Determining Spatial Contact Networks for Pathogen Transmission

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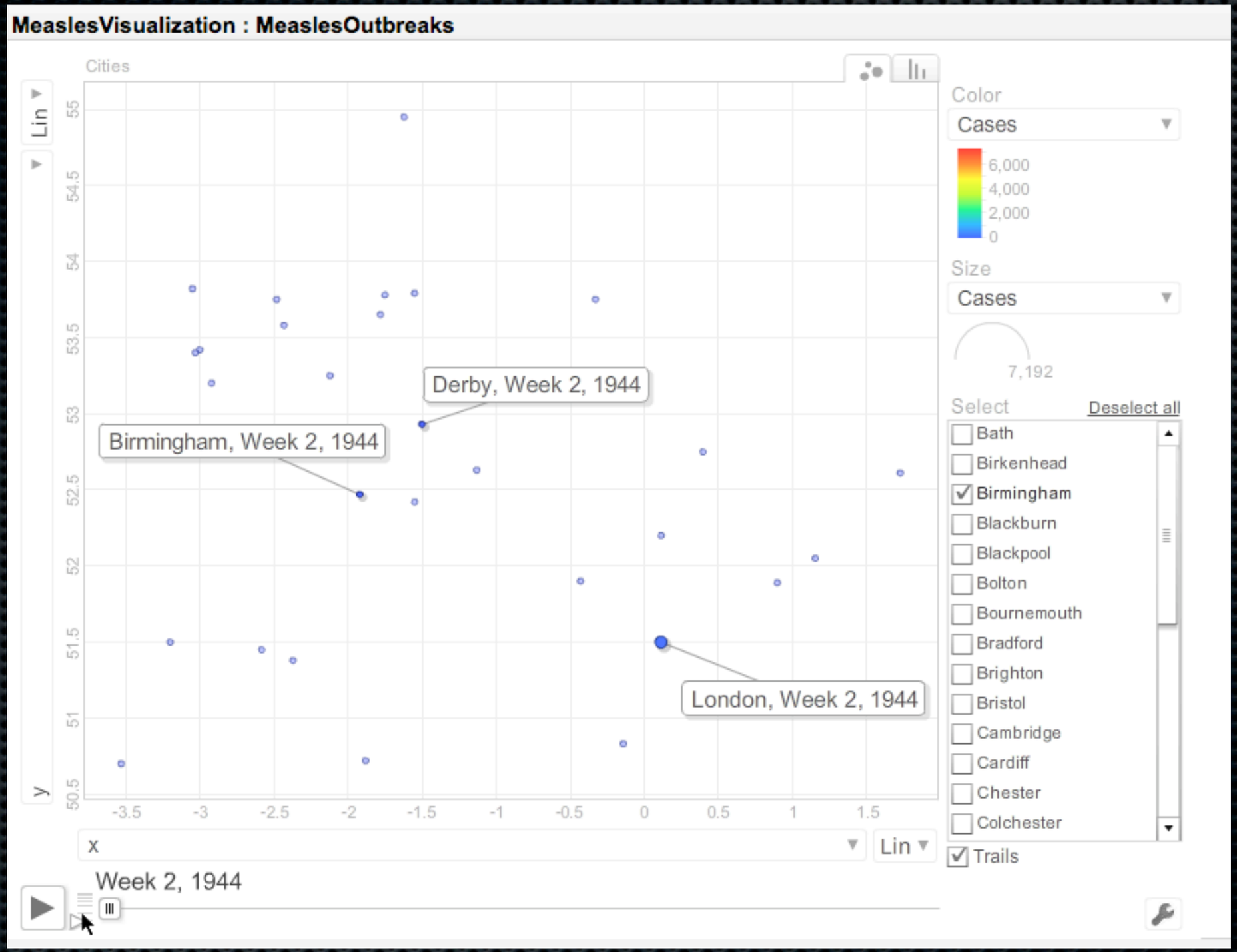
"Understanding the spatial contact network for disease transmission is a holy grail because it will allow prediction about the spread of emerging pathogens and ultimately guide public health and veterinary intervention programs." (Grenfell et. al. 2002)



http://spreadsheets.google.com/ccc?key=0Anx0qRmatj9NcnptdkhCYnRQRVpfbFBfc0FDWm10c1E&hl=en

See sheet entitled “MeaslesOutbreaks”

Calculating the Directed Transfer Function

1. Fit multivariate autoregressive model to time series

$$X(t) = \sum_{i=1}^{p} A(i)X(t-i) + E(t)$$

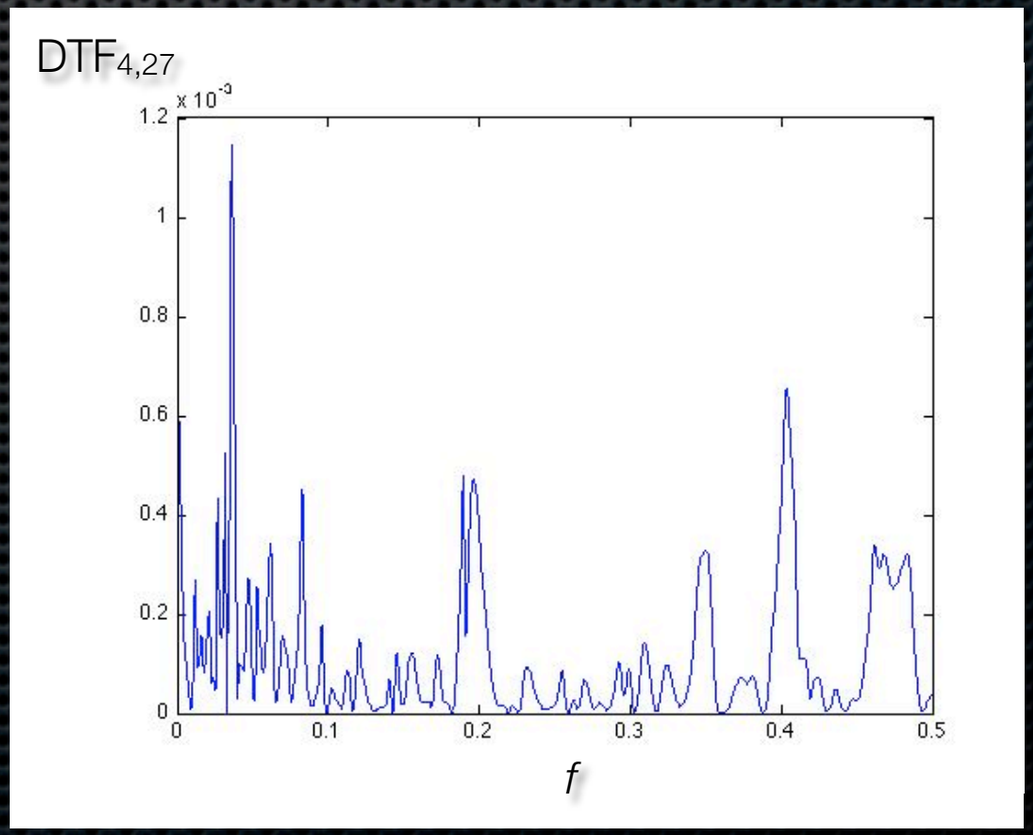
2. Fourier Transform the regression coefficients

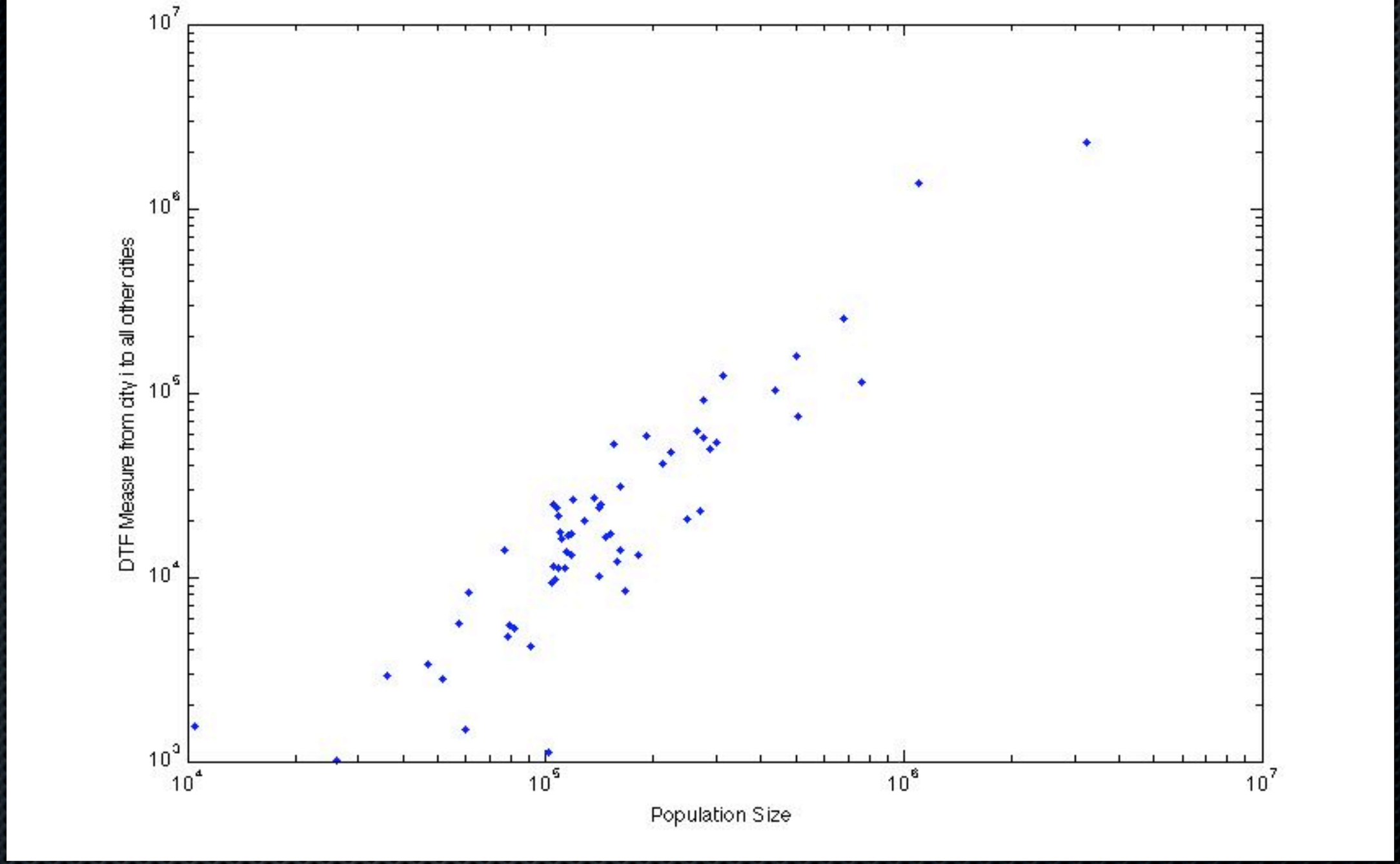
3. Take the inverse to get DTF

DTF_{ij} =>

Causal influence of *j* on *i*

Randomize time series to determine significance





Influence of a city on disease spread scales with its population size

Spatial contact network for England and Wales