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(Kulldorff M. 1998, Lawson A.B. 1993,  
.Bithell J.F. 1995)

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.Rezaeian M. 2001, English D. 1996)

(Rushton G. and Lolonis P. 1996,  
Openshaw S. et. al. 1987, Kulldorff M. and  
.Nagarwalla N. 1995)

(Moore D.A. (Disease clustering)  
.and Carpenter T.E. 1999)

.(Everitt B.S.E. 1995)

(general clustering)  
large scale )

(Snow)

(clustering

.(Snow J. 1854)

(spatial autocorrelation)

(specific clustering)

(focused)

Besag J. and Newell )

(non-focused)

.(J. 1991

.(Moore D.A. and Carpenter T.E. 1999)

Odland J. )

.(1988

.( )

.(Odland J. 1988)

.(Rosenberg S.M. et al. 1999)

(Smoothing)

Moore D.A. and Carpenter T.E. )

.(1999

.(Bailey T.C. and Gatrell A.C. 1995)

.(Olsen F.S. et al. 1996 )

( global smoothing)

(Bell (local smoothing)

.B.S and Broemeling L.D. 2000)

(Moran  $I$ )

:(Moran P.A.P. 1948)

$$I = \frac{n \sum_i \sum_j W_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i \sum_j W_{ij} \sum_i (x_i - \bar{x})^2}$$

.(Olsen F.S. et al. 1996)

(statistical model)

$$I = \frac{\sum_i \sum_j W_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i \sum_j W_{ij} \sum_i (x_i - \bar{x})^2}$$

(Coggn

.D. et al. 2003)

(Poisson model)

(Moran  $I$ )

correlation

Semenciw R.M. et al. )

( ) (2000)  
(Semenciw)

(Bailey T.C. and

.Gatrell A.C. 1995)

Semenciw ) / (Moran  $I$ )

.(R.M. et. al. 2000

Geary's  $c$

.(Lorant V. 2001)

Geary R.C. )

.(1954

$$c = \frac{(n-1) \sum_i \sum_j W_{ij} (x_i - x_j)^2}{2(\sum_i \sum_j W_{ij}) \sum_i (x_i - \bar{x})^2}$$

spatial )

(models

Mollie )

.(A. and Richardson S. 1991

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(Sainsbury P. 1955, Ashford  
 J.R. and Lawrence P.A. 1976, Congdon P. 1996, McLoone P. 1996, Whitley E. et al. 1999, Crawford M.J. and Prince M. 1999, Gunnell D. et al. 2000) .( )  
 .(Wakefield J.C. et al. 2000)

(Lester D. 1989, Wasserman  
 I.M. and Stack S. 1995, Rezaeian M. et al. 2001, Rezaeian M. et al. 2004)  
 (Lester)

)  
 / (Moran  $I$  .(Walter S.D. 1992)  
 (binary)

.(Lester D. 1989)

(Wasserman) (Stack)  $W_{ij}$   
 ( Moran  $I$  .(Semenciw R.M. et al. 2000)

/

/ (Geary's  $c$ ) (Moran  $I$ )  
 (Walter S.D. 1992)

.(Wasserman I.M. and Stack S. 1995)

(Local Authorities)

( Geary's  $c$  ) / ( Moran  $I$  )  
 / (Moran  $I$ )  
 (STATA) .1977)

.(STATA Corp. 1999)

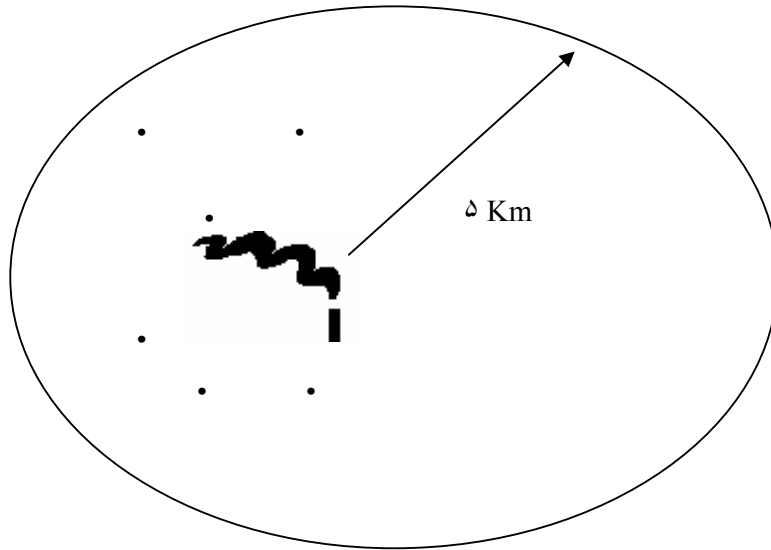
(Rezaeian M. et al. 2001,  
 Rezaeian M. .et al. 2004)  
 (Semenciw)  
 /  
 Semenciw R.M. et al. )  
 (Lester) (2000)

Rezaeian M. et al. )

(2001

(Upton G.

and Fingleton B. 1985)



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## LARGE SCALE CLUSTERING AND ITS APPLICTION TO THE HEALTH AND EPIDEMIOLOGICAL STUDIES

**Rezaeian M., PhD\*<sup>1</sup>**

*Spatial autocorrelation statistics* provide summary information about the spatial arrangement of data in a map. In fact, these statistics compare neighboring area values in order to assess the level of large scale clustering. Whenever a large number of neighboring areas have either relatively large or relatively small values, large scale clustering may be detected. Detecting such clustering is a very important issue because failure to take into account the spatial dependency of the data may bias the association between mortality and morbidity rates and their risk factors and erroneously suggest a direct relationship between them. The present article, therefore, explains the two most commonly used spatial autocorrelation statistics for continuous data including morbidity and mortality rates.

**Key Words:** *Spatial Autocorrelation, Medical Cartography and Geography*

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