GIS ANALYSIS OF ENVIRONMENTAL, SOCIO-DEMOGRAPHICAL & BEHAVIOURAL RISK

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INTRODUCTION

• The idea that geography has an impact on health has been largely overlooked in the past.

• One of the earliest records of the connection between geography and health was made by Dr. John Snow during the 1854 outbreak of Cholera in London, England.
• Data that can be mapped through GIS and collected in different databases can be layered to explore connections between different geographic attributes and population characteristics.

• This provides the opportunity to analyze health issues in a different way – how geographic attributes contribute to the impact of an individualized chronic disease care plan.
PURPOSE

- Understand how chronic disease risk factors in different areas of the Algoma Region may affect nurse practitioner patients based on their location of residence.
RESEARCH QUESTION

• How can patient health information, layered with behavioral, environmental & sociodemographic information, facilitate individualized health promotion & disease prevention care plans for patients suffering from, or at risk of, developing chronic disease?
PARTICIPANT RECRUITMENT

- Comprehensive health & wellness survey mailed to 1250 patients who had had an appointment at the Clinic between 2012-2014 or recruited in the Clinic waiting room.

- Patients who didn’t consent after the first mailing were mailed another invitation.

- Patients who had not yet participated were followed-up with a phone call.

- 1100 follow-up phone calls made & a second mailing was completed.

- This increased the response rate by 100%.
DATA COLLECTION
DEC. 2013-FEB. 2014

• Geographic data extracted from Environment Canada, Statistics Canada & Manifold Data Mining Inc.

• Patient data extracted from surveys & Clinic patient records in Nightingale

• Patients asked to identify all past & present places of residence – This provided a demographic history of potential areas of risk

• Longitude & latitude of patients’ home addresses obtained from Google Maps & entered into GIS
HEALTH & WELLNESS SURVEY

Addressed the following variables:
• Demographics
• Overall health condition
• Socioeconomic characteristics
• Health status
• Health insurance coverage
• Beliefs about health conditions
• Social support
• Attitudes towards medications
Data extracted from the patient’s electronic medical record included:

- Smoking
- Alcohol consumption
- Medical conditions
- Drug use
- Height, weight, blood pressure
- Cardiovascular disease risk
- BMI
ANALYSIS

• GIS analysis was applied to the following health risk factors:

A) Behavioural (tobacco & alcohol use, fruit/vegetable consumption, inactivity, obesity)

B) Socio-demographical (income, education level, employment status)

C) Environmental (air & water quality)
RESULTS

- n=220 adult and n=15 child surveys were completed and returned with signed consent

- Participants provided a significant response to surveys & allowed access to their personal information
MAP EXAMPLES:
Walkability Scores are based on the walking distance an address is from different amenities. These amenities are from 7 categories: Dining & Drinking, Groceries, Shopping, Errands, Parks, Schools, and Culture & Entertainment. Maximum points for a 5 minute walk to an amenity and no points for an over 30 minute walk. The points are added to give an addresses a walkability score. (www.walkscore.com)

Walkability Score
- 0 - 24 (Car-Dependent)
- 25 - 49 (Car-Dependent)
- 50 - 69 (Somewhat Walkable)
- 70 - 89 (Very Walkable)
- 90 - 100 (Walker’s Paradise)

The areas shown are based on data from a Clinical Study done by the Algoma Nurse Practitioner Led Clinic and the Health Informatics Institute at Algoma University.
Heart Problem Cases in Sault Ste. Marie

The data stating the number of Heart Problem cases in Sault Ste. Marie are based on a Clinical Study done by the Algoma Nurse Practitioner Led Clinic and the Health Informatics Institute at Algoma University.
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Anxiety and Depression Cases in Sault Ste. Marie

The data stating the number of Anxiety and Depression cases in Sault Ste. Marie are based on a Clinical Study done by the Algoma Nurse Practitioner Led Clinic and the Health Informatics Institute at Algoma University.
The data stating the number of High Cholesterol and Hypertension cases in Sault Ste. Marie are based on a Clinical Study done by the Algoma Nurse Practitioner Led Clinic and the Health Informatics Institute at Algoma University.
Discussion

• Through analysis of spatial data, the Algoma Nurse Practitioner Led Clinic was provided with a picture of their patient population.

• Application of GIS analyses to this data provided an opportunity for increased efficiency of healthcare and individualization of patient care.
CONCLUSIONS

• Information from this study was used to guide the Algoma Nurse Practitioner Led Clinic towards more personalized patient care

• This study shows that a significant number of patients are willing to disclose sensitive information in exchange for more personalized care
FUTURE DIRECTIONS

• Findings will be used at the individual level as well as in health promotion and disease prevention activities for public health

• Future studies should attempt to replicate successful patient recruitment
REFERENCES


QUESTIONS?