Impact of Income on School Readiness

Includes:
Research Paper

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ABSTACT -- #661 Analyzing Demographics in Comparison with Early Childhood Development

The report "analyzing demographics in comparison with early childhood development" main focus is to see what correlations exist between neighbourhood income levels and school readiness as measured by EDI (early development instrument).

Through a complicated matching of postal codes, thereby producing clusters or areas of populations, with the income levels of those areas as per the 2001 census the researchers were able to assess income levels with EDI levels for 25 areas in the city of Peterborough and the surrounding area of Peterborough County. The methodology used for this were 3 GIS programs, those being: ArcGIS 9.0, ArcGIS8.3 and ArcView3.2.

The results showed no significant variations, either positive or negative, between income levels and EDI results. This was a surprise to the researchers as all other studies and reports have clearly shown a connection between lower levels of income and lower EDI levels. The researchers concluded that there were too many limitations in the data that was available to draw real statistical connections. Further they recommended that all new users to early year's programs answer basic demographic questions in order that statistical analysis may be done efficiently and correctly in the future.

Key Words

Learning, Education, Peterborough, Family, Resource, Early Years, Childhood, Development, EDI, Income

Analyzing Demographics in Comparison with Early Childhood Development

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Executive Summary

This project was completed in cooperation with the Peterborough Family Resource Centre. The purpose of this project was to look to see if there is a correlation between the Early Development Instrument (EDI) and low-income families in the Peterborough area. The location for this study was the City of Peterborough and area. The EDI results that were contributed by the Peterborough Family Resource Centre contained five domains along with the corresponding postal code. With the help of a geographic information system (GIS), a postal code shape file was created to enable the mapping of the EDI results. Census tracts and vital demographic data such as income, education, and number of families were used. Once all the shape files were created in the GIS, the attributes were then exported for statistical analysis. Correlations were tested between the number of families living under the low income cut off and above. The results showed that there were no statistically significant correlations between any of the five domains in the EDI. The results can be considered a good indicator.

Acknowledgements

This project would not have been possible without the help from my two supervisors, Professor Raul Ponce and Professor Steven Tufts. I would also like to thank the Peterborough Family Resource Centre and especially Emmeline Ruttle. With out the support and the knowledge from Emmeline this thesis would never of gotten off the ground. A special thanks goes out to my closest peers, Brian Kelsey, Colin Squirrell and Cory Molloy. These people have offered me their support and knowledge at times of need. With out that support I would have been going in circles. I would also like to thank my parents for believing in me and supporting me throughout this entire paper. I would like to thank the Geography Department as a whole.

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Definition of Terms

GIS – Geographic Information System

EDI – Early Development Instrument

Polygon – An area bounded by a closed loop of straight-line arc segments

Introduction

Early childhood is the most important part of any child's life. This is where their road map to life begins as we know it. Having an unyielding understanding of the development in children is the best groundwork for providing, ultimately the best early childhood program possible. The Peterborough Family Resource Centre is an organization where parents can take advantage of childhood programs. The Peterborough Family Resource Centre originally started out as a parent study group in the early 1970's and how has grown to be designated as an Ontario Early Years Centre.

The Peterborough Family Resource Centre now offers a number of after school programs and parental support programs. This all helps and affects the development of a child Attempting to discover what kind of factors can attribute to child development can be a very daunting task. Just as Thompson (2000) states, heredity guides every aspect of social, cognitive, physical, personality, and emotional development. There are also a number of social and economical factors that can contribute both positively and negatively to early childhood development.

Definition of Problem

The aim of this project is to determine if there is a correlation between the EDI results. This project will contribute to the greater body of research by the Peterborough Family Resource Centre. Through the power of a geographic information system (GIS), postal codes and EDI results will be mapped. This project was directed towards the Peterborough City and surrounding area.

Background Information / Research

Understanding the development of children is imperative to providing adequate early childhood education. The development of early childhood education programs can be a complex task due to major external forces such as family income and education level, just to name a couple. Throughout the available literature regarding childhood development, income and access to public programs seem to be recurring themes.

There are a variety of factors that influence child development. Heredity guides every aspect of physical, cognitive, social, emotional, and personality development in all children. Family members, peer groups, the school environment, and the community influence how children think, socialize, and become self-aware (Thompson, 2005). Economic and political institutions, the media, and cultural values all guide how children live their lives. Other factors such as critical life events, and family crisis's, can alter the development of the child. Factors that influence child development come from both the outside and within the person (Thompson, 2005).

In a study completed in 2002 by Hertzman, et al. (2002) in the City of Vancouver it was found that children who grow up in safe and cohesive neighborhoods do better on average than those from dangerous and fragmented neighbourhoods. It was also noted that children who grow up in a mixed income neighborhood tend to manage better than those who grow up in uniformly low income neighbourhoods (Hertzman, et al, 2002). On the other hand in a study by McAllister in 2005 found that children living in poverty, in neighborhoods where most families were not poor, had higher developmental levels than same-aged poor children living in areas with a high concentration of poverty (McAllister, 2005).

In Doherty's (1997) report, it is stated that income is directly linked to meeting children's needs. These needs can be physical, food, shelter, and developmental needs such as books. Low-income conditions make it difficult for parents provide these basic necessities for childhood development. It was found that children in low-income families were at risk of delayed language development, poor school performance (low EDI scores) and leaving school before completing high school (Doherty, 1997).

Poverty in Canada and the United States is surprisingly high in today's youth. In Canada, 19.8% of children live in impoverished environments. In the United States, there is a lower rate of 18.2% of children who live in impoverished environments (Fiorentino and Ninahowe, 2004). Just as Duncan, et al (1994) state that poverty can be a

multi-risk environment where children may be at risk for health problems, social problems, and academic troubles.

It was also found that children with academic difficulties given those children in low income families may start school unprepared for the classroom environment. This puts the child in the position in which they are unable to catch up to the grade level expectations. This could lead to low academic scores (Garmezy, 1991). This makes school readiness is an important issue because, the multiple risks evident in the disadvantaged child's environment may contribute to future school difficulties.

The economic growth since 1975 in Ontario, and as well as for Canada, has not sustained an ever-raising standard of living compared to that of 1945 to 1975 (McCain and Mustard, 1999). It has been found that since the 1970s transfer payments (such as, social assistance, employment insurance) have replaced much of the earnings as the main source of income for low-income families with children (McCain and Mustard, 1999).

As there are programs in place to help families with low-income, Helm (1997) suggests that not all early childhood education programs are equally effective in promoting the learning and development of young children. She suggests that the overall effectiveness of an early childhood program is dependent on many different factors. For example, the quality of staff or volunteers, the type of environment, parental involvement and location of the services (Helm, 1997).

The decisions about these factors above are often made quite early within the planning and organizing process. These decisions have crucial consequence because they will have an effect on the child, the family, the classroom, the school, and the community (Helm, 1997). Research has also shown that a poor quality child care environment, that is, one lacking in verbal or other stimulation, hinders the development of middle-class children even though their family environment is not lacking in stimulation (Doherty, 2000).

With regards to the spatial location of these services, Massam (1975) states that when selecting a site for public services, there should be a great attempt to minimize the cost and the effort with regards to commuting to and from public service programs (Massam, 1975). Having access to quality childcare and developmental environments, programs, and services; both those that include parents and those that do not, can and do make an important difference for the child's development (Hertzman, et al, 2002).

It is well known that a higher proportion of children in low-income families do not do well academically and socially, compared to that of children in families with higher incomes. However, there are more children that do well, despite the unfavorable family economic circumstances, than those who do not (McCain and Mustard, 1999). Research shows that children considered being in poverty who start school are missing many of the basic requirements for school success (Pigott and Israel, 2005).

Studies of children in the United Kingdom and the United States have indicated that early school success is linked to positive school trajectories, both academic and social (Dockett and Perry, 2004). It has been found by researchers that early childhood experiences will have considerable long term effects (McKellar, 1997).

The readiness to learn at school is defined as a child's ability to meet the task demands of school, such as being cooperative, sitting quietly and listening to the teacher, and to benefit from the educational activities that are offered by the school (Janus, 2001). The readiness to learn is measured by many different aspects of the child's development at age 5. Doherty's (1997) research shows that the following five components are all important:

- physical well-being and appropriate motor development;
- emotional health and a positive approach to new experiences;
- age-appropriate social knowledge and competence;
- age-appropriate language skills; and
- age-appropriate general knowledge and cognitive skills.

As McKellar (1997) suggests, the lack of readiness to learn can harm children's chances of fulfilling their potential. This will also add additional costs to society through increased government social expenditures; decreased government revenue; reduced human resource potential in an increasingly knowledge-based global economy; and, reduced social stability, functioning and cohesion (McKellar, 1997).

As McKellar (1997) states, "Preliminary analysis of data from the National Longitudinal Survey on Children and Youth indicates that up to 15 % of Canadian children may not be school-ready. Certain children - particularly those from low income backgrounds - are particularly vulnerable". This means that, preparing children to become "learning ready" become a mutual effort for the community and local government services.

The Early Development Instrument (EDI) was developed by Dr. Dan Offord and Magdelena Janus of McMaster University and is a checklist that teachers complete after having several months of classroom/school interactions with children in their class (Hertzman, et al, 2002). The EDI is a teacher completed checklist that consists of 112 core questions addressing five specific areas: physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge (Offord Centre, 2004). These five specific areas that are outlined by the Offord Centre can be seen below:

1. Physical health and well-being

- gross and fine motor skills,
- holding a pencil,
- running on the playground,
- motor coordination
- adequate energy levels for classroom activities
- independence in looking after own needs

- daily living skills

2. Social knowledge and competence

- curiosity about the world,
- eagerness to try new experiences,
- knowledge of standards of acceptable behaviour in a public place,
- ability to control own behaviour,
- appropriate respect for adult authority,
- cooperation with others,
- following rules
- ability to play and work with other children

3. Emotional health/maturity

- ability to reflect before acting,
- a balance between too fearful and too impulsive
- ability to deal with feelings at the age-appropriate level
- empathic response to other people's feelings

4. Language and cognitive development

- reading awareness,
- age-appropriate reading and writing skills
- age-appropriate numeracy skills
- board games,
- ability to understand similarities and differences,
- ability to recite back specific pieces of information from memory

5. Communication skills and general knowledge

- skills to communicate needs and wants in socially appropriate ways
- symbolic use of language,
- story telling,
- age-appropriate knowledge about the life and world around;

Since 1999 the EDI has been used in many communities across the country. A non-exhaustive list includes such places as: Toronto, Ottawa, North York, Ottawa, New Brunswick, Baffin Island, and Vancouver just to name a few (Hertzman, et al, 2002). It is known that the EDI is a group level measure. Although it is completed for each individual child, data can only be interpreted at a group level (ie. for a whole class, a whole school, or a whole neighbourhood) and is not meant to be used as an individual diagnostic tool. The purpose of the measure is to examine populations of children in different communities in order to help communities assess how well they are doing in supporting young children and their families (Hertzman, et al, 2002). As well, the EDI can be used to monitor changes over time. All information is kept in confidential and is used for statistical analysis.

Client Information

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Objectives

This project was broken down into three different steps. These steps are as follows.

1. Using a GIS, create polygons (one shape file) of the postal codes in the County of Peterborough and with in the city.

2. Map EDI results by postal code and usages of programs offered by the Peterborough Family Resource Centre

3. Determine if there is a correlation between income and EDI results.

Services

1. Develop a shape file that includes all the postal codes in the County and the City of Peterborough as polygons.
2. Customize Microsoft Excel, so data postal coded data from the Peterborough Family Resource Centers internal database can be cleaned.
3. Acquire demographic data, and map the demographic data by census tract
4. Using the developed postal code shape file, map program usage for a select number of programs.
5. Using statistical methods to determine if there is a correlation between demographic data and EDI results.

Benefits of Services

The overall purpose of this project is to contribute to the ongoing research conducted by the Peterborough Family Resource Centre. The project will help determine adequate coverage by the current locations provided. This project will also allow the organization to see what kind of people are using the program and if any logistic or formal changes can be made.

1. Customization of Microsoft Excel will allow users to easily use postal codes found in the internal database to be used with a GIS.

Resources

The data for this project was mainly obtained from the Peterborough Family Resource Centre. This included a table from then internal database, some census data, city and county shapefiles. Other demographic data had to be collected through the Canadian Census Analyser through the Computing in Humanities and Social Sciences (CHASS).

Demographic Data

- Income data from under $10,000 to over $100,000
- Number of people with high school diploma
- Number of people with college degree

Geographic Information System (GIS) Files

Files that have been contributed by the City of Peterborough are as follows:

- Shape files
    - Streets
    - School Building
    - School Properties
    - Parks
    - Water Features
    - City Limits
    - Census Tracts

Files that have been contributed by the County of Peterborough are as follows:

- Shape File
    - County Limits
    - Water Features
    - County Roads
    - School Locations

Software:

- Microsoft Office 2003
- ArcGIS™ 9.x Desktop and 8.x Desktop
- ArcView ™3.x

Hardware:

The hardware need to meet the minimum requirements of the software was required.

Study Site

The County of Peterborough is located north of Northumberland County, south of Halliburton County, east of Victoria County and west of Hastings County. Within the County of Peterborough, the main city that will be examined is the City of Peterborough. The City of Peterborough is 267 km from Ottawa and 135km from Toronto. This can be seen below in Figure 1.

Figure 1. Image of Southeastern Ontario, showing Toronto, Peterborough and Ottawa (Google, 2005).

According to the 2001 census, Peterborough is home to 71,445 citizens (Statistics Canada), a 2.7% increase from the 1996 census (Statistic Canada). The City of Peterborough covers a total of 61.37 square km. The County of Peterborough has a total population of 32,727 citizens (excluding the City of Peterborough) (County of Peterborough). The County also covers a total 3,806 square km including the City of Peterborough and First Nations. This results in a total density of 33.1 persons per square km.

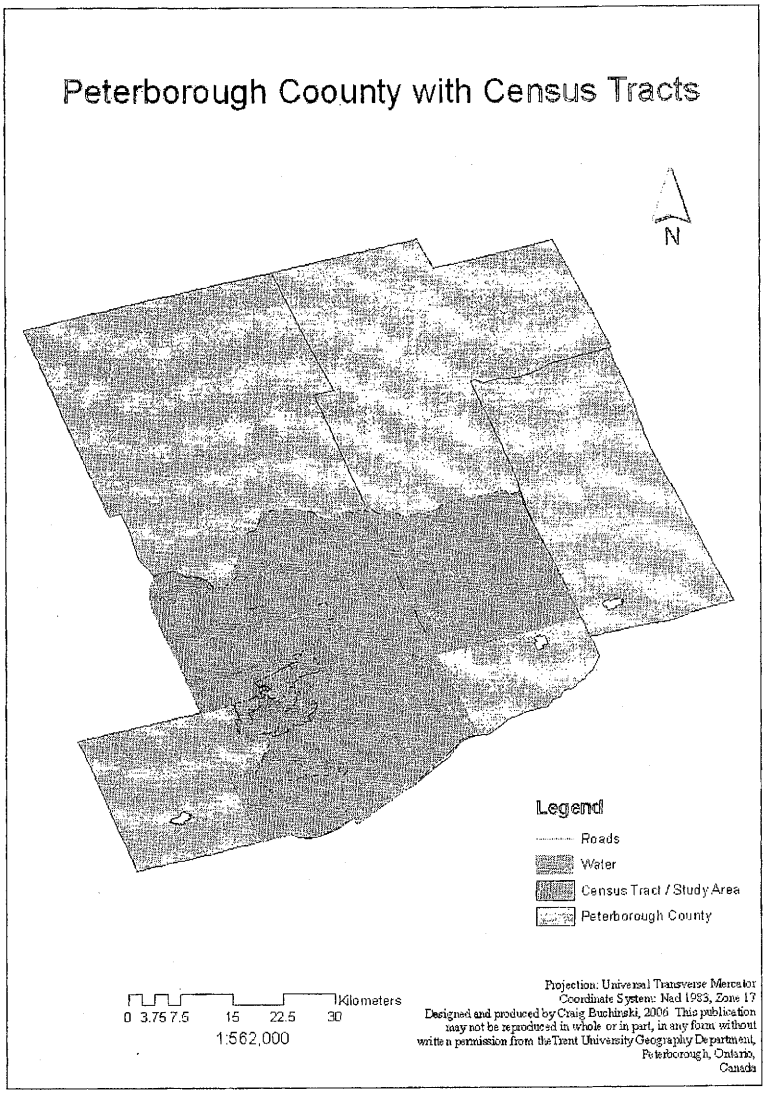

Figure 2. Map showing Peterborough County and Study area.

The main study area with in the county can be seen above in figure 2. The study area will be limited to the census tracts within the county. In the City of Peterborough there are a total of 42 schools. These do not include the schools that are not located outside the city limits. The total number of schools located in the County of Peterborough, excluding the schools in the City of Peterborough, is 21. There are also currently 15 different locations in which the Peterborough Family Resource Centre offers their programs. The facilities that host the programs are located with the County of Peterborough as well within the heart of the city, and they can be seen in figure 2.

Data Acquisition

The demographic data was collected through The Canadian Socio-Economic Information Management System (CANSIM). The location of the postal codes were also collected though CANSIM. This was accessed through the Trent University library. This can be found through the link below. (Note: You must have a valid student account to access the CANSIM)

http://www.trentu.ca/library/data/

All the shapefiles and EDI data were collected from the Peterborough Family Resource Centre.

Data Preprocessing

There was quite a lot of preprocessing before any analysis could be done. The postal codes originated as a comma delaminated text file. This had to be transformed into a format that ArcGIS™ could understand. This first had to be imported into a database, then imported into ArcGIS™. Once this was complete the creation of the polygons could be completed.

The data that was provided from the Peterborough Family Resource Center's internal database had many inconsistencies with in the postal code column. This was rectified by writing a short program in Visual Basic for Applications in Microsoft Excel. This made all the corrections with in the data and provided easy integration into a GIS.

Methodology Description

There will be three GIS programs used for the process of this project. These three software packages are ArcGIS™ 9.0, ArcGIS™ 8.3 and ArcView™ 3.2. The reason for using the two different versions of ArcGIS™ is because ArcGIS 9.0 is readily available throughout the University Campus, and the Peterborough Family Resource Centre uses ArcGIS™ 8.3.

ArcView™ 3.2 will be used in order to make use of its model builder application, which is built in. ArcGIS™ 9.0 has the same availability of a model builder, however ArcView™ is able to handle a large amount of data much easier. Before any of the

analysis is complete, a projection and coordinate system must be determined. Because some of the data have already been projected and have a coordinate system, these will be used through out the project. Projected coordinate system name: NAD_1983_UTM_Zone_17N . Geographic coordinate system name: GCS_North_American_1983.

Once all the needed data are collected through the Canadian Census Analyser, they have to be turned into a database file format (extension .dbf). This process will be completed though Microsoft© Excel™, once all the demographic data have been converted to a dbf file format. These steps need to be taken so the joining of tables within ArcGIS™ and ArcView™ can be achieved much more efficiently.

All the locations of the Peterborough Family Resource Centre outreach centres are stored as a data base file with the latitude and longitude. These data are used to create a shape file of the outreach centres, using the add x,y data feature. Once this is done the shape file is saved. Other shape files that had to be created are, the location of the schools within the County of Peterborough and location of the postal codes with in the county of Peterborough. To create the shape file of the schools within the County of Peterborough similar steps are taken as the creation of the outreach centres. The creation of the shape file of the location of the postal codes is much more complex.

To determine the postal code zones, it was established that an interpolation method based on Thiessen polygons was to be used to provide a rough idea about what

area the postal codes covered. This operation was carried out in ArcINFO™ 8.3. For this process, the shape file had to be imported in to ArcINFO™ and converted into a coverage, as ArcINFO™ primarily works with coverage's. Below in figure 3 an example is shown of what the thiessen interpolation achieves.

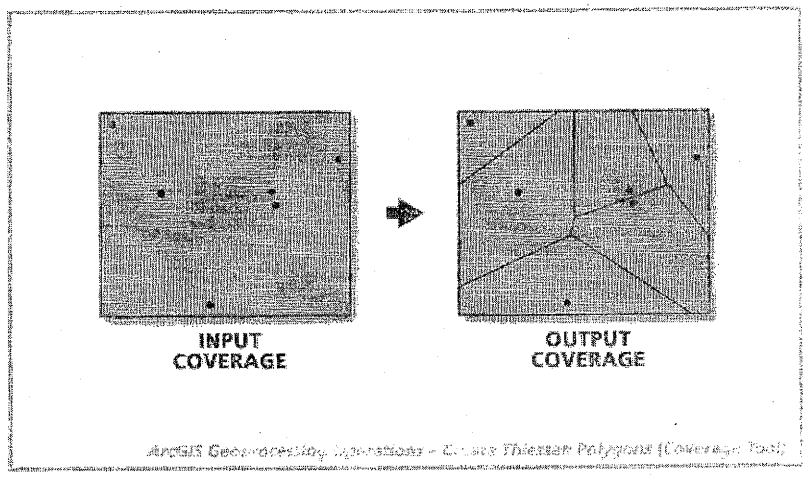

Figure 3. Shows how a thiessen polygon is created (ArcGIS 9.0 Help)

The reason for dividing into thiessen polygons is because all the data from the EDI results are related by postal code. This will provide an easy integration into GIS of the EDI results. Once the new interpolated coverage is created, it then has to be converted back to a shape file. Before this newly created shape file can be used, it needs to go through a dissolve process.

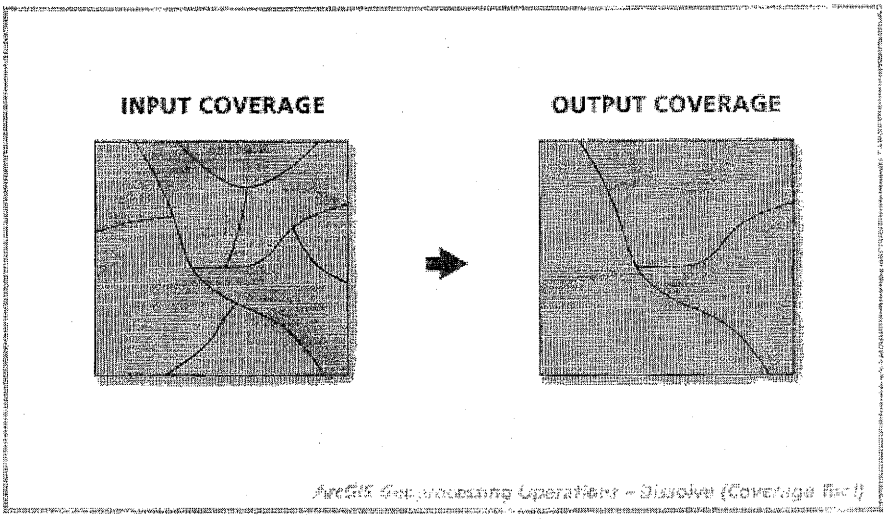

Figure 4. Showing how the dissolve command works (ArcGIS 9.0 Help)

The thiessen polygon that is created consists of many small polygons. Sometimes, this process makes two or more polygons with the same attributes. Using the dissolve process will amalgamate all the common polygons. This process is necessary to complete the final postal code shape file for the analysis. This new shape file will be specifically used for the EDI results.

Before the EDI results can be joined to the postal code shape file they must be extracted from the excel file. This is easily done by copying and pasting the data that are needed. Once all the data that are needed the format of the postal coded must be changed. This is because postal code zones format is X#X#X#. There is no space or dash separating the forward sorting from the rest of the postal code. A visual basic script for application will have to be written in Excel™, to remove the spaces in the EDI

results. This script will be added to a button in a customized interface for easy use in the later part of the project.

Because it is very likely to have more than one EDI result per postal code, the average and the standard deviation will be calculated and taken. To find the average and standard deviation, the data will be brought into Microsoft© Access™ and a Structured Query Language (SQL) statement will be written to find postal codes that are the same and to give the average and standard deviation for these selected postal codes. All these data will be saved to a database file to create a join in ArcView™ with the postal code shape file. The main link between the EDI results and the postal code shape file will be the postal code. Joins in ArcView™ are only temporary, and to make them permanent, once the join is complete the data must be exported. Doing this holds the relationships and creates a new database file containing all the joint attributes.

The census tracts shape file will be linked with the family income and education levels provided through the Canadian Census Analyser. The census tract name will be the main link between the income data and the census tract shape file. These joins will be completed in a similar fashion in regards to the EDI results.

Before any statistical analysis can be completed, all the data must be in one dataset. Before this can be done, all postal codes must be assigned to a census tract. This task was done in two steps. The first step was to convert the census tract shape file to a raster format. The values that were used in the conversion were the household income.

Each income bracket (i.e. $10,000 - $19,999, $20,000 - $29,999) was converted into a raster format. A tool found in ArcGIS™ called Extract Values to Point was used. The orginal postal code points were placed over the raster maps and their value were then extracted to the postal code centroids. The new data sets that were created were then joined just as past joins to the postal code polygon shape file. This process was then validated manually by visually checking to see what postal code is in what census tract. If changes needed to be made, they were done manually. This created one dataset that contained the census tract values and the EDI results.

The newly created dataset is then exported to Microsoft© Excel™ for analysis. From Excel™ the datum can be imported into a statistical program such as Statistica™. All the statistical tests were carried out in Statistica™, however before any statistical test can be preformed the data must be checked for normality. In this case study it was found that the data were not normal and a nonparametric correlation test had to be performed.

Results

Income

Family income has played an important role in the outcome of this thesis objective. Due to limitations of data with postal codes and income, the census tracts had to be used for this part of the analysis. It was determined that for the study area that a Low income cutoff would be $24,242 per year. This is in accordance with Statistics Canada Low income cut-offs for 2004 (Statistics Canada 2004).

Income data that are provided for census tracts are in divisions of $10,000's. For this research project three divisions were used for income, they were; under $10,000, $10,000 - $19,999, and $20,000 - $29,999. Unfortunately the income range $20,000 to $29,999 had to be used because a significant number of families would not have been included within the analysis. Consequently, this will also over represent the number of families that are considered to be low income. For this study it will be called the adjusted LICO.

Census Tract Name	Percent Under LICO
1	19
2	27
3	24
4	28
5	33
6	27
7	54
8	24
9.01	35
9.02	19
9.03	6
9.04	15
10	37
11	13
12	24
13	18
14	11
100	13
101	25
102.01	19
102.02	26
103	15
104	14
105	19
106	15

Table 1. The percent of families living under adjusted LICO ($29,999).

Above in table 1.1 is the name of the census tracts used with the percentage of families living in those census tracts that are living under the low income cut-off. It was found that the average percentage for all the census tracts was 22.4% for the area of Peterborough.

There were three census tracts which had a high percentage of families living under the low income cut-off. Census tract 10, 7, and 9.01 had percentages of 37%, 54%, and 35% respectively. It was also noted that the location of these census tracts are with in the City of Peterborough. This can be seen in figure5 below.

Percent of Families Living Under the Low Income Cut-off With in Peterborough County (by census Tract)

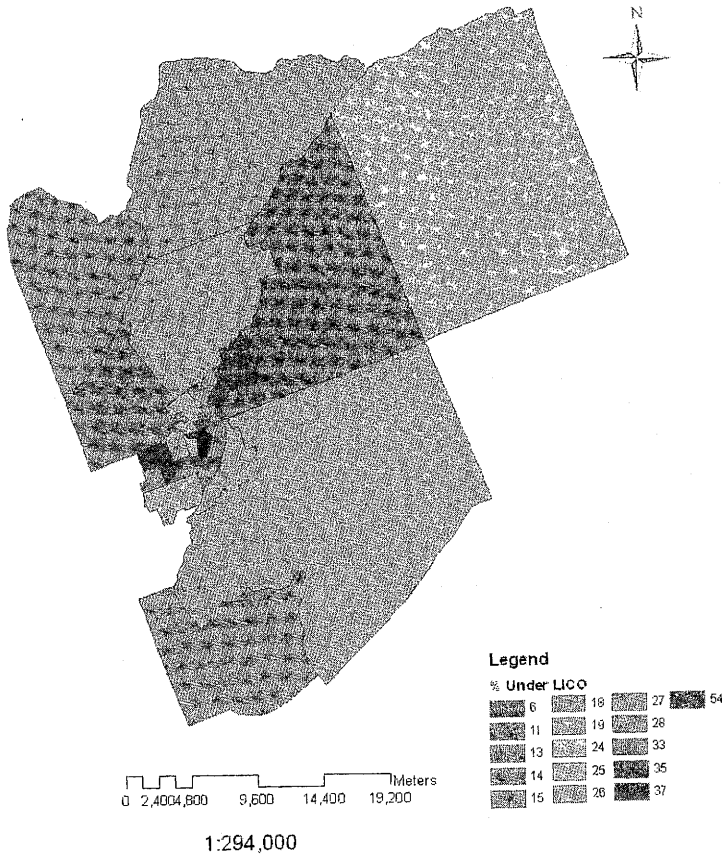

Figure 5. Map showing Peterborough County Percent of families living under the low income cutoff by census tract

For a better analysis in comparison with income data to school results, income data could be collected from the parents along with the child's school readiness scores. This would provide for a better and more accurate statistical analysis.

School Results

The School readiness results were broken down in to five different categories. These categories consisted of, Total, Emotional Skills, Language Skills, Physical Skills, and General \ Comment. Each record was recorded with a postal code. These scores for each postal code were averaged, so that there would be a single number to compare to income results. One category that was not looked at was General\Comments. The reason why this was not considered was because some of the questions asked were opened ended and given a number. For example a question that would be asked would be "If you have any additional comments about his child and her / his readiness for school, list them below" (Early Development Instrument). There were some missing records within this category as well.

Average Total

The total result that is provided is the final score that the child receives. This score was averaged for each of the postal codes in which there were records. The average total scores were compared to income and education. In figure 6 is a map that shows the average total mapped for the City of Peterborough. In figure 4 is a map of the County of Peterborough that show the average total from the EDI results.

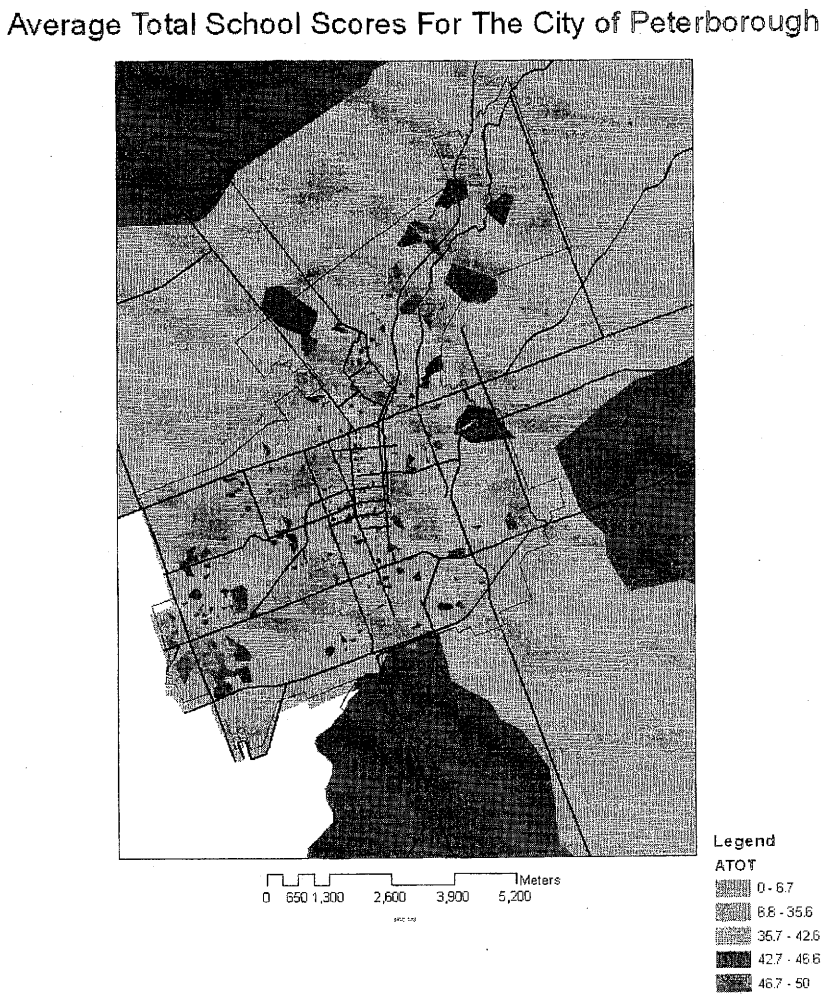

Figure 6. Map showing average total EDI results for the city of Peterborough

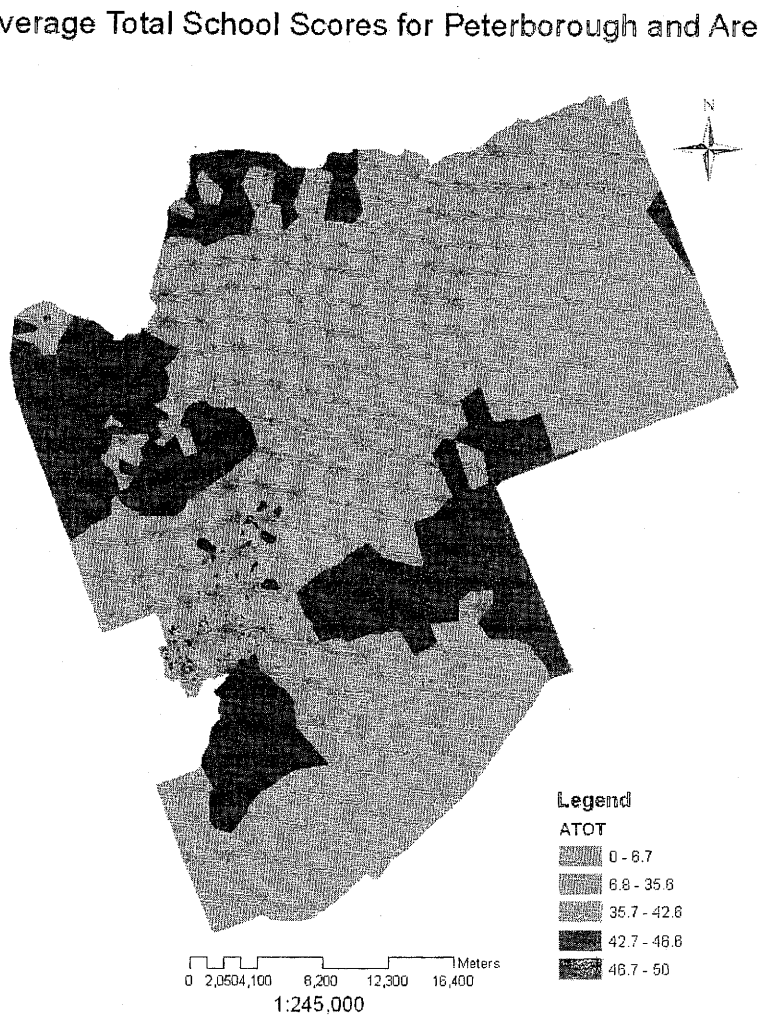

Figure 7. Map showing study area (Peterborough census tracts) with average EDI results mapped.

It was found that a majority of the low scores were located out side of the city core and in the outskirts of Peterborough. There is also a large area in which there was

no data available with in the city. This could be due to the fact that Catholic school board data was not included in this analysis. The total average for the total category was 41.54.

When comparing the total scores to the income within the area it was found that there was an association with between number of families living under the low income cut-off and school results. The spearman rank order correlation coefficient showed a slight positive association ($r = 0.14$, $p < 0.001$). Although this is not a statistically significant result, it can be an indicator that there might be an association. It was surprising to find that there was no significant association because throughout the literature it was found in almost all cases that there was a significant association between the EDI results and low income. It was also found that there was a slight positive association using the spearman rank order correlation as indicator, when analyzing the total school results to people who do not have a high school degree ($r = 0.10$, $P < 0.001$). As mentioned earlier in this paper, Doherty's (1997) report, states that income is directly linked to meeting children's needs. However in the finding in this case study it was found that the relationship was not statistically significant. The extremely weak Spearman Rank correlation coefficients found that it is unlikely that low income is associated with the EDI scores results.

As Doherty (2000) can state that there is a direct relationship between income and the children's needs that statement can not be confirmed here due to data limitations. However one could conclude that there could be a possible association. It was also noted that there was a slight positive association between the total average and the number of

the average total that most of the low scores for the emotional skills were located with in the city limits of Peterborough.

families living in Peterborough who's income in less then $10,000 ($r = 0.18$, $p = < 0.001$), although this association is too weak to be meaningful.

There were two main areas within the Peterborough area that could be considered troubled areas. This meaning that there are more than 30% of the families living under the low income cut-off, and the average total scores are below 30 (test is out of 50). This can be seen below in Figure 8.

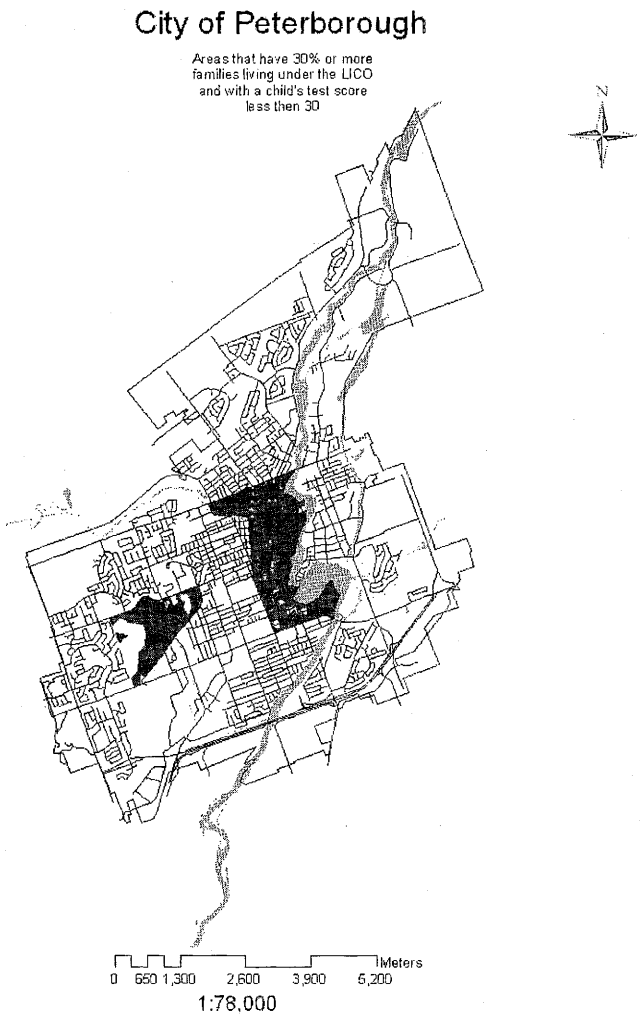

Figure 8. Areas that have 30% or more families living under the LICO and with a child's test score less than 30.

Other factors that could affect a child's school readiness would be parents' education. It was also noted that areas in which people possessed a university or college

degree that there was a slight negative association with child test scores using the spearman rank order correlation ($r = -0.16$, $p = <0.001$, $r = -0.12$, $p = < 0.001$ respectively). All these correlations are not statistically significant, however they can be used as an indicator.

This was a surprising find, because earlier Duncan (2000) suggests that parent education and income are directly related. This meaning, that parents that live under the low income cut-off generally have a low education. This then, relates to a low school readiness for their child. However, with the analysis done here, it suggests that there could be a negative relation to parents with College and University degrees.

Average Emotional Skills

The emotional skill is one of the main important skills that are included with in the EDI test. An example of a question that would be answered is; "Is upset when left by a parent or guardian" (Early Development Instrument). This would be one of many questions in which someone would grade the child. The highest mark a child can receive would be 10 out of 10. It was found that in the county of Peterborough the average score was 8.04.

Below in Figure 9 and Figure 10 are two maps showing the spatial locations of the average scores across the Peterborough area. It was interesting to see that unlike in

Average Emotional Scores For The City of Peterborough

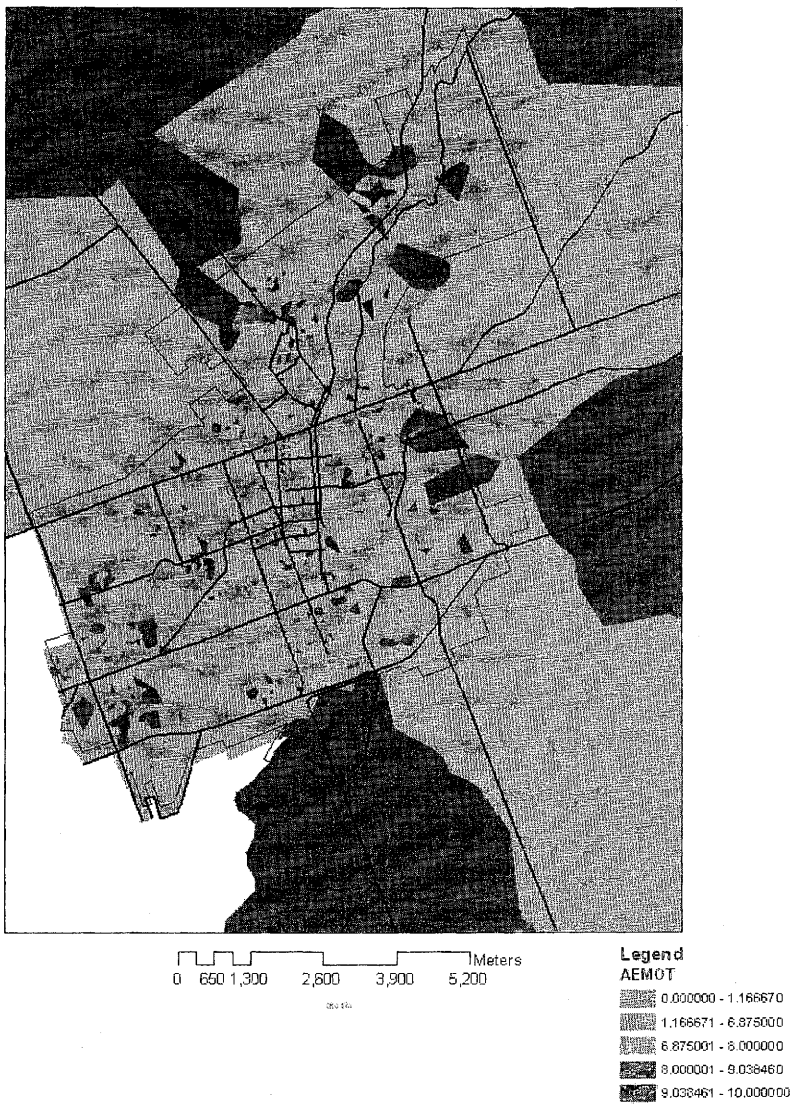

Figure 9. Map showing the City of Peterborough average emotional scores for the City of Peterborough.

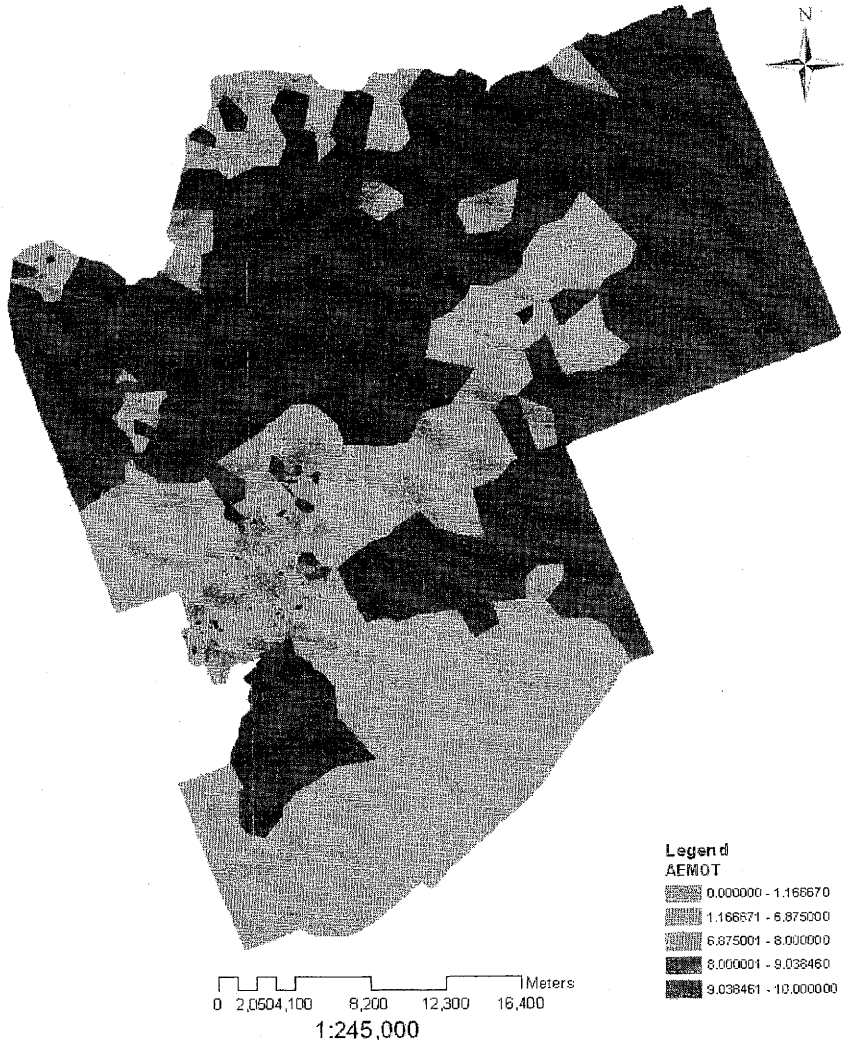

Figure 10. Map showing study area (Peterborough census tracts) with average Emotional results mapped.

It was interesting to see that there was a slight positive association with the total score and income, and it was also found that there was a slight positive association with the number of families living under the low income cut-off. Using the spearman rank order correlation an r value of 0.08 was determined. As there might be a slight positive association with regards to family income, the data does not show that there is a strong correlation between the two. This could mean that even though there are families living under the low income cut-off, it does not affect to emotional skills of the children in those families.

Average Social Skills

The social skills of a child is also heavily considered within the EDI results. This section also has a maximum score of 10. An example of a question that would be answered to determine the social skills of a child would be; "Plays and works cooperatively with other children at the level for his/her age" (Early Development Instrument). This would be one of the many questions answered to help determine the social skills of a child. It was found in the Peterborough area that the average was 8.3.

Below in Figure 11 and Figure 12 are two maps showing the locations of the scores within the Peterborough area. It was interesting to see that there was one main

area in which the average social scores were low. Although there are some small locations with in the city limits that also scored low for social skills.

Average Social Scores For The City of Peterborough

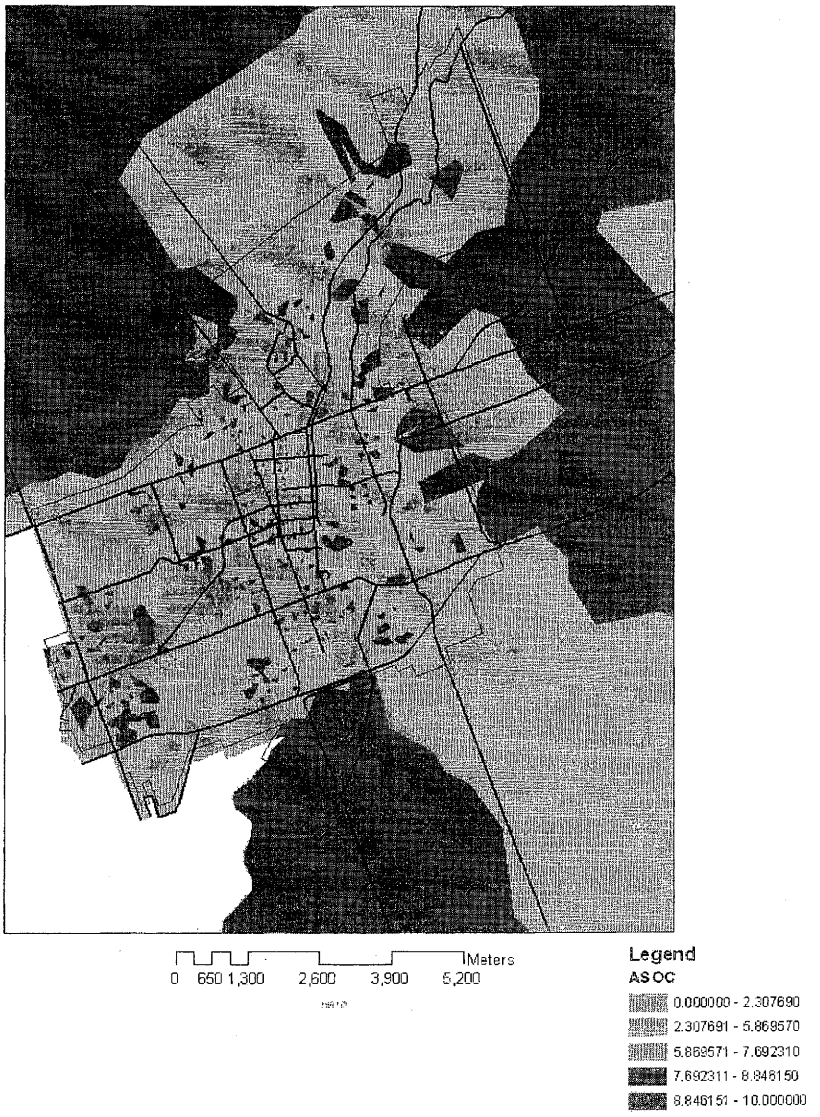

Figure 11. Map showing the City of Peterborough average emotional scores for the City of Peterborough.

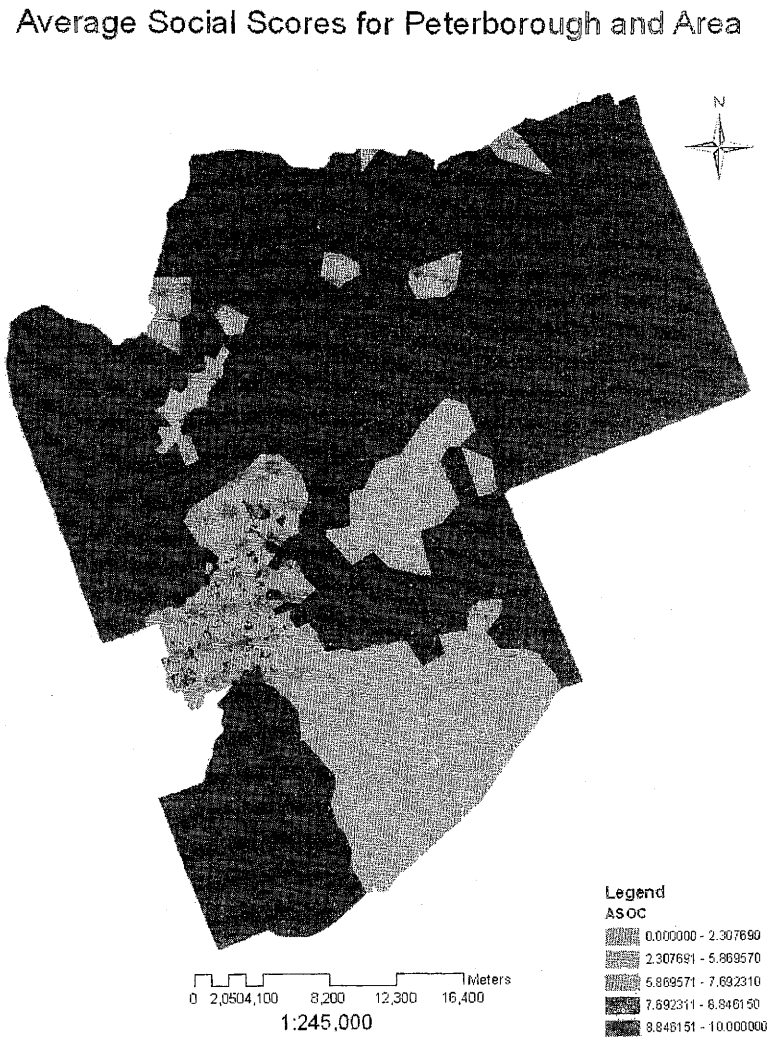

Figure 12. Map showing study area (Peterborough census tracts) with average Social results mapped.

It was also noted that the same area that a low total average, and low emotional average are located with in the same area (south east of the city). Again it was noted that the rural area outside the city limits scored higher. In regards to comparing the number of families living under the low income cut-off and the average social scores, it was found that there was a slight negative association ($r = -0.08$, $p = < 0.001$). As McCain and Mustard stated earlier, it is well known that a higher proportion of children in low-income families do not do well academically and socially compared to that of children in families with higher incomes. However there are more children that do well, despite the unfavorable family economic circumstances, than those who do not.

Even though areas that have a high percentage of families living under the low income cut-off, it seems that the children in these areas sill perform with their social skills. A conclusion can not be drawn that there is or there is not a relationship between the income and social skills, again because of the data limitations.

Average Language Skills

The language skills of child are also one of the most important things when it comes to the EDI test. This part of the test is also out of 10. It was noted that the average for the Peterborough area was 8.58. This was the second highest score of the five, with physical skill being the highest. One of the many questions that were asked to determine the language skills of a child were; "Is able to write a simple sentence" (Early Development Instrument).

Below in Figure 13 and Figure 14 are the areas within and outside the city of Peterborough that shows the average score for the language skills.

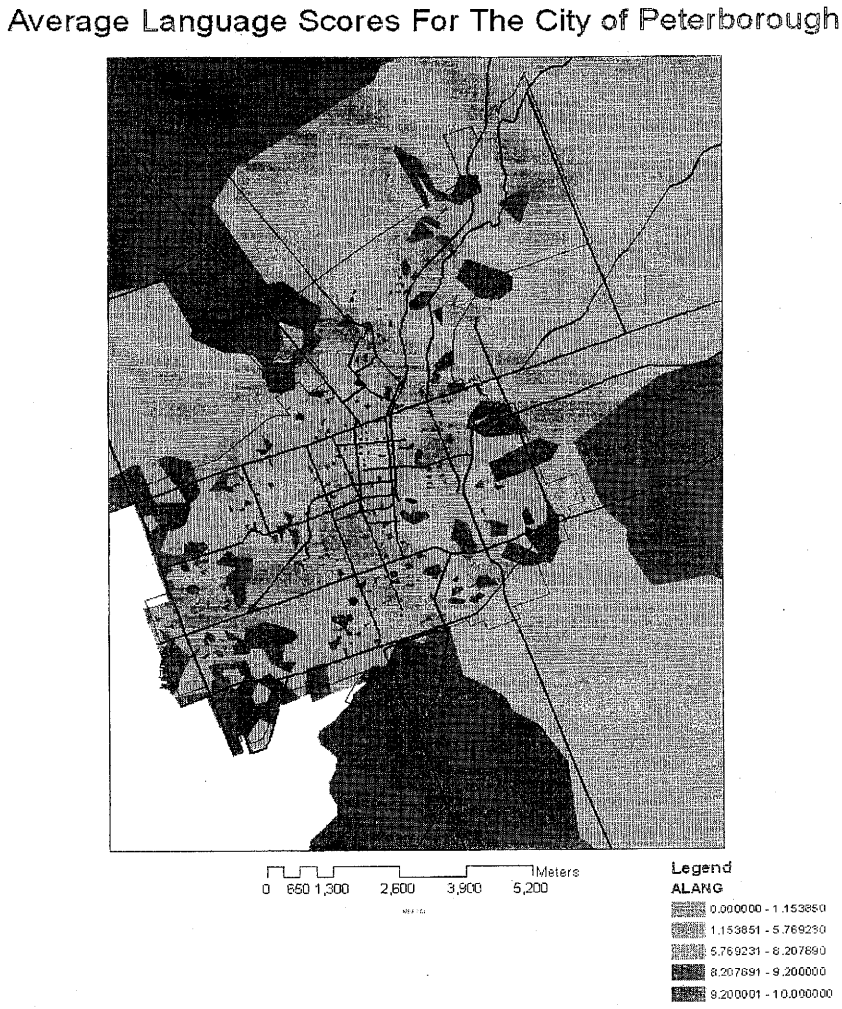

Figure 13 Map showing the City of Peterborough average Language scores for the City of Peterborough.

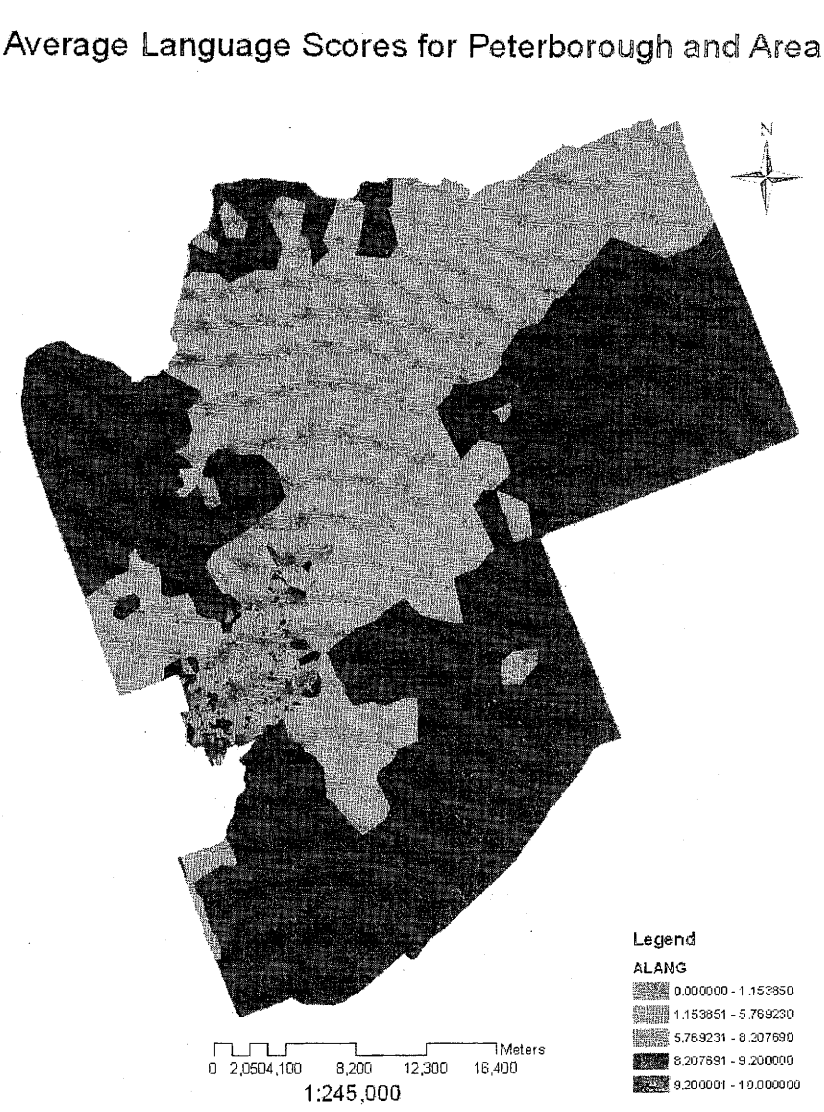

Figure 14 Map showing study area (Peterborough census tracts) with average Language results mapped.

It was interesting to note that the one area to the south east of the city, in which generally showed a lower score results in the total average, social and emotional skills were rated higher. There is a large area outside and to the north of the city in which possessed a low score. There could be many different reasons why this one area is lower then that of the rest of the region.

In regards to comparing the number of families living under the low income cut-off and the average language skill scores, it was found that there was a slight positive association ($r = 0.25$, $p = <0.001$). This finding was not surprising, because as Doherty states, It was found that children in low-income families were at risk of, delayed language development and poor school performance (low EDI scores). Although a definitive statement can not be made about the correlation, there could possibly be similarities between the results found and those of Doherty's (1997) findings.

Average Physical Skills

The physical skills of a child are also another factor in the results of the EDI test. This part of the test is also out of 10. A question that would be answered to determine the physical skills of a child would have been; "level of energy throughout the school day" " (Early Development Instrument). It was found that the Peterborough area has a score of 8.75. This was the one category in which was the highest out of all five.

Figure 15 and Figure 16 below, show the areas in which the scores are located. They both show within the city of Peterborough and the surrounding areas.

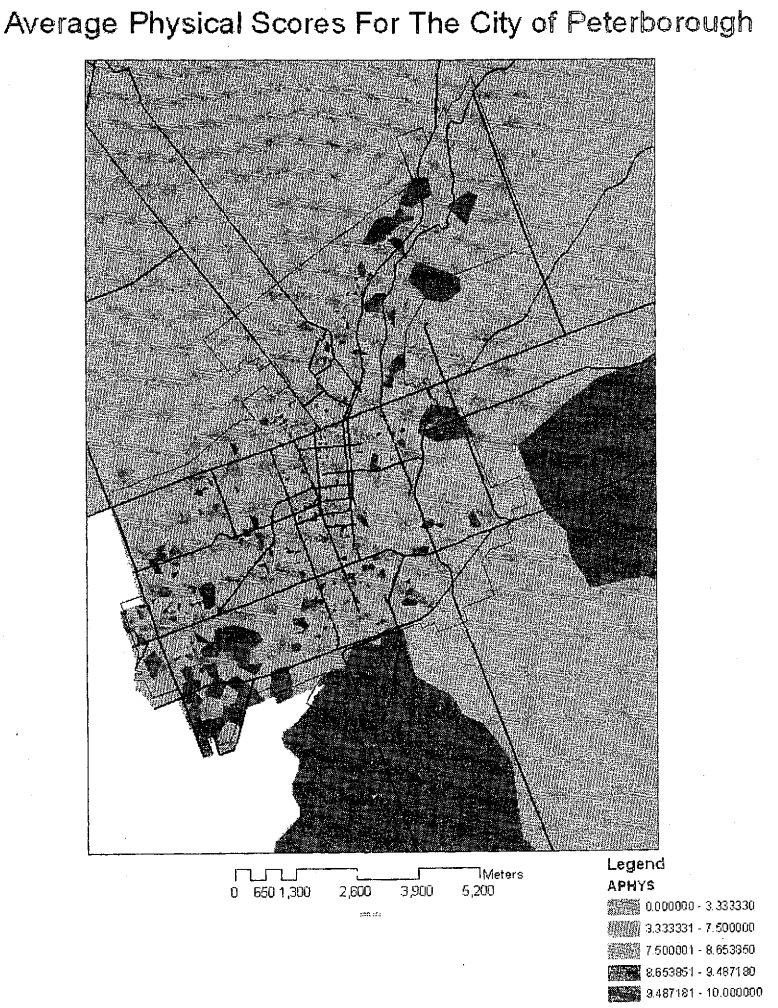

Figure 15. Map showing the City of Peterborough average Physical scores for the City of Peterborough.

Average Physical Scores for Peterborough and Area

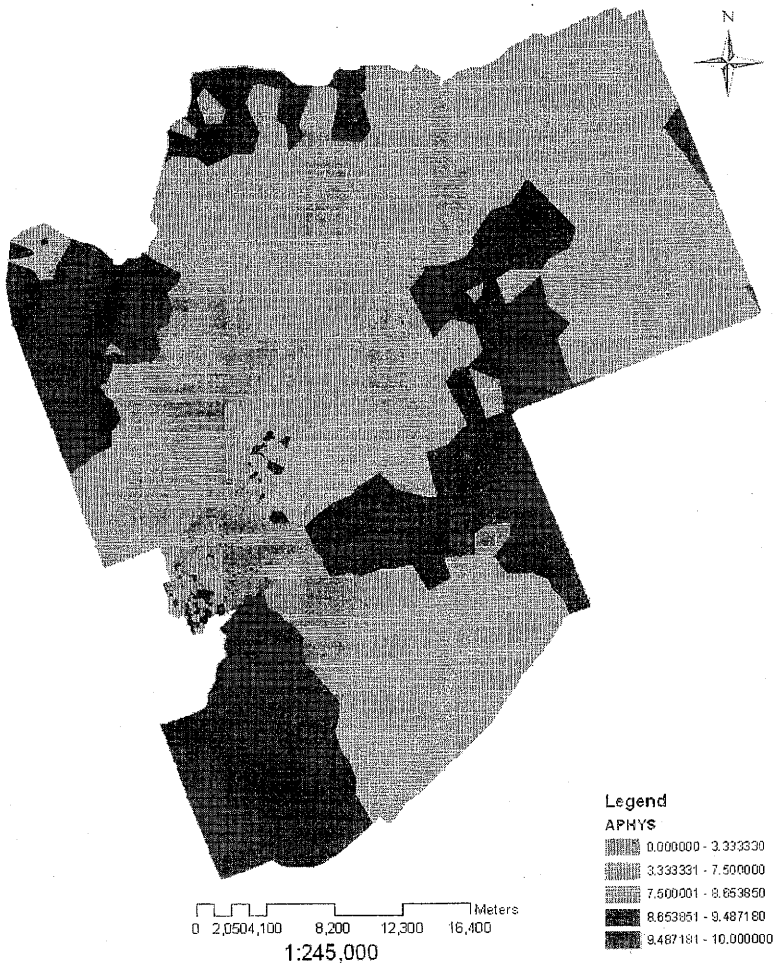

Figure 16. Map showing study area (Peterborough census tracts) with average Physical results mapped.

It was found this time that a majority of the area outside of the city had a low score for the physical skill. With regards to the number of families living under the low income cut-off, it was found that there is a slight positive association using the spearman rank order correlation ($r = 0.20$, $p = < 0.001$). Again these results are not statistically significant. However the result was not surprising, due to the fact that most low income families can not afforded to have their children in sports. It could also be due to the fact that there are no local sports teams or physical activities offered in this area. This would be another good area to explore further if there was more time allotted, and available data.

The physical skills also look at if the child is hungry, tired or their physical appearance. If the data permitted it would be intrusting to see what areas were more likely to yield a low score. If this were possible, one then could be able to determine a good location for breakfast program, or an after school program.

Conclusion

It was found that all of the comparisons between the five domains of the EDI results and the demographic and economic variables that none were statistically significant. The one main reason why this might be is because of the limitations to the data that was available. Although there are no statistically significant factors associated with the EDI scores and the social, economic and demographic factors, these weak relationships, however can be used as early indicators that with improved data, stronger correlations between the EDI domains and the demographic data may be obtained. For

future research, it would be interesting to compare two sets of EDI results following the same principles addressed in this study.

Limitations and Recommendations

The main limitations in this project were the data itself. It might be recommended that when a new user of the organization is registering, that they answer some simple demographic questions for statistical analysis only. This would then help reduce the ecological falsify during the analysis. Another recommendation would be to make sure the user who enters the data into the database, enters the postal code in one format only. This would help reduce one of the press processing steps.

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Appendix A

Programing Code

Code developed to remove spaces from postal codes in Excel™.

```
Sub removeBlanks()
Dim strHolder As String
Dim icount As Integer
Dim strChar As String
While ActiveCell.Value <> ""
   strHolder = ActiveCell.Value
   ActiveCell.Value = ""
   For icount = 1 To Len(strHolder)
      strChar = Mid(strHolder, icount, 1)
      If strChar <> " " Then
         ActiveCell.Value = ActiveCell.Value & strChar


      End If


   Next
   ActiveCell.Value = "=""" & ActiveCell.Value & """"
   ActiveCell.Offset(1, 0).Select

Wend
 ActiveCell.Offset(-1, 0).Select
Range(Selection, Selection.End(xlUp)).Select
Application.CutCopyMode = False
Selection.Copy
Selection.PasteSpecial Paste:=xlPasteValues, Operation:=xlNone, SkipBlanks _
   :=False, Transpose:=False
End Sub
```

Sample SQL statement used to determine the frequency of visitors.

```
SELECT UCase([PostalCode]) AS [Postal Code], Count(*) AS Frequency
FROM CatsEvent INNER JOIN (Events INNER JOIN (LinksEvent INNER JOIN
(Families INNER JOIN People ON Families.Fam_code = People.Fam_code) ON
(LinksEvent.Client = People.Number) AND (LinksEvent.Family = People.Fam_code))
ON Events.Code = LinksEvent.Event) ON CatsEvent.Code = Events.Category
WHERE (((UCase([PostalCode])) Is Not Null) AND ((Events.Code) Like '081'))
GROUP BY Families.PostalCode;
```

Appendix B

Stats Findings

Variable	Spearman Rank Order Correlations (delete) MD pairwise deleted Marked correlations are significant at p <.05000 ATOT	ACOMG	AEMOT	ALANG	APHYS	ASOC	SSOC	SPHYS	SCOM	SLANG	SEMOT	LICO
ATOT	1.000000	*0.910648*	*0.396493*	*0.827803*	*0.852244*	*0.784626*	-0.020168	*-0.117572*	*-0.066934*	-0.035376	0.032341	*0.297315*
ACOMG	*0.910648*	1.000000	*0.215523*	*0.745701*	*0.726295*	*0.640450*	-0.020310	*-0.092118*	*-0.089951*	-0.044259	0.026446	*0.207056*
AEMOT	*0.396493*	*0.215523*	1.000000	*0.131945*	*0.234292*	*0.520797*	*-0.223558*	*-0.277824*	*-0.241970*	*-0.187298*	*-0.183530*	*0.059683*
ALANG	*0.827803*	*0.745701*	*0.131945*	1.000000	*0.792592*	*0.481915*	0.031076	-0.038869	0.024048	-0.046824	*0.056137*	*0.323689*
APHYS	*0.852244*	*0.726295*	*0.234292*	*0.792592*	1.000000	*0.565775*	0.044429	*-0.063354*	0.014521	0.011761	*0.072987*	*0.286379*
ASOC	*0.784626*	*0.640450*	*0.520797*	*0.481915*	*0.565775*	1.000000	*-0.312271*	*-0.387006*	*-0.327706*	*-0.277873*	*-0.261180*	*0.126230*
SSOC	-0.020168	-0.020310	*-0.223558*	0.031076	0.044429	*-0.312271*	1.000000	*0.931982*	*0.940242*	*0.949383*	*0.978475*	*0.220669*
SPHYS	*-0.117572*	*-0.092118*	*-0.277824*	-0.038869	*-0.063354*	*-0.387006*	*0.931982*	1.000000	*0.894906*	*0.911352*	*0.923673*	*0.063300*
SCOM	*-0.066934*	*-0.089951*	*-0.241970*	0.024048	0.014521	*-0.327706*	*0.940242*	*0.894906*	1.000000	*0.931533*	*0.914000*	*0.243849*
SLANG	-0.035376	-0.044259	*-0.187298*	-0.046824	0.011761	*-0.277873*	*0.949383*	*0.911352*	*0.931533*	1.000000	*0.936775*	*0.251177*
SEMOT	0.032341	0.026446	*-0.183530*	*0.056137*	*0.072987*	*-0.261180*	*0.978475*	*0.923673*	*0.914000*	*0.936775*	1.000000	*0.223349*
LICO	*0.297315*	*0.207056*	*0.059683*	*0.323689*	*0.286379*	*0.126230*	*0.220669*	*0.063300*	*0.243849*	*0.251177*	*0.223349*	1.000000
WUD	*-0.161105*	*-0.179682*	*0.123350*	*-0.166547*	*-0.235943*	*-0.115304*	*0.273182*	*0.310632*	*0.201614*	*0.241043*	*0.300309*	-0.043094
NHS	*0.112669*	0.031216	0.043104	*0.219217*	*0.125092*	*-0.105771*	*0.351675*	*0.316477*	*0.322514*	*0.351837*	*0.354473*	*0.788321*
PLICO	*0.400232*	*0.301652*	*0.076475*	*0.415026*	*0.428626*	*0.209787*	*0.123748*	-0.042363	*0.138871*	*0.140115*	*0.122984*	*0.867253*
WCD	*-0.116786*	*-0.120870*	*-0.081324*	0.022036	*-0.144170*	*-0.271037*	*0.298391*	*0.395834*	*0.283268*	*0.299194*	*0.310090*	*0.391340*
WHS	0.049547	-0.020448	-0.005926	*0.162750*	0.047052	*-0.171009*	*0.443584*	*0.417901*	*0.438643*	*0.456827*	*0.460909*	*0.695302*

Variable	Spearman Rank Order Correlations (delete) MD pairwise deleted Marked correlations are significant at p <.05000 WUD	NHS	PLICO	WCD	WHS
ATOT	*-0.161105*	*0.112669*	*0.400232*	*-0.116786*	0.049547
ACOMG	*-0.179682*	0.031216	*0.301652*	*-0.120870*	-0.020448
AEMOT	*0.123350*	0.043104	*0.076475*	*-0.081324*	-0.005926
ALANG	*-0.166547*	*0.219217*	*0.415026*	0.022036	*0.162750*
APHYS	*-0.235943*	*0.125092*	*0.428626*	*-0.144170*	0.047052
ASOC	*-0.115304*	*-0.105771*	*0.209787*	*-0.271037*	*-0.171009*
SSOC	*0.273182*	*0.351675*	*0.123748*	*0.298391*	*0.443584*
SPHYS	*0.310632*	*0.316477*	-0.042363	*0.395834*	*0.417901*
SCOM	*0.201614*	*0.322514*	*0.138871*	*0.283268*	*0.438643*
SLANG	*0.241043*	*0.351837*	*0.140115*	*0.299194*	*0.456827*
SEMOT	*0.300309*	*0.354473*	*0.122984*	*0.310090*	*0.460909*
LICO	-0.043094	*0.788321*	*0.867253*	*0.391340*	*0.695302*
WUD	1.000000	*0.279034*	*-0.115174*	*0.253790*	*0.247936*
NHS	*0.279034*	1.000000	*0.642413*	*0.658795*	*0.846082*
PLICO	*-0.115174*	*0.642413*	1.000000	*0.060576*	*0.404653*
WCD	*0.253790*	*0.658795*	*0.060576*	1.000000	*0.841547*
WHS	*0.247936*	*0.846082*	*0.404653*	*0.841547*	1.000000