BC INJURY research and prevention unit



Prepared by:
BC Injury Research and Prevention Unit

COLLABORATIVE MEASURES WITH KEY STAKEHOLDERS IN EARLY CHILD DEVELOPMENT

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Deliverable 3.2.4: Seek collaboration with the Human Early Learning Partnership (HELP) and other stakeholders in Early Child Development to develop a report that links child injury and social indicators

Background

In the past, several initiatives were taken by the Ministry of Health to increase awareness and preventative measures around early childhood development. These included an informational series that began with two educational resources. (1) Baby's Best Chance: A Best Chance Guide to Pregnancy, Parenthood and Infant Care, and (2) Toddler's First Steps. These resources targeted parents and caregivers of children six months to three years of age. The purpose of these resources was to enhance understanding about various contributors to the healthy growth of children. To continue the efforts and initiatives towards healthy child development, this deliverable was intended to gain better insight into the social determinants of health and their impact on childhood injuries.

Goals

The goal of this deliverable was to collaborate with champions in early child development, such as HELP (Human Early Learning Partnerships) and correlate their work to date with injury profiles, to better understand the link between social determinants of health and injuries during developmental stages of a child.

Strategies

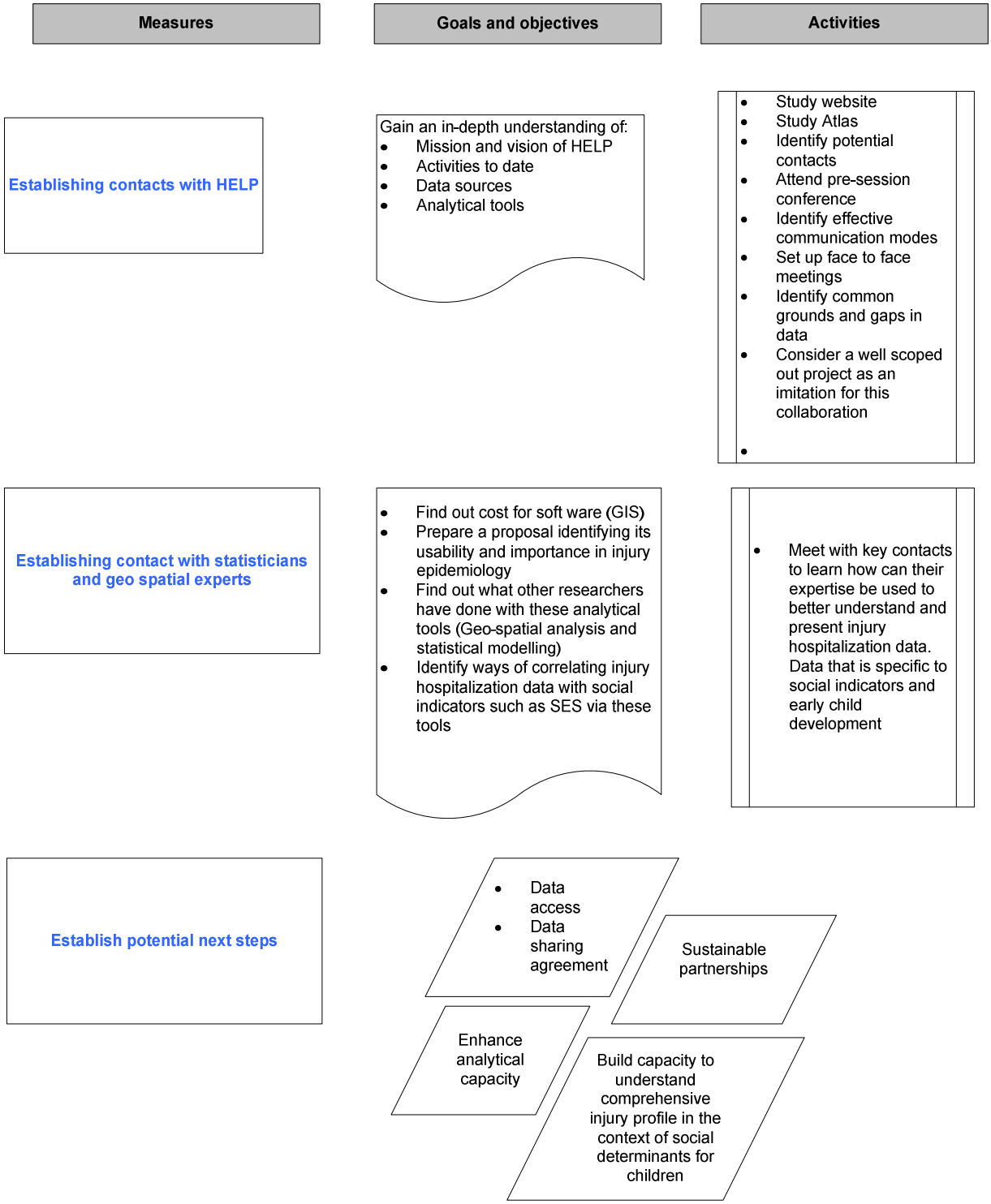
To achieve our goals, the deliverable team adopted a strategic approach by dividing the project into three phases

- Planning
- Implementation of activities and
- Identification of potential next steps

Planning phase

As part of the planning phase, a work flow was established with action items, timelines and roles and responsibilities. Figure 1 outlines the measures, goals and activities of the project.

Figure 1: Work Plan



Implementation phase

A meeting was organized with Matt Herman to better understand the scope of this Deliverable (Appendix A). Further, to gain access and explore the functionality of GIS in the field of injury epidemiology and injury prevention, a proposal was drafted and submitted to Matt Herman in August 07 (presented in Appendix B).

On-going projects being conducted by HELP, Early Developmental Instrument (EDI) Atlas and the website were examined to understand how injury specific initiatives can be (or have been) articulated within HELP projects. It was not surprising to see that among all the indicators studied to date, injuries were a missing component. However, the in-dept analysis of social indicators such as Social Economic Status (SES), childhood vulnerability, income, mother's education, etc., that were analyzed and presented at the school district level in the EDI atlas, could provide a potential basis for our project.

To identify and tailor effective injury prevention interventions based on the needs of a community, the team recognized the importance of exploring the correlation between social indicators and injury outcomes during the early years of child development. Thus as a first step, the team thought about using a map structure that represents SES, at various levels (including Local Health Areas and School Districts), already established by HELP.

The team met several times in Quarter One to plan and discuss the development of a proposal that could be submitted for funding to (or with) HELP. The team drafted a proposal to study environmental contributors to child and youth pedestrian injuries using GIS mapping. The purpose of choosing this specific topic was two fold. First, there is an identified gap in data around pedestrian injuries in BC. Secondly, the team recognized a need to gain an in-depth understanding of the pedestrian injuries in the context of childhood vulnerability and social indicators, in order to establish effective preventative measures for pedestrian injuries, which is one of the leading causes of death among children. However, a research team at VGH/SFU had already submitted a proposal for similar research.

To carry forward the need and potential for the pedestrian injuries project, a meeting was organized with Dr. Nadine Schuurman, primary investigator for this project at SFU, Department of Geography. This informative meeting revealed that Dr. Shurman and her team had done extensive research relating to mapping pedestrian injuries among adults in Metro Vancouver and that they were currently in the phase of developing a deprivation index (based on SES) to overlay the same with pedestrian injuries. Their challenge was in gaining access to pediatric trauma data, particularly the six digit postal codes. The deliverable team found potential for collaboration within their next phase of correlating and understanding environmental factors including traffic calming measures and pedestrian injuries, which in-turn was to be analyzed using a deprivation index. The research themes and questions discussed at the meetings are presented in Appendix C. The relationship with Dr. Schuurman resulted in her involvement in preliminary discussions around the preparation of a Letter of Intent for a CIHR STAIR grant.

Recognizing the importance of the mapping tool and the Early Developmental Instrument (EDI) established by HELP, the team considered the option of improving data usability and presentations by using Geomatic Science and Temporo-Spatial Analysis. Contacts were established with Dr. Charmian Dean, Professor at the department of Statistics and Actuarial Sciences, to seek her advice and expertise in understanding social indicators and early childhood injuries via statistical modeling, given longitudinal hospitalization data. Dr. Dean offered free consultation services to the team on this specific project. A challenge was the sharing of data, if consultation was to be carried forward. Summary of discussion is presented in Appendix D

In May 07, three members of the Deliverable team attended a pre-conference session delivered by HELP at the International Health Promotion Conference, with the intent to gain a better understanding of their on-going projects such that potential collaborative grounds could be identified.

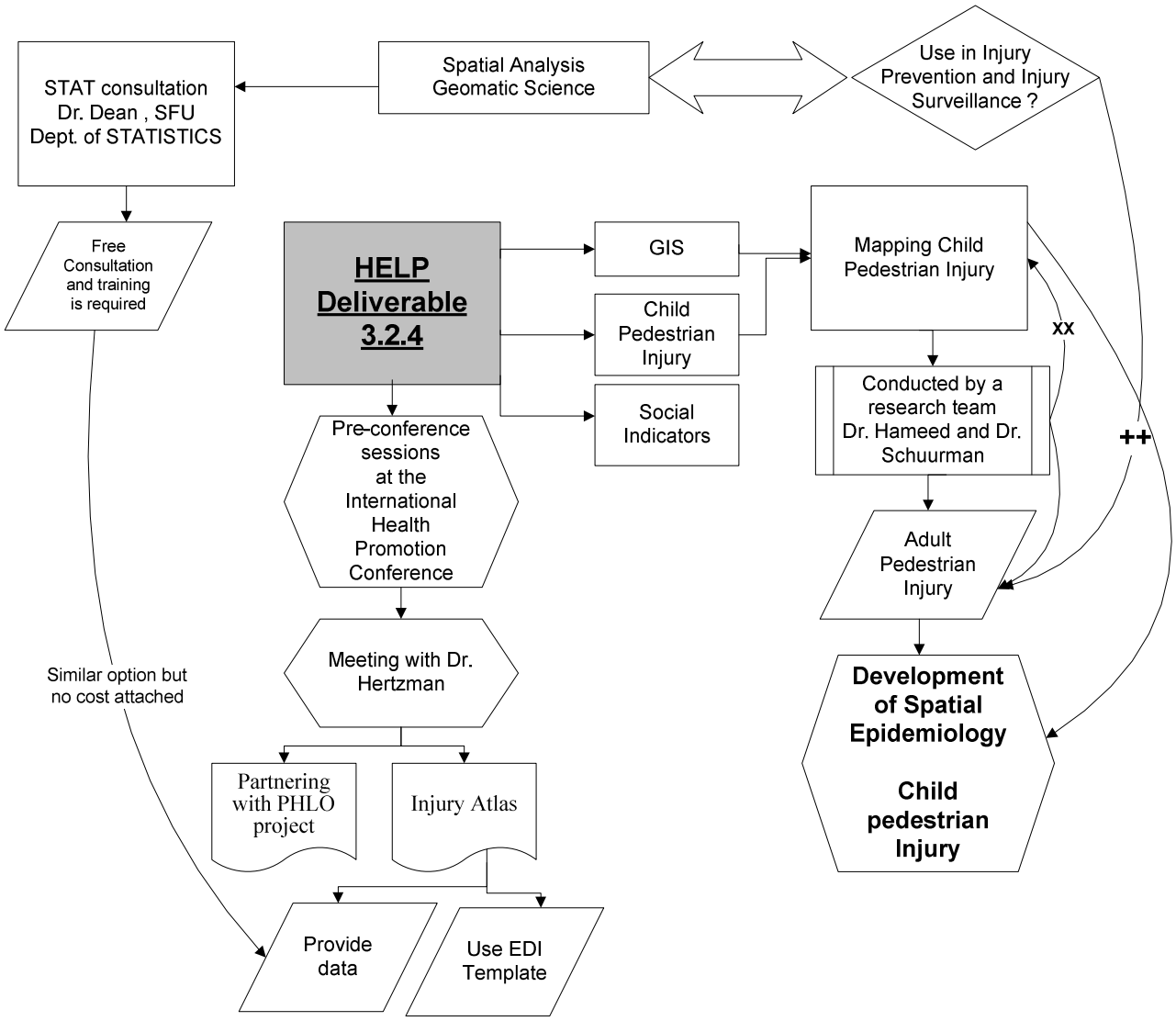
Measures to establish a working partnership with HELP continued. A meeting with Dr. Clyde Hertzman was arranged to foster collaboration and meet the deliverable goals. At a meeting on Sept. 18, 2007, Dr. Hertzman proposed two collaborative options:

1. Establish partnership with the Population and Public Health and Learning Observatory (PHLO) team
2. Develop an injury atlas parallel to the EDI (Early Development Instrument) atlas and identify injury indicators which could be implemented along with the EDI indicators in various school districts.

Minutes of the meeting are presented in Appendix E.

A summary of the implementation phase is diagrammatically presented in below in Figure 2.

Figure 2: Summary of the implemented processes



Potential next steps

- The Deliverable team recommends that at least one of the above suggested collaborative projects with HELP become a future deliverable. This would not only enhance the capacity and usability of our data but also result in more targeted interventions
- The team also recommends considering potential options for complimenting the descriptive analyses with statistical modeling using hospitalization data. This would enable the researchers at the BCIRPU, to further explore the social indicators and injury trends over time and mitigate relevant injury-related risks to ensure creation of a safe, injury-free Province.

Appendix A

Teleconference with Matt Herman

Shelina and Khairun participated in a phone meeting with Matt on July 13th.

The meeting focused on two issues

1. To understand Ministry's perspective on the nature of the deliverable
2. To explore potential ways for obtaining a GIS license for the BCIRPU.

Outcomes:

- It was made explicit that the deliverable outcome shall be a report explaining areas of potential collaboration with HELP. It may not be a project /data specific report.

- Matt requested a brief proposal outlining the advantages of GIS in public health, specifically within the domains of injury prevention. Concerns were raised around accessing and identifying information such as postal codes.

- There was discussion around collaborating with teams/organizations working with GIS, such that we have a better understanding of the data sources and the relevant measures that may be required for using GIS for injury prevention initiatives (and surveillance).

- Matt has collaborated with Health Canada and they may be willing to share a one-desk ArcView floating license with the Injury Unit. The agreement shall be finalized after reviewing the proposal.

- GIS proposal to be submitted in August

Appendix B

GEOMATICS - GEOGRAPHIC INFORMATION SYSTEM (GIS) APPLICATIONS IN INJURY PREVENTION & CONTROL

Prepared by:
Khairun Jivani

BC INJURY research and prevention unit

Functionalities of GIS

Geographic Information System (GIS) is a part of the newly emerging Geomatic Science which is focused on geospatial dimensions of features, activities and processes (Cusimano, Chipman, Glazier, Rinner and Marshall, 2007). GIS is an analytical tool that stores, updates, manages analysis and displays all forms of geographically referenced information. It generally deals with two types of data, geometric data (e.g. points, street address, postal codes, cities, regions and countries, coordinates of longitude and latitude) and attribute data (e.g. socioeconomic data such as census data, data relevant to occurrence and prevention of injury/disease, patient characteristics, and injury types) (Ormsby, 04).

GIS provides a method of linking social, economical, ecological and demographic factors with individual-level data, aggregated at a variety of geographical scales. It displays geographical information and combines multiple databases (from various sectors such as health, housing, police, transport) to identify specific patterns and determinants. It allows researchers to analyze and depict health data in various effective ways including animated maps showings patterns and trends of health outcomes (e.g. injury & disease) overtime, or density maps that display spatial clusters.

Geomatic methods subsumed in GIS are characterized by three inter-related functions.
(1) The organization of geographically referenced databases
(2) The visualization of data on maps and graphs and
(3) The spatial analyses of the data (Cusimano et al., 2007).

Exploratory analysis and model building are two important GIS applications. Exploratory analysis allows the analyst to sift through spatial data to identify unusual patterns and formulate hypotheses to guide scientific research. Model building involves procedures for testing hypotheses about the etiology of injury and disease.

GIS applications also assist to determine the geographic distribution and variance of a disease/injury, map population at risk, stratify risk factors; assess resource allocation (health services, prevention programs), plan and target interventions and monitor disease/injury trends and patterns. It can also assist to locate potential sites for health services and map interventions that may have maximum impact on a community.

GIS Applications in Public Health

In recent years, the use of GIS by public health professionals has expanded rapidly, as it has been realized that:

- The majority of datasets have a spatial component
- Graphical representations, particularly maps are informative to various sectors of pubic health
- The data is enriched and is more useful when linked with multiple data sources (e.g. census data, environmental data, socioeconomic status). Linked data

provides a novel profile of health outcomes and its associated risk profiles. (PHAC)

Currently there exists a lack of regional studies to determine whether geographic, environmental, age-related or socio-economic differences affect injury patterns. Recognition of these factors at different levels will facilitate planning of geographically targeted interventions.

In the recent years, GIS has been used to identify lead hazards and children at risk in a neighborhood. It has also been used in the surveillance and monitoring of diseases (e.g. sexually transmitted disease, malaria), in environmental health, in the analysis of disease policy and planning, and in understanding access to health services (Briggs & Elliott, 1995, Barnes & Peck, 1994, Bullen, Moons & Jones, 1996). In Ontario Canada, GIS was used to develop preventative measures for bicycle travel on sidewalks, roads and off-roads paths in two major cities in Ontario (Aultman-Hall, 1997(a) & 1999(b)).

Some Public Health departments have used GIS to monitor and plan health-service delivery. For example, Florida state-wide web-based GIS application is being used by local health agencies to evaluate and re-develop health programs using health and demographic data at the census level (Grigg, Alfred & Keller, 2006).

Geomatic has increasingly been used by traffic enforcement and crime agencies to understand the geographical patterns of traffic collisions and to better allocate resources. Rates of assaults have been related to density of liquor stores and social indicators such as poverty and proportion of visible minorities (Gruenewald et al., 2006).

GIS Applications Specific to Injury Surveillance and Prevention

Geomatic approach helps understand where, details, contributors to and consequences of injury which is essential in developing strategies for prevention and control (Cusimano et al., 2007). The geocoding of the location of injury and residence of the injury victim provides an extensive profile of the environmental and individual contributors to injury. Geocoding translates the addresses associated with injury events or injured persons to geographic coordinates, allowing for integration with the spatial data (e.g. census data). Demographic data helps develop risk profiles and explains unusual injury counts/patterns with various socioeconomic indicators. Population health determinants such as income and social status, education, employment, social and physical conditions, personal health behaviour and practices, and culture are believed to have a relationship with injury patterns. Although each of these factors plays an important role, the complex interaction of these indicators may have a different role in specific geographical locations and community extents. In the filed of injury, GIS has been used to strategically plan the location patterns for a proposed trauma center network in UK and to outline their catchment areas (Kivell & Mason, 1999). GIS has been used to predict pedestrian injuries and to develop traffic accident information systems to assess risks of different types of traffic collisions (Braddock et al., 1994,

Lightstone et al., 2001, LaScala, Gerber & Gruenewald, 2000, Ng K, Hung & Wong, 2002). An injury surveillance GIS for San Diego County was developed from a combination of several existing data sources that showed cause-effect relationship between different types of traffic crashes and several community based programs (Pierce et al., 1999). GIS has also been used to study patterns of intentional injuries and abuse with geographical locations (Midford et al., 1998, Earnst, 2000). It is of great importance to examine the social context of health-related behaviours and identify geographical areas and population groups that are at high risk of injury. A study conducted in Texas, US, used spatial scan statistics with GIS and regression methods to identify mortality clusters due to accidental poisoning and demonstrated the spatiotemporal variations in risk and clustering by gender and race/ethnicity (Nkhoma, Hsu, Hunt & Harris, 2004).

The Institute for Clinical Evaluative Science has developed a series of atlases including an atlas entitled "*Injuries in Ontario*" (Macpherson, Schull, Manuel, et al., 2005)
. A Canadian Study (Alberta) investigated the geography of fall injuries among elderly, using GIS (Yiannakoulias et al., 2003).

Knowledge Translation and Injury Prevention

In addition to the development of risk profiles, the web-based technology had enhanced the use of GIS and has led to the development of web-based mapping, which allows a broad audience to access health determinant datasets and run quires of interest on-line (Cusimano et al., 2007).

Challenges and Limitations

The quality of the data is paramount in any population-based study. The validity and robustness of the data at the level of interest determines the ability of geomatics to inform the process of prevention. Privacy issues and laws in many countries limit the ability to collect and use data in ways that can deal with community-level issues. When undertaking geographical analysis, it is important to consider the issue of ecological fallacy. Such issues arise when assumptions are made about a group or cluster. For example, it cannot be assumed that people living in high-risk areas are directly represented by the general characteristics of those areas. Bias in ecological studies can include modifiable areal unit problems as well as, not accounting for long-term exposures (e.g. carcinogens) that may develop over time in many studies. "Although GIS can show association of community-based data with injury based data, it on-its self cannot infer causality. However, it can inform the interpretation of causal relationships in several ways. GIS can provide a rational basis for causality; it can assess dose-response effect and risk exposures" (Cusimano et al., 2007). It can also be used as an analytical tool before and after an intervention.

Conclusion:

Geomatic provides an innovative and comprehensive approach in disease and injury surveillance, and in the planning and evaluation of health promotion and prevention programs. It provides a framework with considerable opportunities for various disciplines within public health to come together to combat the burden of disease and injury at various geographical levels.

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Appendix C

Research themes- Discussion with Dr. Nadine Schuurman

Meeting with Dr. Nadine Schuurman

The purpose was to discuss efficient ways of using administrative data and the socioeconomic data by conducting spatial analysis. The project of interest was child pedestrian injury and identifying contributing social and environmental factors towards pedestrian injuries

Meeting to date: 2 (Oct 10th and Oct 23rd)

Summary of issues discussed:

Brief overview was provided by Dr. Schuurman and Ian Pike on the work done by each of their teams/units.

Work on environmental factors and its impact on pedestrian injuries is underway by Dr. Schuurman and Dr. Morad Hameed.

The discussion gave rise to many interesting research themes and questions. The purpose was to identify the health, spatial and social indicators related to pedestrian injuries.

A summary of ideas is presented below

Child pedestrian injuries:

1. To examine the trends and patterns of child pedestrian injuries over 10-13 year period, in BC. (Morbidity and mortality profile). (Using trauma/hospital discharge data)

    - Exploratory study; indicating place, injury type, involved vehicles, drivers, weather, demographics
    - Identify clusters of neighborhood involved

2. Exploring the identified indicators: Environmental, Social and cultural factors
3. Identify the association between the environmental, social and cultural factors
4. Utilizing the identified contributors towards designing, enforcing and evaluating interventions. These interventions could be environmental, educational or enforcement of policies

Environmental factors / engineering factors/ road network may include

Traffic calming measures

- ✓ Traffic volume
- ✓ Traffic calming density per km road length
- ✓ Speed limits
- ✓ Signals
- ✓ Posted signs

Road structure/layout:

- ✓ Speed bumps
- ✓ Narrow streets, one-way/two-ways
- ✓ Cross walks
- ✓ Road length
- ✓ Average distance between features
- ✓ Residential streets
- ✓ Separation of drive ways from children's play area
- ✓ Road closures/ median barriers/ traffic circles

Surrounding structures:

- ✓ Playgrounds
- ✓ Schools
- ✓ Parking area/ parked vehicles
- ✓ Absence of fence around home
- ✓ Bars and pub
- ✓ Landuse and proximity to roadways

Other measures:

- ✓ Evaluating the impact of public transport policies
- ✓ Identifying social and cultural contributors to pedestrian injuries
- ✓ Income per household
- ✓ Number of children per household, GINI index, lone parents, maternal age, level of education, employment, deprived neighborhood (related to exposure)

The second meeting on Oct 23rd:

- Discussion was focused on ways to validate the established injury indicators for child and youth

Appendix D

Teleconference with Dr. Dean

- A teleconference was organized and Dr. Dean, Dr. Brussoni and Khairun were on the call.
- Dr. Dean offered to look at the existing data on injury and provide consultancy and training, (if required) on spatial epidemiology specific to injury data, currently collected/accessed by the unit
- Dr. Dean agreed to share some statistical papers for a better understanding of spatial analysis and its application
- Dr. Dean recommended we come up with a focused research topic, this would enable her team to provide spatial consultancy more efficiently

Appendix E

Meeting for Deliverable 3.2.4

Attendees: Clyde Hertzman, Ian Pike, Shelina Babul, Shannon Piedt and Khairun Jivani

Venue: BCIRPU

Date: Sep18th, 2007

Agenda:

- Discuss the role and current activities of BCIRPU and HELP
- Discuss potential grounds/areas for collaboration with HELP

Dr. Hertzman was introduced to the attendees and an overview of BCIRPU was provided by Ian and Shelina.

Dr. Hertzman briefly talked about the success of Early Development Instrument (EDI), its sustainability and the process which has been established to obtain data on an annual basis from the school districts. While discussing the new upcoming projects, Dr. Hertzman brought forward two potential collaborative proposals which were to:

1. Establish partnership with the Population and Public Health and Learning Observatory (PHLO) team
2. Develop an atlas parallel to the EDI (Early Development Instrument) atlas and identify injury indicators which could be implemented along with the EDI indicators in various school districts.

Partnering with PHLO

Population, Public Health and Learning Observatory (PHLO) was established through a Canada Foundation for Innovation (CFI) infrastructure grant, awarded in 2004, and has received matching funds from the British Columbia Knowledge Development Fund, through the Ministry of Advanced Education.

PHLO intends to provide a platform to the research community. The purpose is to provide a 'one-stop shop' for access to case-linked longitudinal data held by various partners of the PHLO, to multidisciplinary researchers for their studies of interest. This would ensure a streamlined application and approval process with one central contact. The partners are listed on PHLO website www.phlo.ubc.ca.

For BCIRPU to partner, the process would require procedures such as ensuring secure data access, establishment of privacy act agreement, approval and implementation of

data security actions for an on-going data import system and other relevant measures may be required to operationalize this partnership.

Contact provided:

Nancy Meagher, Executive Director
Tel: 604.822.1370
Email: Nancy.Meagher@ubc.ca

Injury Atlas

The "Injury Atlas" would serve as a population-based tool for assessing the trends and patterns of injuries among children (aged between 0 and 5 years), consequences of injury and its impact on child development and quality of life. The identified injury indicators parallel to EDI measures would assist in understanding the relationship of various indicators and injury trends at a community level (e.g. SES, employment, education level, population density, intervention programs). These measures (stated below) would help the communities/government and other related bodies in planning polices and preventive interventions. It would also help to identify population at risk (vulnerability).

EDI measures include:

- Physical health and well-being
- Social competence
- Emotional maturity
- Language and cognitive development
- Communication skills and general knowledge

Two options were proposed for this task.

1. To utilize the expertise of the HELP mapping team and provide them with ten years of hospitalization data to develop an injury atlas parallel (similar) to the EDI atlas, using the same geographical boundaries, clusters and programming. The content, measures, definitions, and other relevant details of the "injury atlas" would be determined by BCIRPU. (option of choice for Dr. Hertzman)

2. The second option would require BCIRPU to conduct the analyses and develop the atlas, using the HELP spatial template for programming of postal codes, clusters and boundaries.

Contact Provided:

Lori Irwin (lead on the mapping team) - Lori.Irwin@ubc.ca

Other potential ideas revolved around various studies being conducted in partnership with HELP. For example, currently data is being collected on different languages spoken

at a household level. Using the linked data base system (PHLO), it would be interesting to explore and understand the impact of cultural diversity on injury trends. This would be a long term potential project.

Overall, it was evident that Dr. Hertzman had a great interest in 'thickening data' for children and for establishing a unified platform of linked databases from multidisciplinary sectors, such that researchers from various disciplines could access the longitudinal data of interest from a central stream. The linked data would also enable researchers to track cases on an individual basis.

Next Steps:

1. Review the ideas
2. Set up a meeting with the GIS team to discuss the cost, procedure and options to implement the task of developing an atlas