Community Acceptance of Wife-beating in Ethiopia: Is education an important correlate?

Presentation for Bahir Dar University, School of Graduate Studies

October 24, 2022

BACKGROUND

A regression analysis identified "…. low economic status, partner alcohol use, witnessing family violence, marital controlling behaviors, and community acceptance of wife-beating as significant predictors of domestic violence" in Ethiopia

Women living in communities with high acceptance of wife-beating were 1.4 times more likely to experience domestic violence than women living in communities with low acceptance of wife-beating (AOR = 1.39, 95% CI: 1.16, 1.66)."

Source: Seid, E., Melese, T. & Alemu, K. Spatial distribution and predictors of domestic violence against women: evidence from analysis of Ethiopian demographic health survey 2016. *BMC Women's Health* **21**, 334 (2021). https://doi.org/10.1186/s12905-021-01465-4

Problem: the study ignored the spatial autocorrelation of the dependent variable

"The study found spatial clustering of domestic violence cases in Ethiopia with Moran's I value of 0.26, *Z* score of 8.26, and *P* value < 0.01."

VIDEO SPATIAL AUTOCORRELATION
https://youtu.be/M9ecMxVG6jQ

OBJECTIVES OF MY PRESENTATION

1. To bring attention to improper applications of spatial statistics by population/health researchers

2. To highlight the need to take into account Ethiopia's diversity when conducting spatial statistics

3. To highlight a Geographic Information System (GIS) tool by using as an example unweighted percentages of women who responded that wife-beating was okay

DATA SOURCE METHODOLOGY

- **Data source: Ethiopia's 2016 Demographic and Health Survey (DHS)**
  - **Data processing using R-programing language**
  - **Spatial statistics using geographically weighted regression (GWR) - an ArcGIS-Pro application**

More about DHS

- Paid for by the United States Agency for International Development (USDA)
- Over 30 years
- 90 countries across Africa, Asia, Latin America/Caribbean, and Eastern Europe.
- In Ethiopia – 2000, 2005, 2011, 2016

R-PROGRAMMING

Ethiopia's 2016 DHS files

```
> #Couples' recode
> DHS2016_Couple <- read.dta("D:/DHS2016/ETCR71DT/ETCR71FL.DTA")
> nrow(DHS2016_Couple)
[1] 6141
> #Household recode
> DHS2016_HHold <- read.dta("D:/DHS2016/ETHR71DT/ETHR71FL.DTA")
> nrow(DHS2016_HHold)
[1] 16650
> #Individual recode
> DHS2016_Wom <- read.dta("D:/DHS2016/ETIR71DT/ETIR71FL.DTA")
> nrow(DHS2016_Wom)
[1] 15683
> #Births recode
> DHS2016_Births <- read.dta("D:/DHS2016/ETBR71DT/ETBR71FL.DTA")
> nrow(DHS2016_Births)##41392
[1] 41392
>
```

Q: V744c It is the respondent's opinion that a husband is justified in hitting or beating his wife when she argues with him

V744A	Beating justified if wife goes out without tell	57	1	N	I	1	0	No	No
	0 No								
	1 Yes								
	8 Don't know								
	(m) 9 Missing								
	(na) Not applicable								
V744B	Beating justified if wife neglects the children	58	1	N	I	1	0	No	No
	0 No								
	1 Yes								
	8 Don't know								
	(m) 9 Missing								
	(na) Not applicable								
V744C	Beating justified if wife argues with husband	59	1	N	I	1	0	No	No
	0 No								
	1 Yes								
	8 Don't know								
	(m) 9 Missing								
	(na) Not applicable								
V744D	Beating justified if wife refuses to have sex w	60	1	N	I	1	0	No	No
	0 No								
	1 Yes								
	8 Don't know								
	(m) 9 Missing								
	(na) Not applicable								
V744E	Beating justified if wife burns the food	61	1	N	I	1	0	No	No
	0 No								
	1 Yes								
	8 Don't know								
	(m) 9 Missing								
	(na) Not applicable								

R-programing (National)

```
DHS2016_Wom <- read.dta("D:/DHS2016/ETIR71DT/ETIR71FL.DTA")
> nrow(DHS2016_Wom)
[1] 15683 (number of women - unweighted)

> summary(DHS2016_Wom$v744c)
```

no	yes	don't know
9,839 (62.9%)	5,707 (36.4%)	137 (0.7%)

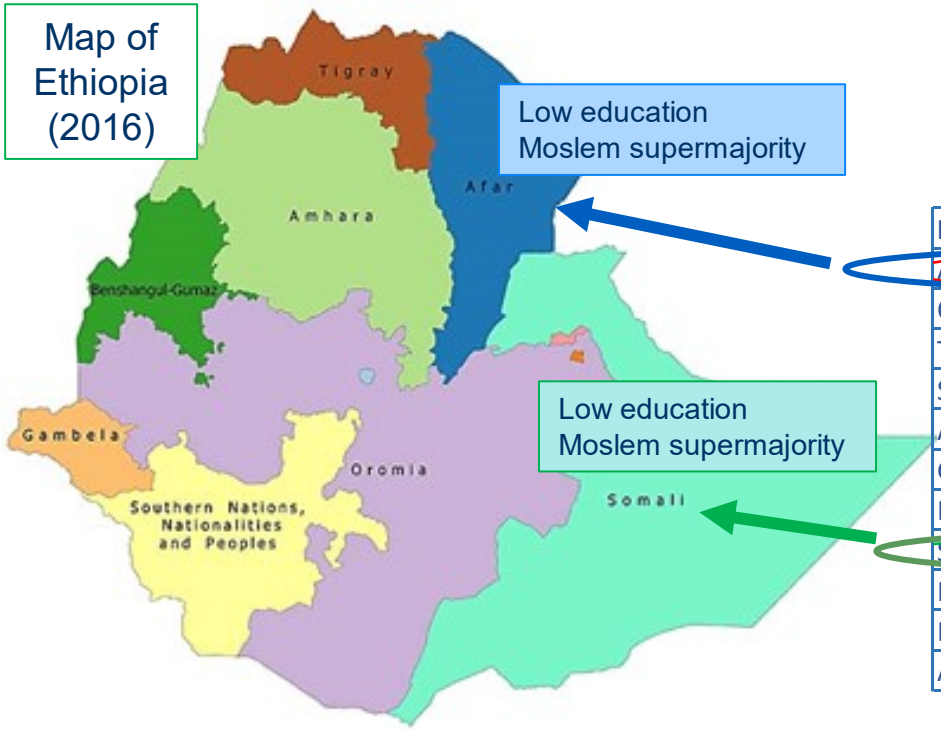
Q: V744c It is the respondent's opinion that a husband is justified in hitting or beating his wife when she argues with him

A. Yes
B. No

R-programing (Regional)

```
#Regional proportions of yes/no answers to beatings if wife argues with husband
WomArgReg <- table(DHS2016_Wom$v101,DHS2016_Wom$v744c) # WomArgReg # print table
```

Map of Ethiopia (2016)



Low education Moslem supermajority

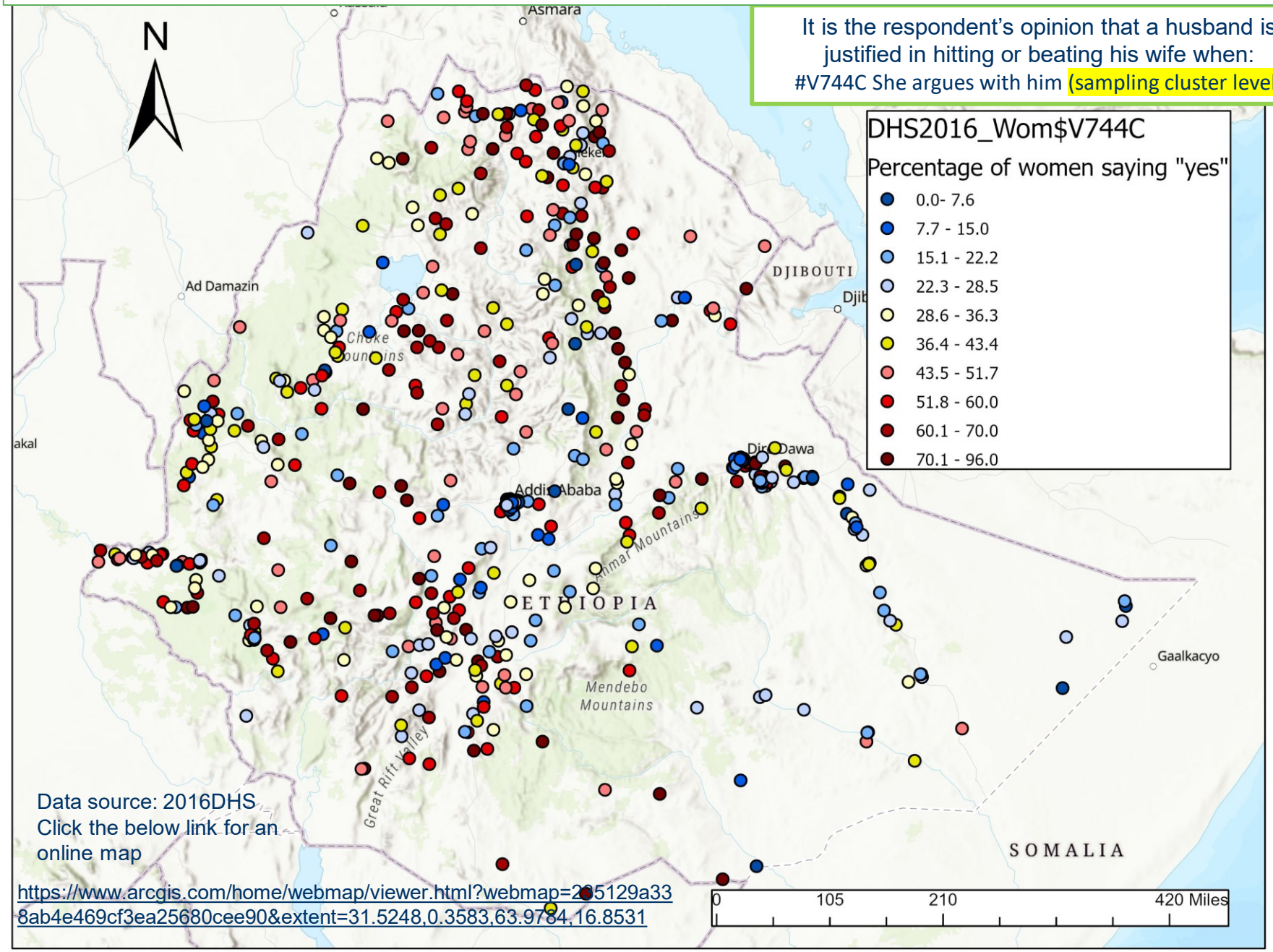
Low education Moslem supermajority

Regional percentage of women who answered yes/no to a question on wife-beating over spousal arguments

Region	No	% NO	Yes	% YES	Don't l	%
Afar	531	47.1	582	51.6	15	1.3
Oromia	965	51.0	905	47.0	22	2.0
Tigray	894	53.2	783	46.4	5	0.4
SNNPR	1014	54.8	823	44.1	12	1.1
Amhara	980	57.0	725	41.7	14	1.2
Gambela	614	59.3	414	40.1	7	0.6
Benishang	725	64.4	400	35.5	1	0.1
Somali	913	65.6	446	31.5	32	2.8
Harari	654	72.2	243	27.0	9	0.8
Dire Dawa	879	77.7	239	21.1	13	1.2
Addis Aba	1670	91.6	147	7.8	7	0.6

Unweighted cluster percentages of women with a “yes” response to V744c

It is the respondent’s opinion that a husband is justified in hitting or beating his wife when:
#V744C She argues with him (sampling cluster level)



Data source: 2016DHS
Click the below link for an online map

https://www.arcgis.com/home/webmap/viewer.html?webmap=285129a338ab4e469cf3ea25680cee90&extent=31.5248,0.3583,63.9784,16.8531

STEP: 1

Conduct a Global Moran's I test of unweighted percentages of women with a "yes" response to Q: V744c

Global Moran's I

Global Moran's *I* is a measure of the overall clustering of the spatial data. It is defined as

$$I = \frac{N}{W} \frac{\sum_{i=1}^{N} \sum_{j=1}^{N} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{N} (x_i - \bar{x})^2}$$

$\tilde{x}_{\text{V744c}} = 37.02$

where

- N is the number of spatial units indexed by i and j;
- x is the variable of interest;
- $\bar{x}$ is the mean of x;
- w_{ij} is a matrix of spatial weights with zeroes on the diagonal (i.e., $w_{ii} = 0$);
- and W is the sum of all w_{ij} (i.e. $W = \sum_{i=1}^{N} \sum_{j=1}^{N} w_{ij}$).

*Source: http://www.50northspatial.org/global-morans-i-spatial-autocorrelation/

SPATIAL Autocorrelation Global Moran's I

50	23	58	38
19	84	16	55
78	13	83	27
38	75	26	41

Dissimilar values
Negative

84	83	58	38
78	75	50	27
55	41	26	19
38	23	16	13

Similar values
Positive

19	83	84	13
38	55	58	26
50	41	38	75
16	78	23	75

Random pattern
No autocorrelation

Global Moran's I Summary

Moran's Index:	0.324838
Expected Index:	-0.001558
Variance:	0.000260
z-score:	20.256442
p-value:	0.000000

Dataset Information

Input Feature Class:	DHS2016_Wom$V744C
Input Field:	PCTWFBT_YE
Conceptualization:	INVERSE_DISTANCE
Distance Method:	EUCLIDEAN
Row Standardization:	True
Distance Threshold:	121760.4172 Meters
Weights Matrix File:	None
Selection Set:	False

Input field: Percentage of women responding "yes" to V744C

Global Moran's I Summary

Moran's Index:	0.364077
Expected Index:	-0.001558
Variance:	0.000325
z-score:	20.282289
p-value:	0.000000

Dataset Information

Input Feature Class:	DHS2016_Wom$V744C
Input Field:	PCTWFBT_YE
Conceptualization:	K_NEAREST_NEIGHBORS
Distance Method:	EUCLIDEAN
Row Standardization:	True
Distance Threshold:	None
Weights Matrix File:	None
Selection Set:	False

SPATIAL Autocorrelation
Global Moran's I

50	23	58	38
19	84	16	55
78	13	83	27
38	75	26	41

Dissimilar values
Negative

84	83	58	38
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55	41	26	19
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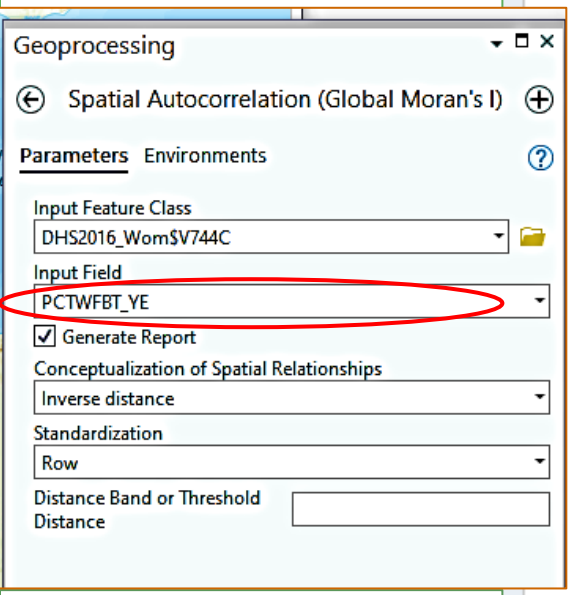
Similar values
Positive

19	83	84	13
38	55	58	26
50	41	38	75
16	78	23	75

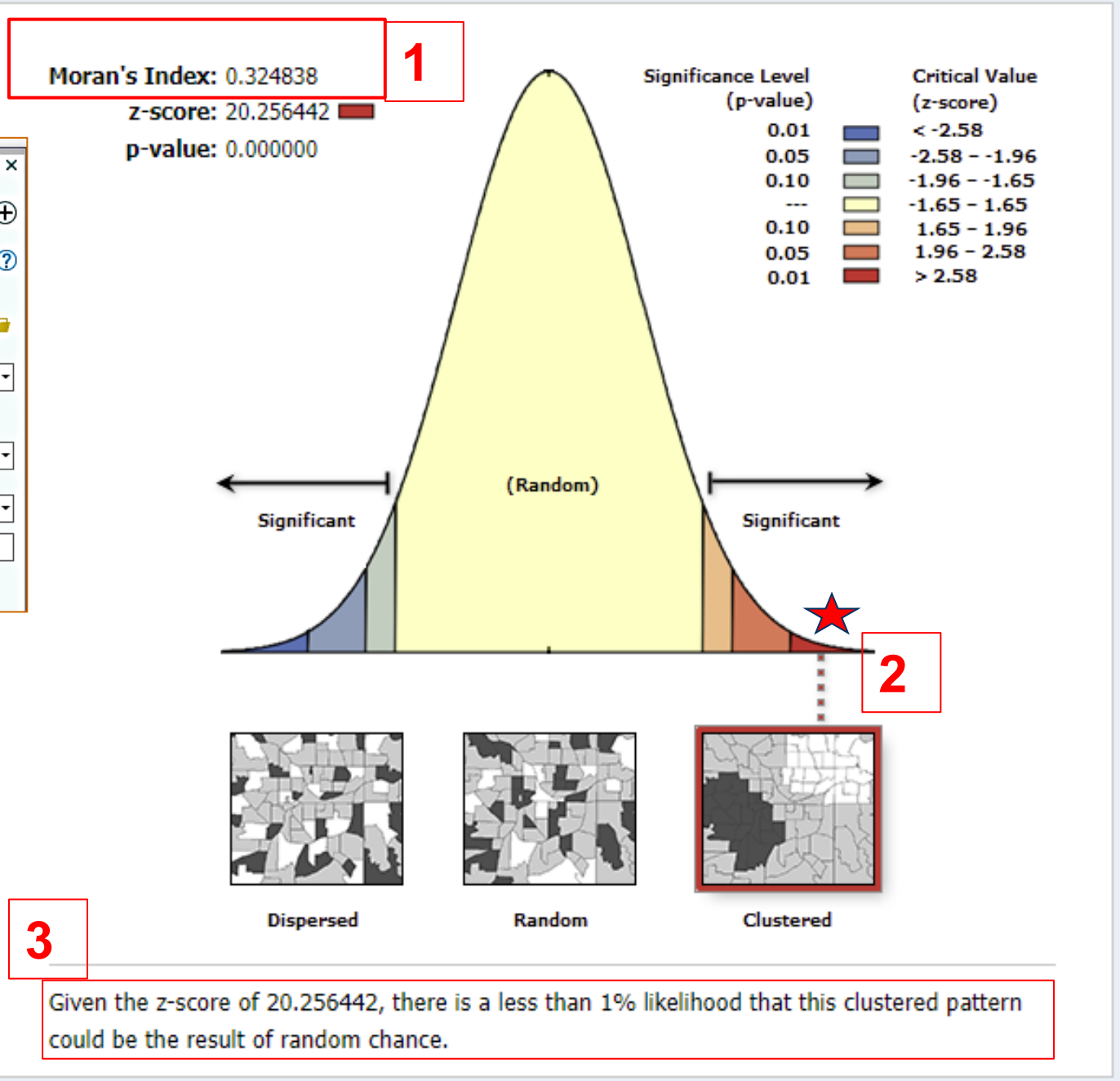
Random pattern
No autocorrelation

II. Test of clustering (spatial autocorrelation): % saying "yes" to wife-beating



RESULT

The dependent variable, V744c is not suitable for global ordinary least squares (OLS) regression due to spatial autocorrelation (non-random residuals)



STTEP 2: SOLUTION

Apply the geographically weighted (local) regression (GWR) method with PCTWFBT_YE as (y) and PCNT_NOED as (X)*

HV109 Educational attainment

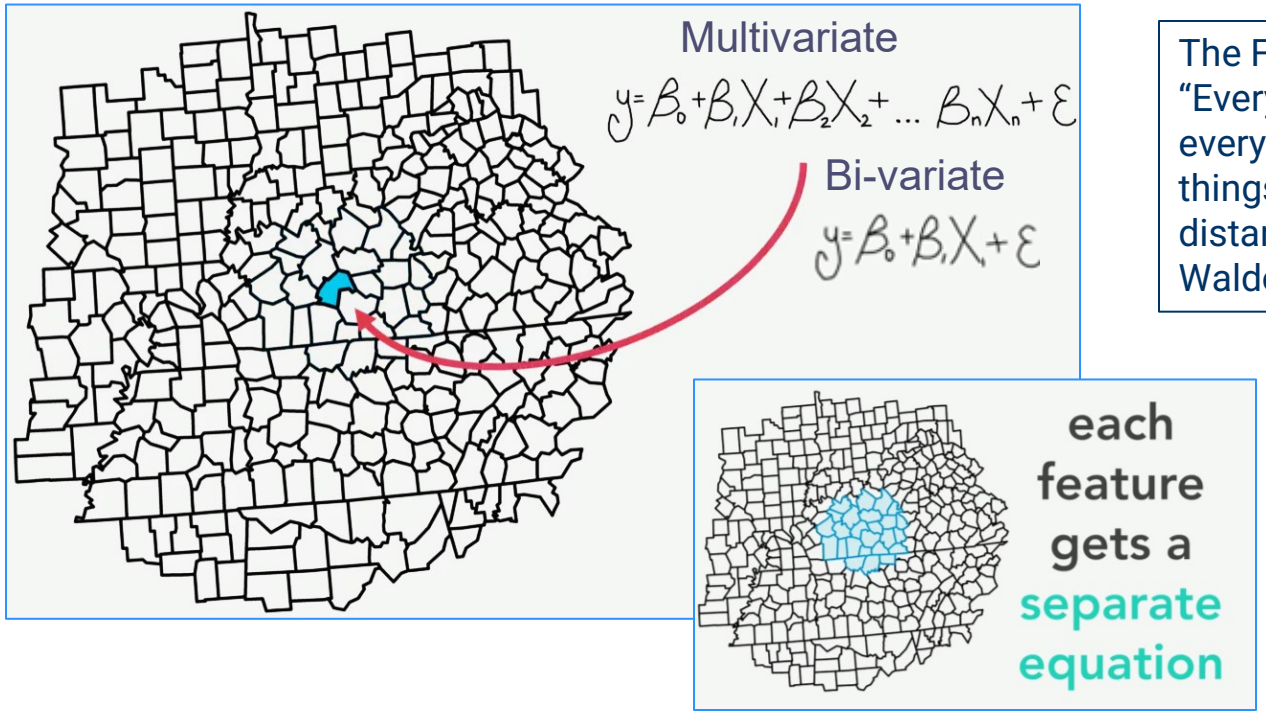
0	No education
1	Incomplete primary
2	Complete primary
3	Incomplete secondary
4	Complete secondary
5	Higher
8	Don't know

*Source: https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1538-4632.1996.tb00936.x

Geographically Weighted Regression - GWR

https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1538-4632.1996.tb00936.x

With GWR, each cluster is grouped with its immediate neighbors and is given a separate equation*

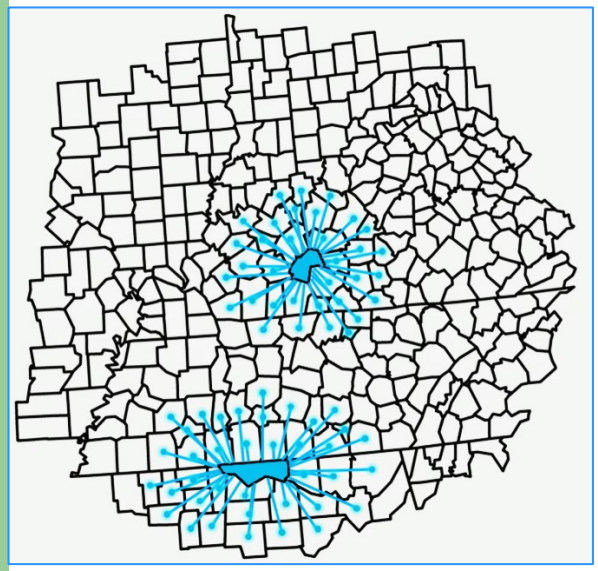


The First Law of Geography: "Everything is related to everything else, but near things are more related than distant things."
Waldo Tobler

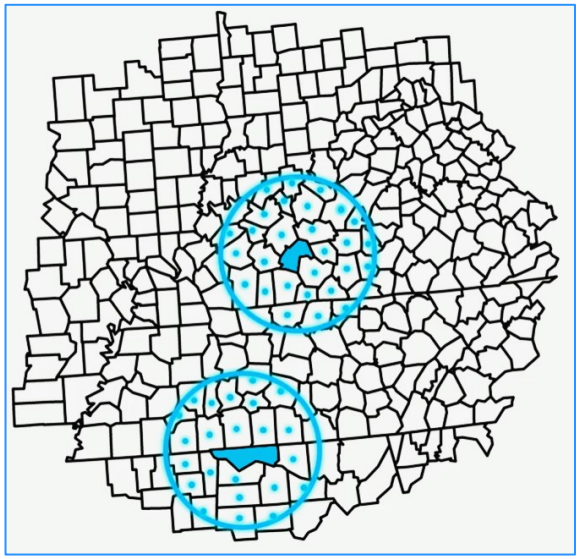
*Source: ESRI https://www.youtube.com/watch?v=ob18SuuAJGI

GWR ….contd.
Defining local

Number of neighbors



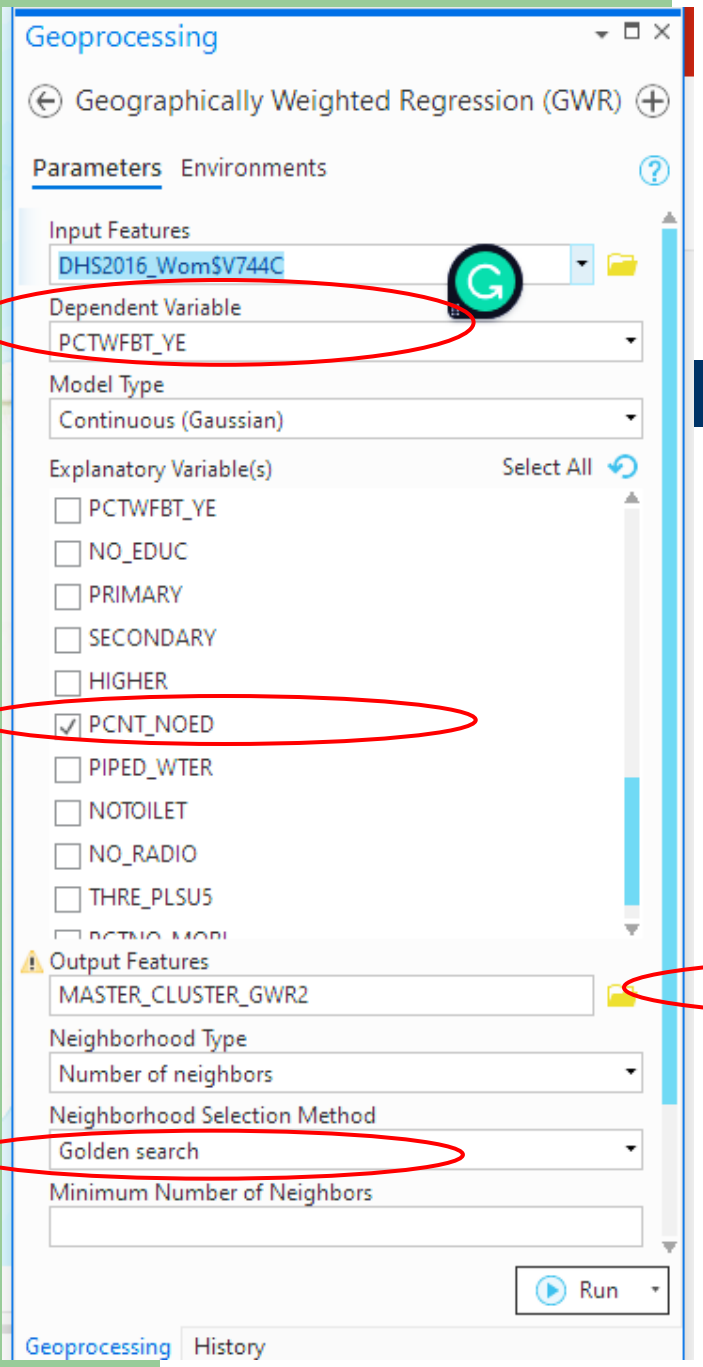
Distance band



Golden search*

*Software finds an optimum distance by increasing distances by thirds (golden search) until the best local minima are found

Source: ESRI https://www.youtube.com/watch?v=ob18SuuAJGI



GWR ….contd.

Results

v744C (y) vs. education (x)

WARNING 110306: The final model didn't have the lowest AICc encountered in the Golden Search Results.
WARNING 110259: At least one local regression had very limited variation after applying the weights. Use caution when interpreting the results.

-------- Analysis Details -------
Number of Features: 643
Dependent Variable: PCTWFBT_YE
Explanatory Variables: PCNT_NOED
Number of Neighbors: 72

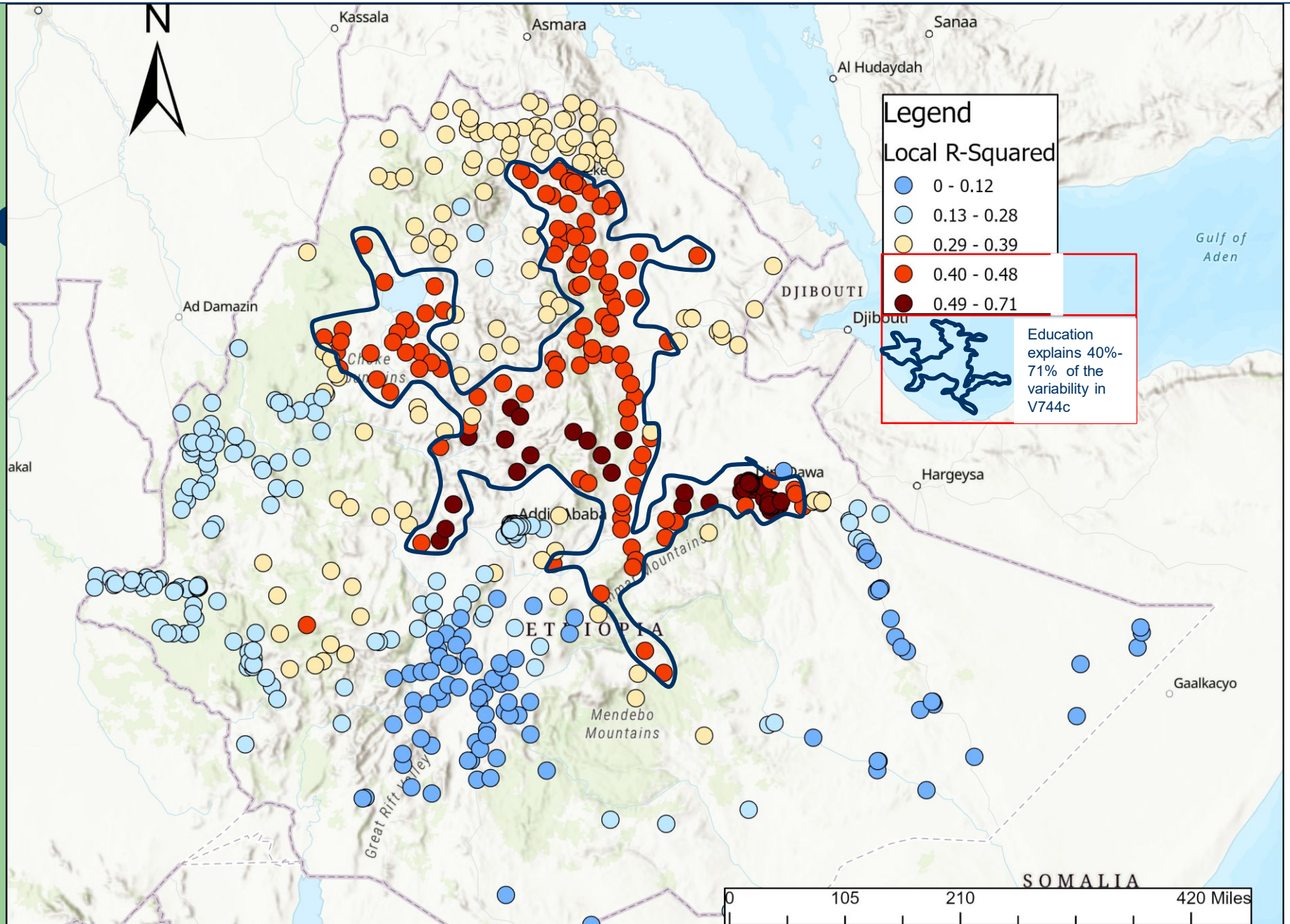
---------- Model Diagnostics ----------
R2: 0.5123
AdjR2: 0.4585
AICc: 5489.8314
Sigma-Squared: 280.1931
Sigma-Squared MLE: 252.3868
Effective Degrees of Freedom: 579.1888

Succeeded at Friday, September 23, 2022 7:26:15 AM (Elapsed Time: 6.19 seconds)

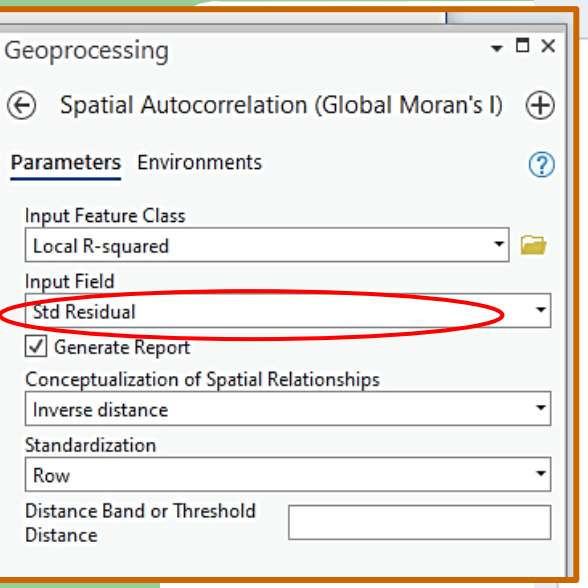
-- Golden Search Results

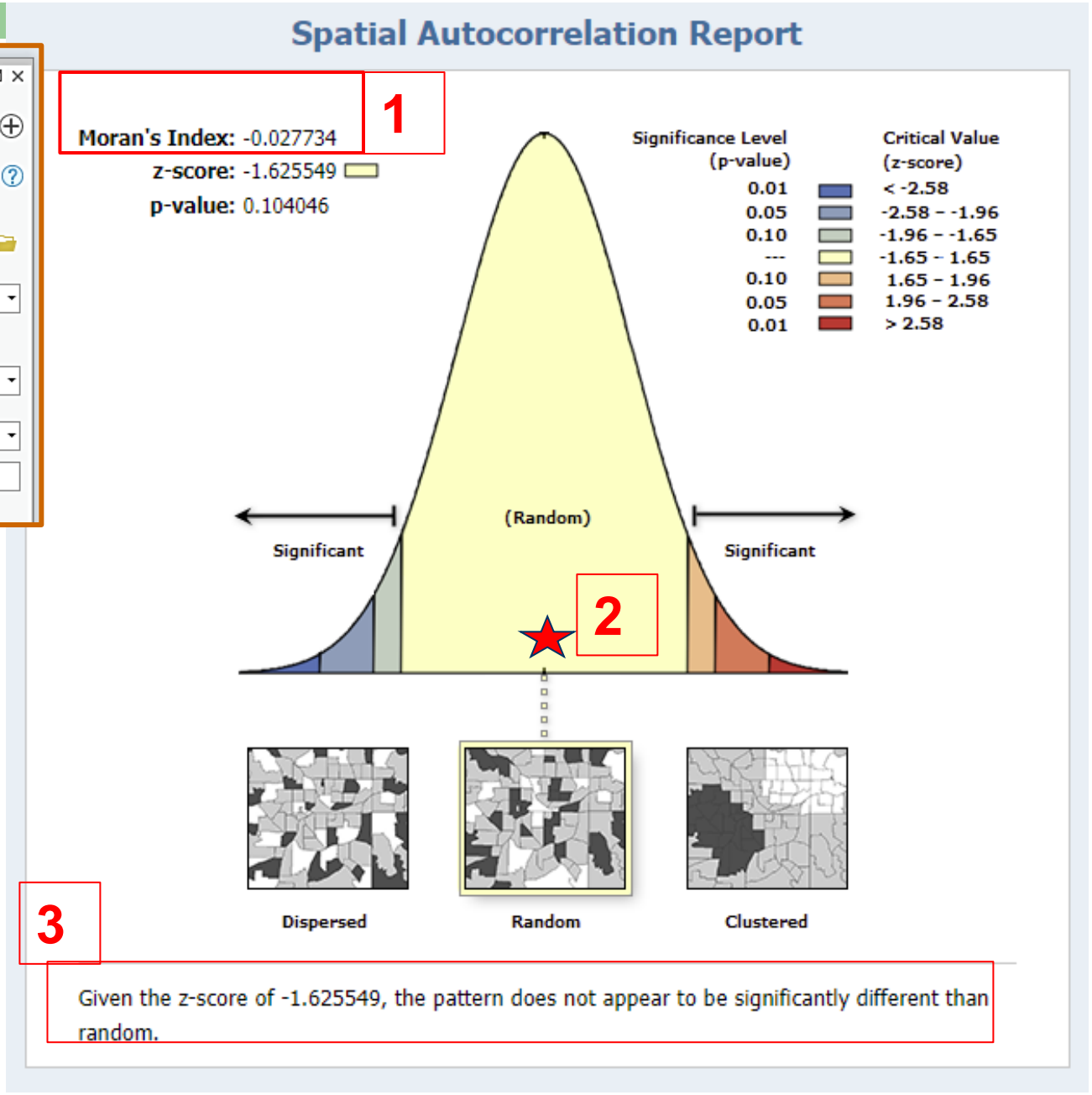
#Neighbors	AICc
30	5514.0940
643	5667.8465
264	5548.8335
409	5569.4515
175	5524.7560
119	5500.4482
85	5491.6356
64	5492.1195
98	5493.9578
77	5489.8220
72	5489.8314

Local R-Squared, Geographically Weighted Regression of Women's Response on Wife-beating (y) and education (x)



The assumption of independent residuals was not violated this time





SUMMARY

- The geographically weighted regression method (GWR) corrected for potential methodological flaws of a global least squares regression by producing local results that are unaffected by spatial autocorrelation
- Based on GWR, lack of education explained 46% (R^2 = 0.46) of the variability in the percentage of women responding “yes” to a question on wife-beating (V744c) nationally. However, this varied locally from near zero to a high of 0.71%.
- The mountainous north and rift valley regions with the highest correlations between education and wife-beating (R^2: 0.40 – 0.71) may benefit from policies that prioritize education as a tool for countering women’s acceptance of wife-beating
- Other explanatory variables, including urban-rural status, income, and DHS’ Wealth Index, were omitted from the analysis due to the risk of multicollinearity
- Policy interventions aimed at protecting women against spousal abuse in Ethiopia need to be framed with local (not national or regional) sets of preventative measures in mind

*Waldo Tobler, First law of geography, “Everything is related to everything else. But near things are more related than distant things.” https://gisgeography.com/tobler-first-law-of-geography/