Mapping out Deaf spaces in Montreal - GIS applications to Deaf geography

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BACKGROUND

DEAF GEOGRAPHY

- Contributions of Cultural Geography to Deaf studies (Comat, 2010; Mathews, 2007; Valentine and Skelton, 2003;…)

- Consensus among authors regarding the importance of Deaf spaces and Deaf places for Deaf people's identity building (Eickman, 2006; Gulliver, 2008; Lachance, 2007;…)

- **Deaf space**: A constructed space and central locus of language and knowledge transmission through generations. Among these grounded spaces, there are Deaf school and Deaf clubs (Lachance, 2007; Comat, 2010; Gulliver, 2008;…)

BACKGROUND

GROUNDED DEAF SPACES : A REVIEW OF THE LITERATURE

- Exploration of the origins and the spread of Deaf cultural identity and Deafhood on national and continental scales by mapping out Deaf pillars with ArcGis (Eickman, 2006)

- Deaf spaces as social and identity catalyzer for the Deaf (Comat, 2010)

- Deaf schools as anchor points of the deaf communities' spatial distribution (Comat, 2010)

OUR PRESENTATION FOCUSES ON GROUNDED DEAF SPACES ONLY

RESEARCH OBJECTIVES AND QUESTIONS

OBJECTIVES FOR THIS FIRST STEP OF MY RESEARCH

- Objectively identify and qualify Deaf spaces within the Montreal Island territory
- Compare the spatial distribution of two types of services provided in sign language
  - Deaf spaces and non Deaf spaces

RESEARCH QUESTIONS

- Is there a spatial concentration of Deaf spaces and non Deaf spaces?
- If so, are their location any different? Or are they showing specific spatial distribution patterns?

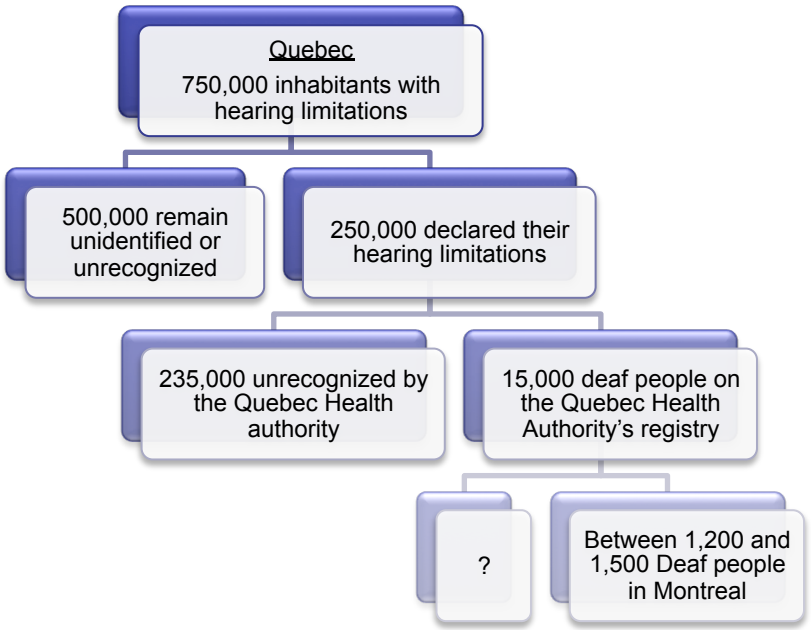
2. DATA AND METHODS

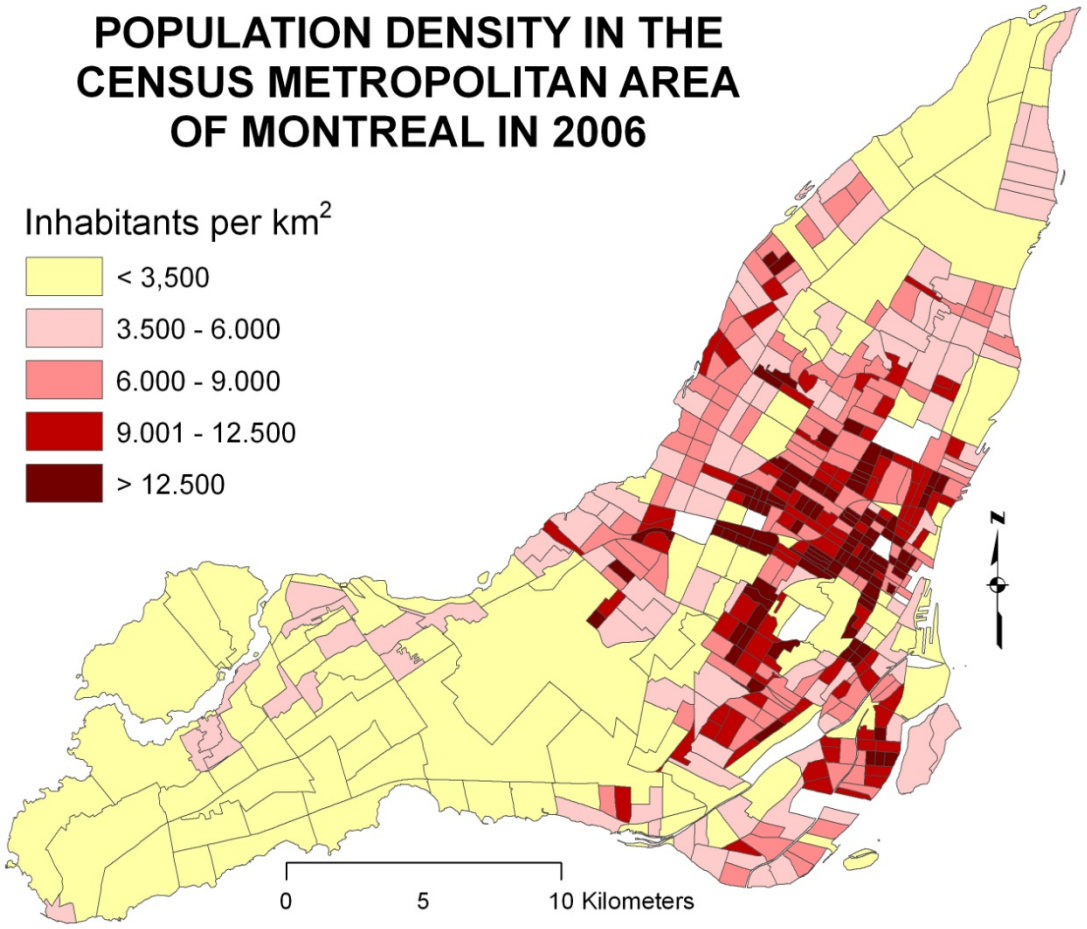
2.1. STUDY AREA

2.1.1 DEMOGRAPHY

- 500 KM^2
- **1.85 MILLION INHABITANTS**
- 3,700 INHABITANTS PER KM^2

2.1.2 DEAF DEMOGRAPHY





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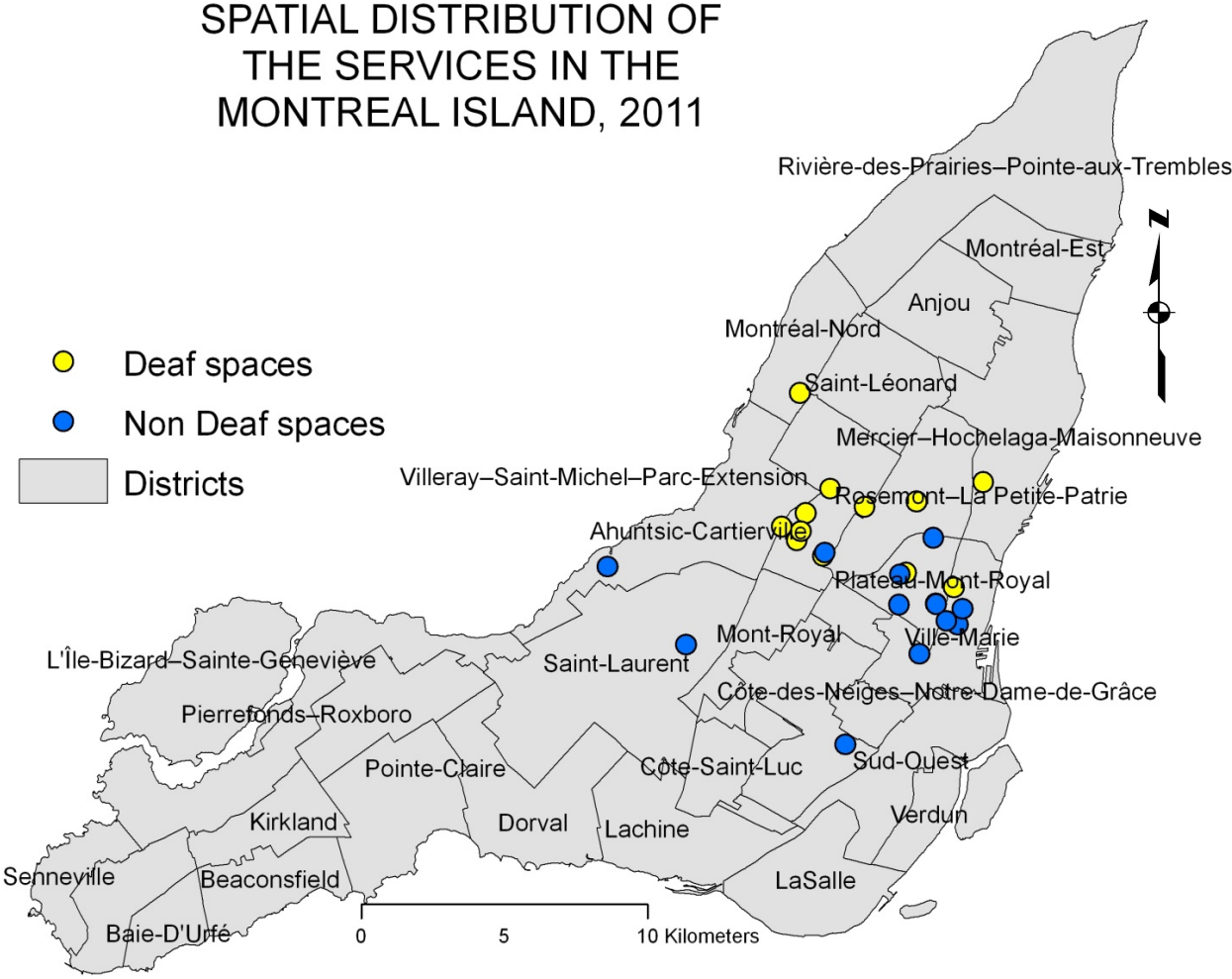
Source: Statistic Canada, 2006.

2. DATA AND METHODS

2.2. GIS DATASET

TYPES OF SERVICES	N
LEISURE	5
EDUCATION	6
MISCELLANEOUS	6
ORGANIZATION/ASSOCIATION	9
SERVICES	21
TYPES OF SPACES	
DEAF SPACES	29
NON DEAF SPACES	18
TOTAL	**47**

SPATIAL DISTRIBUTION OF THE SERVICES IN THE MONTREAL ISLAND, 2011



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2. DATA AND METHODS

2.2. METHOD: POINT PATTERN ANALYSIS

2.2.1 STANDARD DEVIATIONAL ELLIPSE

2.2.2 WONG'S INDEX

2.2.3 NEAREST NEIGHBOUR INDEX

2.2.4 KERNEL DENSITY MAPPING

2.2.1 Standard distance and directional distribution (Standard deviational ellipse)

Mean Centre

$$\left(\bar{x}_{mc}, \bar{y}_{mc}\right) = \left(\frac{\sum_{i=1}^{n} x_i}{n}, \frac{\sum_{i=1}^{n} y_i}{n}\right)$$

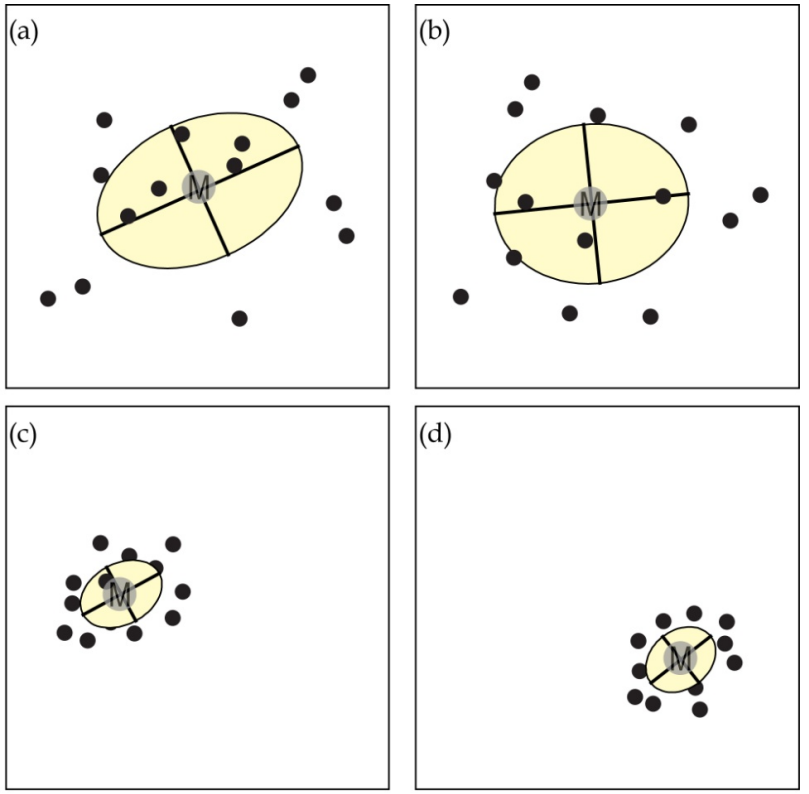
Standard Distance

$$SD = \sqrt{\frac{\sum_{i=1}^{n}\left(x_i - \bar{x}_{mc}\right)^2 + \sum_{i=1}^{n}\left(y_i - \bar{y}_{mc}\right)^2}{n}}$$

Where,

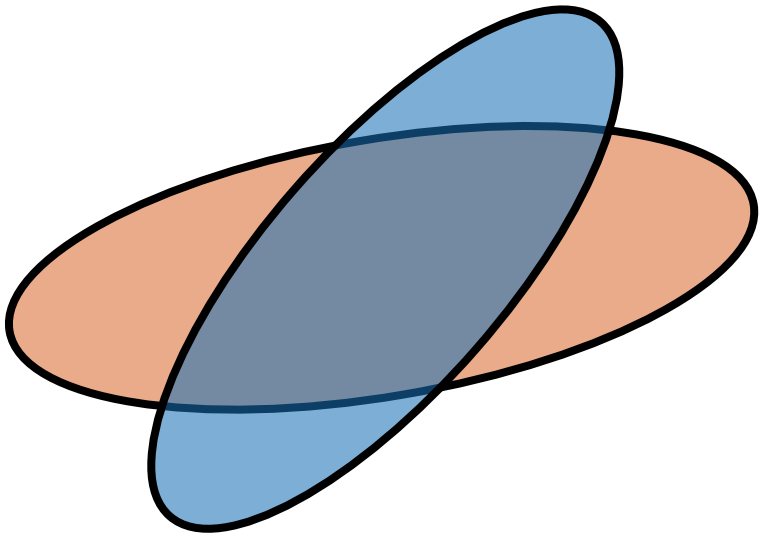
n = number of points;

x_i and y_i = X and Y coordinates of point i.



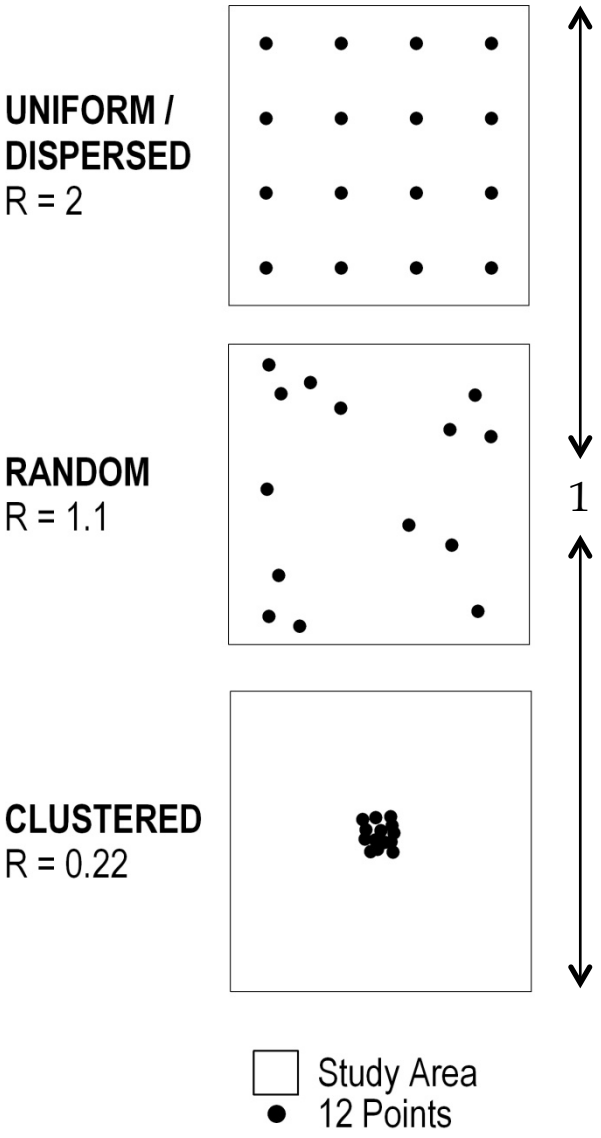
2.2.2 WONG'S INDEX

$$S = 1 - \frac{E_i \cap E_j}{E_i \cup E_j}$$



E_i : Standard distance ellipse for the group of points *i*

E_j : Standard distance ellipse for the groupe of points *j*



2.2.3 Point Pattern Analysis: Nearest Neighbour Index

Average Nearest Neighbour Distance:

$$r_{obs} = \frac{\sum_{i=1}^{n} d_i}{n}$$

Excepted Average Nearest Neighbour Distance:

$$r_{exp} = \frac{1}{2\sqrt{n/A}}$$

Nearest neighour index:

$$R = \frac{r_{obs}}{r_{exp}}$$

Where,

n = number of points;

d_i = nearest neighbour distance for the point i.

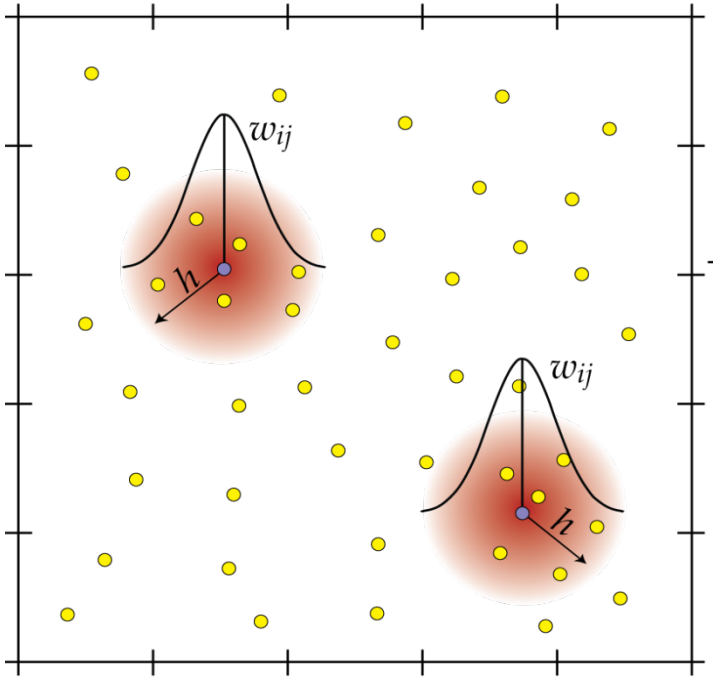
A = Surface of the study area (Montreal city)

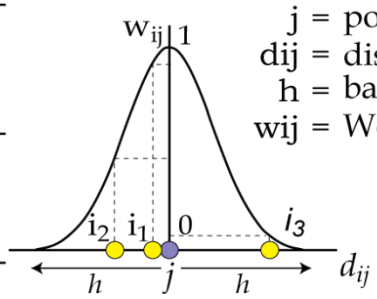
2.2.4 KERNEL DENSITY MAPPING

KERNEL DENSITY CALCULATES THE DENSITY OF POINTS PER KM^2 IN A NEIGHBORHOOD AROUND THOSE FEATURE (ONE OR TWO KM FOR EXAMPLE)

$$\hat{f}(x,y) = \frac{1}{nh} \sum_{i=1}^{n} K(d_{ij}/h) \text{ avec :}$$

f(x,y) = Number of points per Km^2 within a radius of h meters at (x,y) using a Kernel function





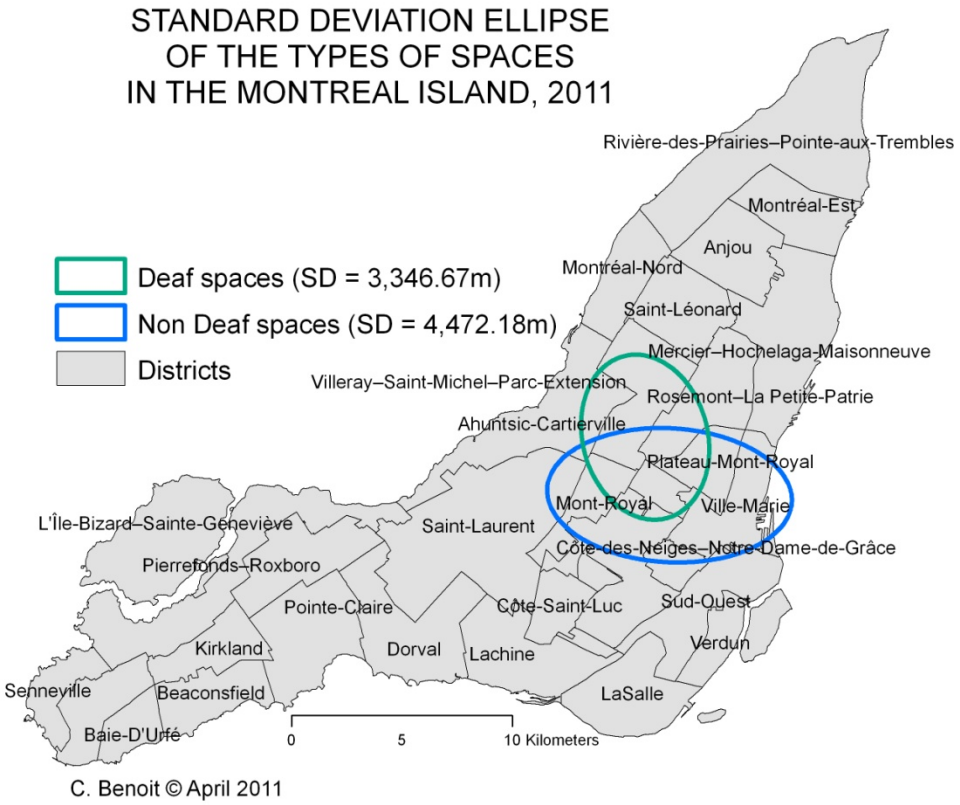
j = point i
dij = distance between i and j
h = bandwith (radius)
wij = Weight

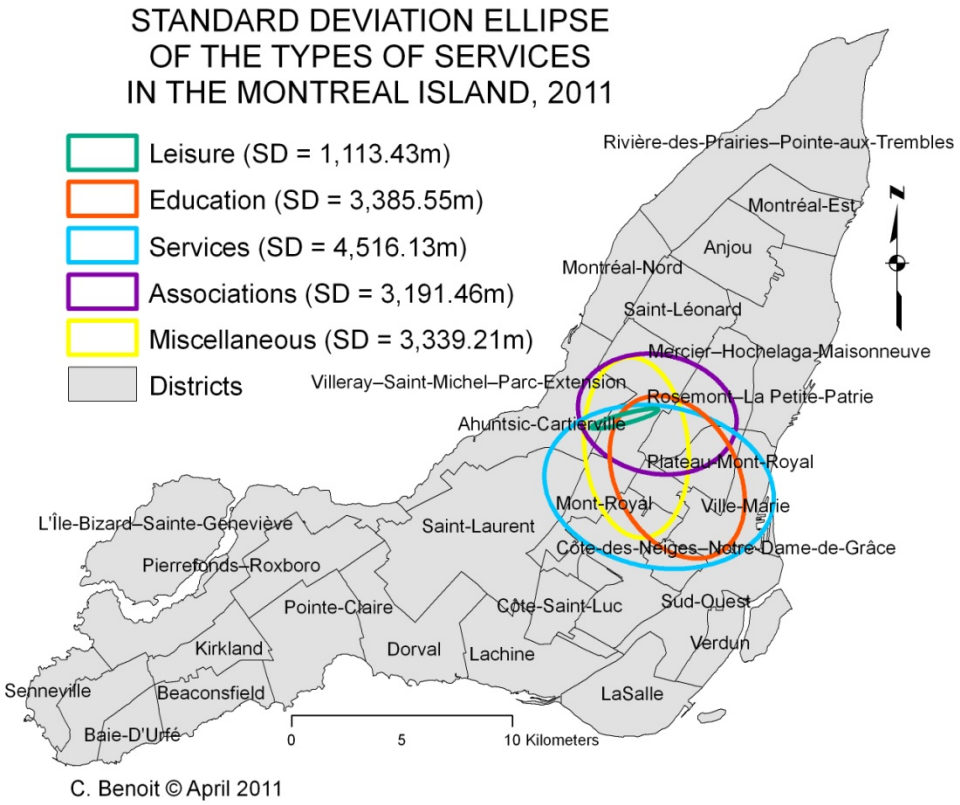
For example, with a bandwith of 1,000 meters, the weights for j point are reported in the table below.

Point	dij (m.)	wij
i1	133	0,921
i2	408	0,454
i3	718	0,074

Adapted of Philibert and Apparicio (2007)

3. RESULTS : STANDARD DEVIATIONAL ELLIPSE





3. RESULTS : WONG'S INDEX

Juxtaposition

No juxtaposition

DIFFERENT TYPES OF SERVICES

SERVICES	ASSOCIATION	EDUCATION	LEISURE	SERVICES
EDUCATION	0.717	-		
LEISURE	0.965	0.980	-	
SERVICES	0.788	0.464	0.982	-
MISCELLANEOUS	0.554	0.622	0.965	0.652

TYPES OF SPACES

	DEAF SPACES
NON DEAF SPACES	0.734

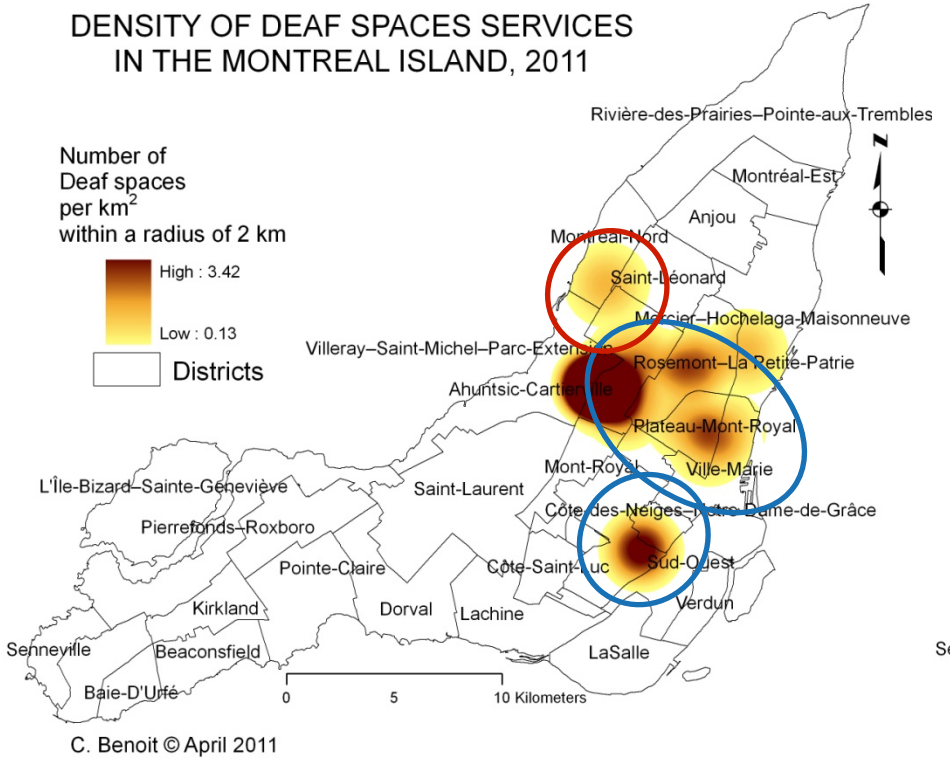
3. RESULTS: NEAREST NEIGHBOUR INDEX

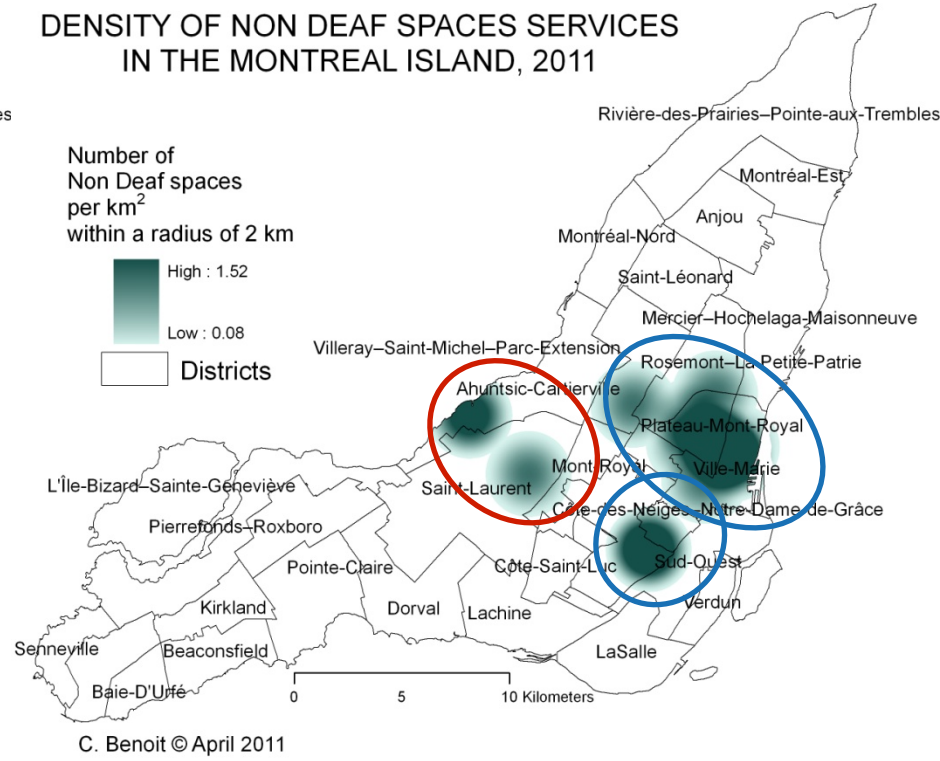
AVERAGE NEIGHBOUR INDEX SUMMARY

	ALL	DEAF SPACES	NON DEAF SPACES
OBSERVED MEAN DISTANCE (M)	413	435	718
EXPECTED MEAN DISTANCE (M)	1632	2077	2637
NEAREST NEIGHBOUR RATIO	0.25	0.21	0.27
Z SCORE	-9.80	-8.14	-5.91
P-VALUE	0.000	0.000	0.000

3. RESULTS: KERNEL DENSITY MAPPING

SIMILARITY DISSIMILARITY





4. Concluding remarks

Results summary

- Broader distribution of general services in the Montreal Island
- An high concentration of Deaf spaces, especially leisure in Villeray
- An high concentration of non Deaf spaces in Plateau Mont-Royal
- Similar spatial distribution patterns but different concentrations around former institutions

Limits

- Small amount of data
- Absence of private services provided in sign language in the dataset
- Gaps in the services' history to enable us to identify whether it's a Deaf space or not

Suggestions for further researches

- Combination of qualitative and quantitative approaches to explore different types of accessibility (spatial, linguistic, acceptability, availability, …)
- Is the spatial distribution of the Deaf population influenced by the location of Deaf spaces or other services?
- Is there any spatial mismatch between these spaces and the Deaf population?