 S.E of regression ML: 5.736

-----  
 Variable Coefficient Std.Error t-Statistic Probability  
 -----  
 CONSTANT 2.15096 0.140282 15.3332 0.00000  
 SPACE 5.14118 0.207354 24.7942 0.00000  
 TIME 0.847231 0.198389 4.27056 0.00002  
 INTERACT 2.25724 0.293243 7.69751 0.00000

===== END OF REPORT =====

run diff-in-diff test = space and time dummies and interaction



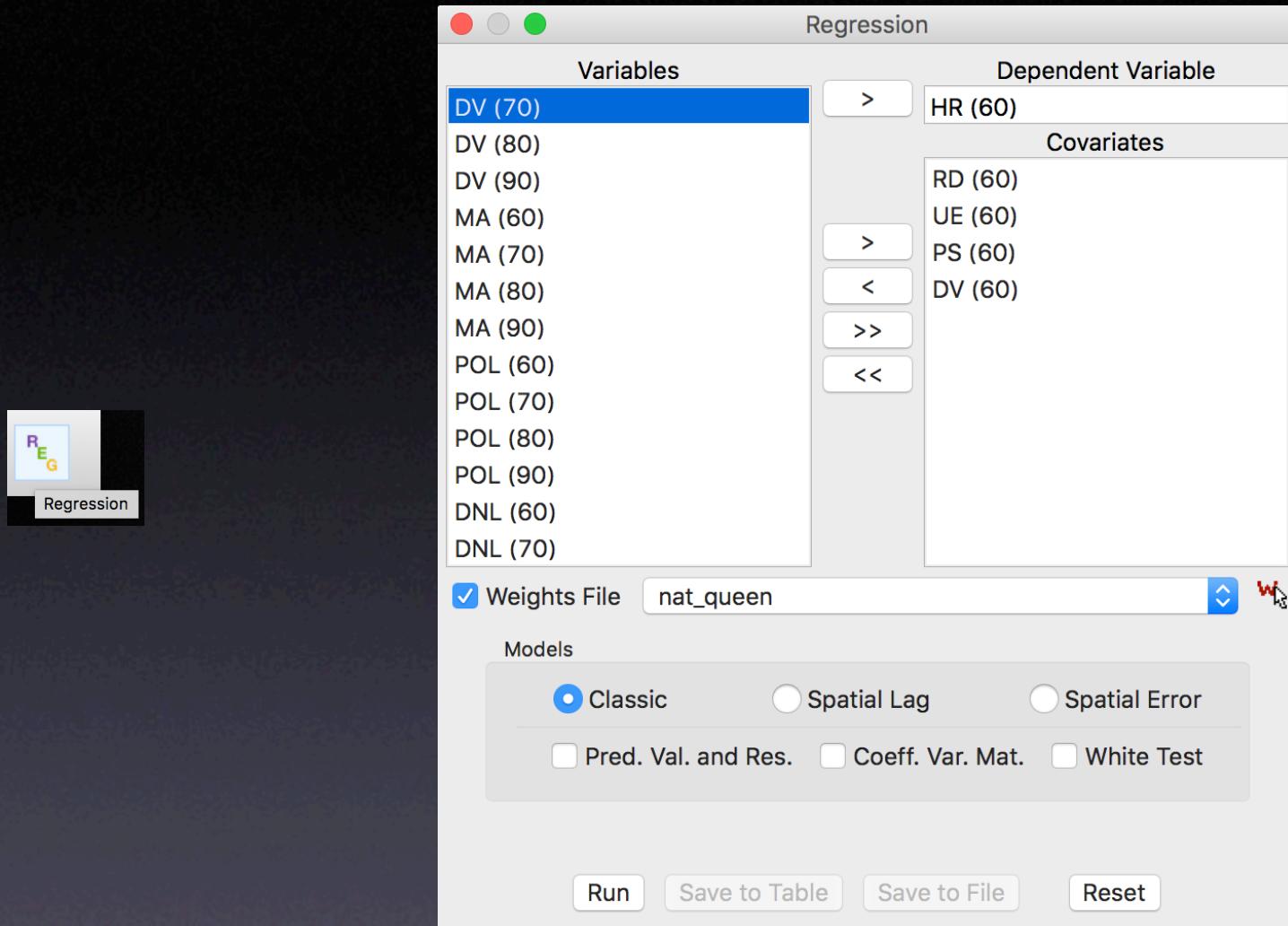
# Spatial Regression



## ● **Functionality**

- OLS regression with diagnostics for spatial effects
- ML regression of spatial lag and spatial error models
- save residuals and predicted values
- limitation: only for intrinsically symmetric weights





regression toolbar icon and interface



Regression Report

>>05/05/2016 05:57:42 PM  
REGRESSION

SUMMARY OF OUTPUT: ORDINARY LEAST SQUARES ESTIMATION

Data set	:	natregimes		
Dependent Variable	:	HR (60)	Number of Observations:	3085
Mean dependent var	:	4.50408	Number of Variables :	5
S.D. dependent var	:	5.64881	Degrees of Freedom	: 3080

R-squared	:	0.220243	F-statistic	:	217.488
Adjusted R-squared	:	0.219231	Prob(F-statistic)	:	0
Sum squared residual	:	76758.7	Log likelihood	:	-9335.2
Sigma-square	:	24.9217	Akaike info criterion	:	18680.4
S.E. of regression	:	4.99216	Schwarz criterion	:	18710.6
Sigma-square ML	:	24.8813			
S.E. of regression ML	:	4.98811			

---

Variable	Coefficient	Std.Error	t-Statistic	Probability
CONSTANT	2.65084	0.252745	10.4882	0.00000
RD (60)	2.87011	0.0987288	29.0706	0.00000
UE (60)	-0.0367479	0.0364174	-1.00908	0.31300
PS (60)	0.702509	0.094004	7.47318	0.00000
DV (60)	1.07469	0.0976658	11.0037	0.00000

---

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 5.711199

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	296191.3107	0.00000

DIAGNOSTICS FOR HETEROSKEDASTICITY

RANDOM COEFFICIENTS

TEST	DF	VALUE	PROB
Breusch-Pagan test	4	460.2628	0.00000
Koenker-Bassett test	4	18.6704	0.00091

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHT MATRIX : nat\_queen  
(row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.1906	17.8535	0.00000
Lagrange Multiplier (lag)	1	382.1303	0.00000
Robust LM (lag)	1	70.8931	0.00000
Lagrange Multiplier (error)	1	313.2932	0.00000
Robust LM (error)	1	2.0560	0.15161
Lagrange Multiplier (SARMA)	2	384.1863	0.00000

---

===== END OF REPORT =====

## ols regression results with diagnostics



```

>>05/05/2016 05:58:11 PM
REGRESSION
-----
SUMMARY OF OUTPUT: SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION
Data set      : natregimes
Spatial Weight : nat_queen
Dependent Variable : HR (60) Number of Observations: 3085
Mean dependent var : 4.50408 Number of Variables   : 6
S.D. dependent var : 5.64881 Degrees of Freedom    : 3079
Lag coeff. (Rho)  : 0.387045

R-squared       : 0.309955 Log likelihood        : -9191.23
Sq. Correlation : - Akaike info criterion : 18394.5
Sigma-square    : 22.0186 Schwarz criterion   : 18430.7
S.E of regression : 4.6924

-----
Variable      Coefficient Std.Error z-value Probability
-----  

W_HR (60)     0.387045  0.0231936 16.6876  0.00000
CONSTANT       1.32898   0.251275  5.28893  0.00000
RD (60)        1.88275   0.106873 17.6167  0.00000
UE (60)        0.00261764 0.0342308 0.0764703 0.93904
PS (60)        0.49365   0.0893103 5.52736  0.00000
DV (60)        0.735294  0.0924862 7.95031  0.00000
-----  

REGRESSION DIAGNOSTICS
DIAGNOSTICS FOR HETEROSKEDASTICITY
RANDOM COEFFICIENTS
TEST                      DF      VALUE      PROB
Breusch-Pagan test        4       649.4843  0.00000
-----  

DIAGNOSTICS FOR SPATIAL DEPENDENCE
SPATIAL LAG DEPENDENCE FOR WEIGHT MATRIX : nat_queen
TEST                      DF      VALUE      PROB
Likelihood Ratio Test     1       287.9311  0.00000
===== END OF REPORT =====

```

## ML estimation spatial lag



>>05/05/2016 05:58:30 PM

REGRESSION

SUMMARY OF OUTPUT: SPATIAL ERROR MODEL - MAXIMUM LIKELIHOOD ESTIMATION

Data set : natregimes  
Spatial Weight : nat\_queen  
Dependent Variable : HR (60) Number of Observations: 3085  
Mean dependent var : 4.504075 Number of Variables : 5  
S.D. dependent var : 5.648806 Degrees of Freedom : 3080  
Lag coeff. (Lambda) : 0.391016  
  
R-squared : 0.300728 R-squared (BUSE) : -  
Sq. Correlation : - Log likelihood : -9212.716168  
Sigma-square : 22.3131 Akaike info criterion : 18435.4  
S.E of regression : 4.72367 Schwarz criterion : 18465.6

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	2.96545	0.309134	9.59279	0.00000
RD (60)	2.44082	0.129618	18.8308	0.00000
UE (60)	0.0359107	0.0413815	0.867796	0.38551
PS (60)	0.650578	0.111279	5.84636	0.00000
DV (60)	0.693085	0.109803	6.31207	0.00000
LAMBDA	0.391016	0.0243657	16.0478	0.00000

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETROSKEDEASTICITY

RANDOM COEFFICIENTS

TEST	DF	VALUE	PROB
Breusch-Pagan test	4	613.6859	0.00000

DIAGNOSTICS FOR SPATIAL DEPENDENCE

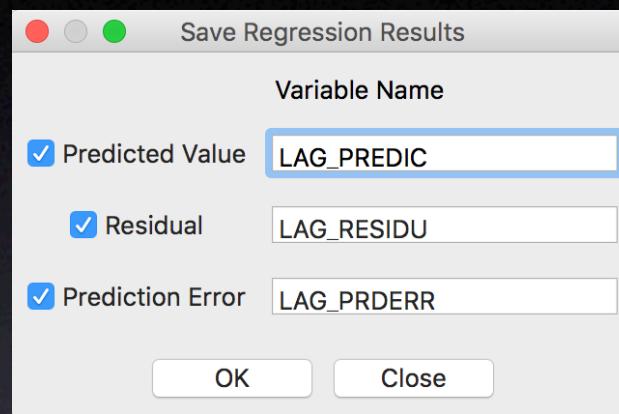
SPATIAL ERROR DEPENDENCE FOR WEIGHT MATRIX : nat\_queen

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	244.9628	0.00000

===== END OF REPORT =====

# ML spatial error model





save to table for spatial lag model

