# Application of GIS Hospital Injury Surveillance System on identification of risk factors for playground injuries

# GIS Injury Surveillance as a tool for community engagement

CB Chow

# Project Team

- Collaboration:
  - Caritas Medical Centre
  - Playright Children's Play Association
  - Princess Margaret Hospital
  - Kwai Tsing Safe Community and Healthy City Association
  - Sham Shui Po Healthy and Safe Community Association
- LCSD
- Housing Authority

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# Background

- Injury is the **leading cause of mortality and disability** among children[1,2]
- Sports injury is one of the significant contributor
  - 32% of paediatric life-threatening injuries were related to sports[3]
- **Playground** is an important context
- Risk factors related to playground injuries have been well studied in Western developed countries but **such knowledge in Hong Kong is still lacking**

1. Krug, E.G., et al., *The global burden of injuries*. Am J Public Health, 2000. **90**(4): p. 523-6.
2. Polinder, S., et al., *Burden of injury in childhood and adolescence in 8 European countries*. BMC public health, 2010. **10**(1): p. 45.
3. Meehan III, et al., *A substantial proportion of life-threatening injuries are sport-related.* Pediatric emergency care, 2013. **29**(5): p. 624.

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Injury

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# Development of an electronic emergency department-based geo-information injury surveillance system in Hong Kong

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ABSTRACT

*Objectives:* To describe the experience in the development of an electronic emergency department (ED)-based injury surveillance (IS) system in Hong Kong using data-mining and geo-spatial information technology (IT) for a Safe Community setup.
*Methods:* This paper described the phased development of an emergency department-based IS system based on World Health Organization (WHO) injury surveillance Guideline to support safety promotion and injury prevention in a Safe Community in Hong Kong starting 2002.
*Results:* The initial ED data-based only collected data on name, sex, age, address, eight general categories of injury types (traffic, domestic, common assault, indecent assault, batter, industrial, self-harm and sports) and disposal from ED. Phase 1 – manual data collection on International Classification of External Causes of Injury pre-event data; Phase 2 – manual form was converted to electronic format using web-based data mining technology with built in data quality monitoring mechanism; Phase 3 – integration of injury surveillance-data with in-patient hospital information; and Phase 4 – geo-spatial information and body mapping were introduced to geo-code exact place of injury in an electronic map and site of injury on body map.
*Conclusion:* It was feasible to develop a geo-spatial IS system at busy ED to collect valuable information for safety promotion and injury prevention at Safe Community setting. The keys for successful development and implementation involves engagement of all stakeholders at design and implementation of the system with injury prevention as ultimate goal, detail workflow planning at front end, support from the management, building on exiting system and appropriate utilisation of modern technology.


*The **Asian Pacific ICT 2009 Award** in Melbourne - Merit Award in E Health*


*Silver Award of the **HKICT 2009** in the Category of Best Public Service*

# Implementation of Surveillance System in an Emergency Department for Injury Prevention and Public Health Surveillance

# 傷害監察系統在預防傷害及公共衛生的應用

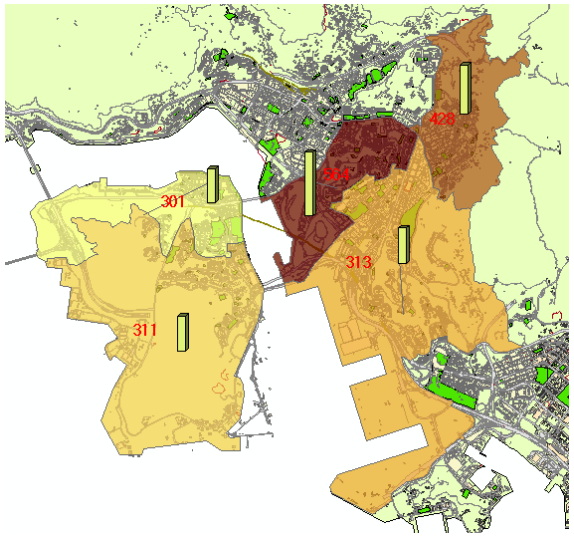
**CB Chow, Leung Ming, Adela Lai, YH Chow**

Centre for Safety Promotion and Injury Prevention

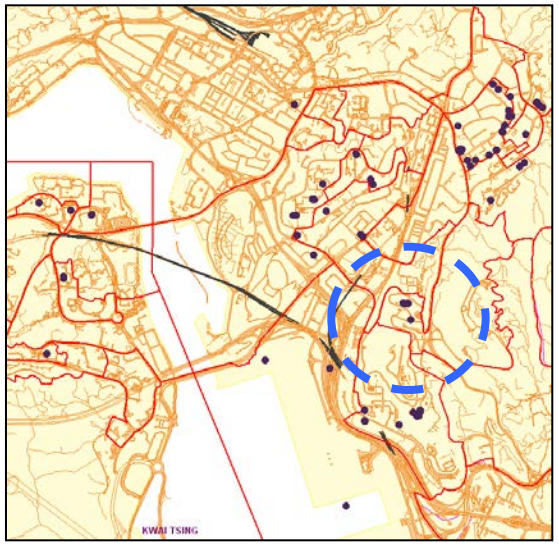
**Kwai Tsing Safe Community and Healthy City**

**Princess Margaret Hospital**

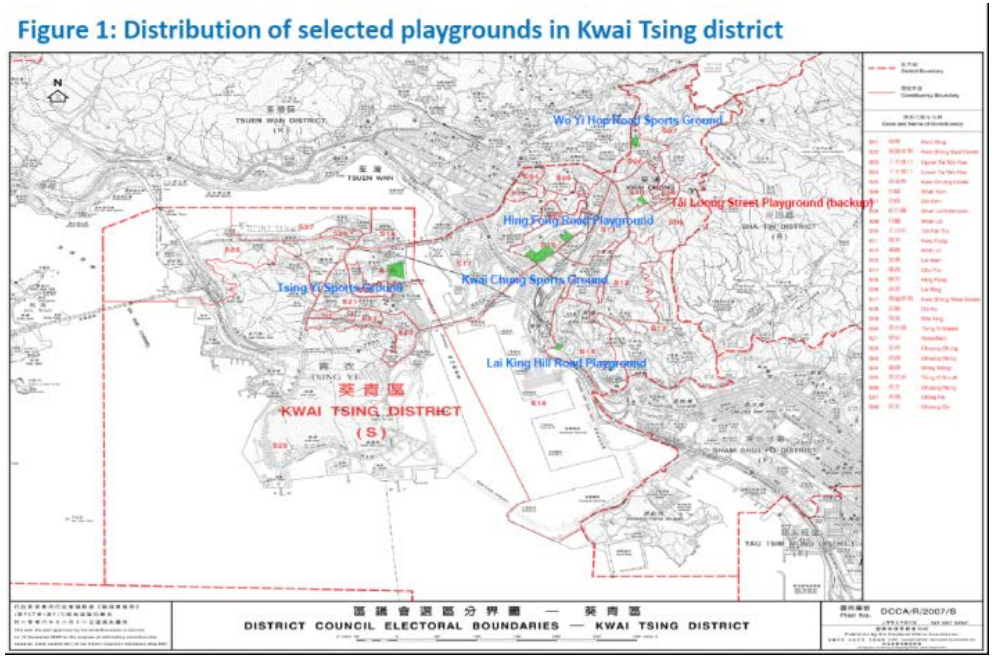
## Self harm and SES
## 自殘和社經水平



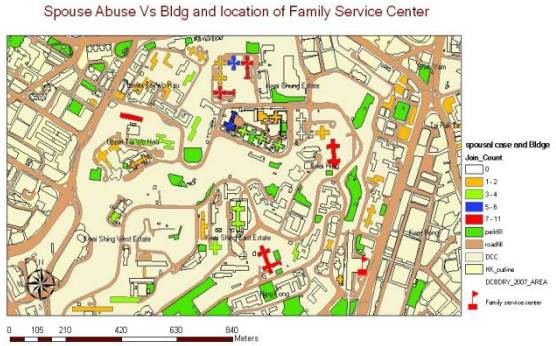

## Cluster of severe elderly falls 老人跌倒

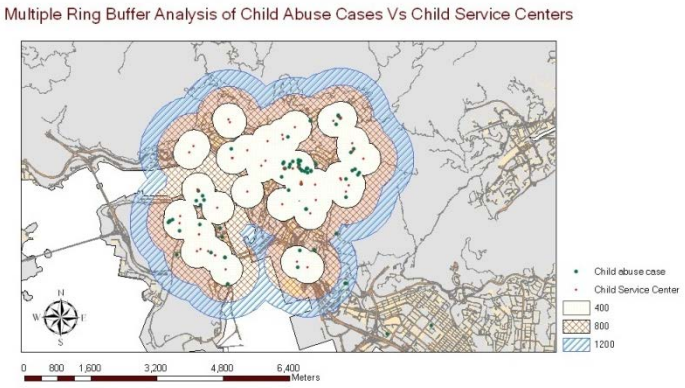



## Playground & sports 運動



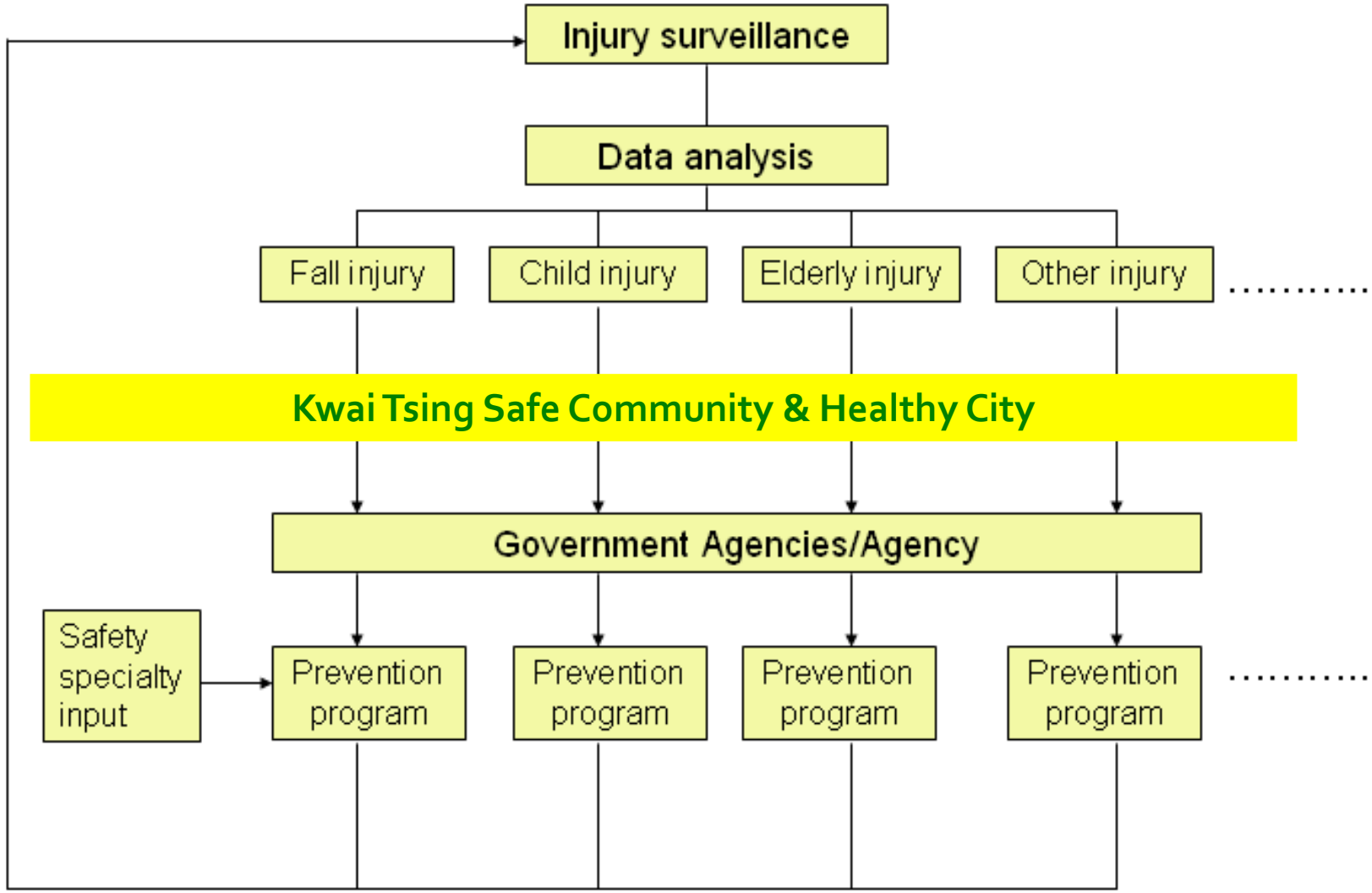

## Interpersonal violence- abuses 暴力




## Hot zones for traffic injuries 交通意外

# Inter-sectoral partnership & community engagement



Community engagement

+

Collaborative Multiplier Model

## Collaboration Multiplier Example: Traffic Safety Coalition

**Goal: Decrease traffic-related crashes and fatalities**

**Phase I: Information Gathering**

(This is a sample; expected levels of detail would be greater)

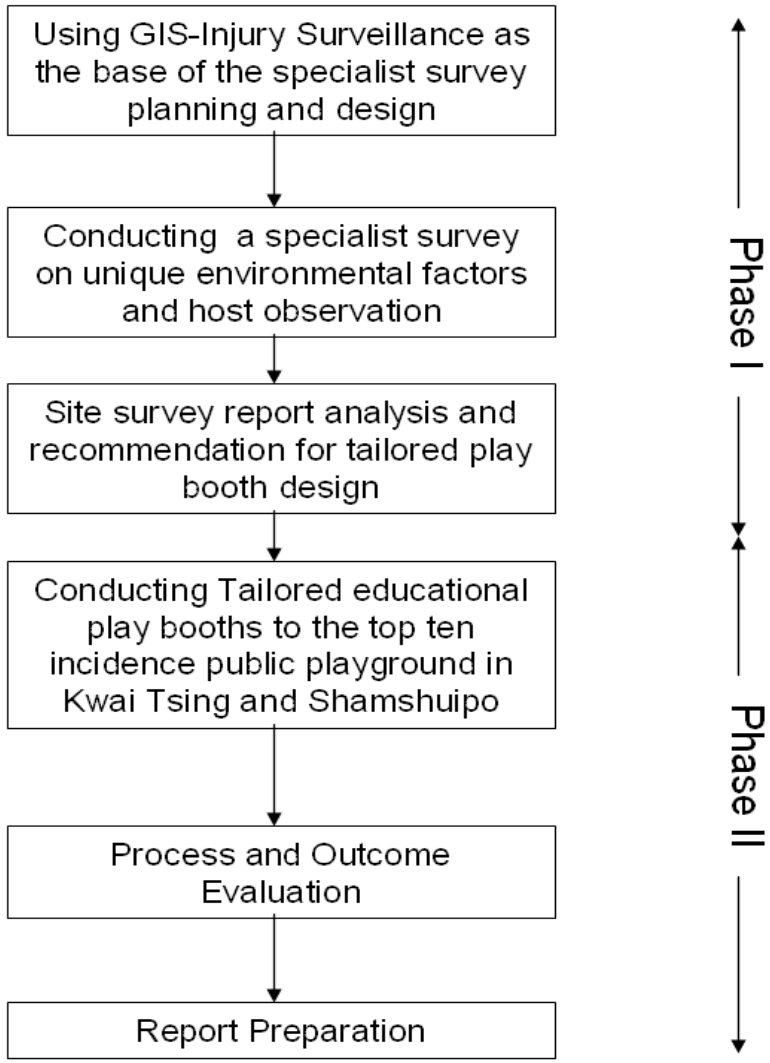
| | Expertise | Desired outcomes | Strategies |
|---|---|---|---|
| District Council | Community engagement<br>Monitor implementation of rules and regulation | Reduce injuries due to bicyclists, sports, pedestrians | Facilitate and monitor environmental and policy changes – bicycle and pedestrian friendly |
| Public health | Data collection of injury rates<br>Population & risk based prevention approach | Reduce injuries due to bicyclists, sports, pedestrians | Facilitate environmental and policy changes – bicycle friendly, warming before sports, wearing of protective gears |
| Law enforcement | Legal requirements and injury investigations and has the authority to enforce laws | Increase compliance to traffic safety laws – children under 11 should not ride in main road<br>Legislate on helmet use | Enforce traffic laws, implement check points, participate in educational campaigns |
| Road engineering | Road and sidewalk design that provide safe cycling | Prevent traffic crashes and reduce severity of injuries | Promote safety regulations for cyclists, implement road design that promote safety |
| Sports experts | Safety measures in sport and bicycling | Reduce injuries due to sports and bicycling | Facilitate environment and policy change<br>Participate in education and training |
| LCSD | Management of sports facilities, regulate on use of sports facilities, training on sport safety, | Reduce injuries due to sports and bicycling | Enforce regulation on use of sports facilities, use of safety measures etc |

# Aims of this study*

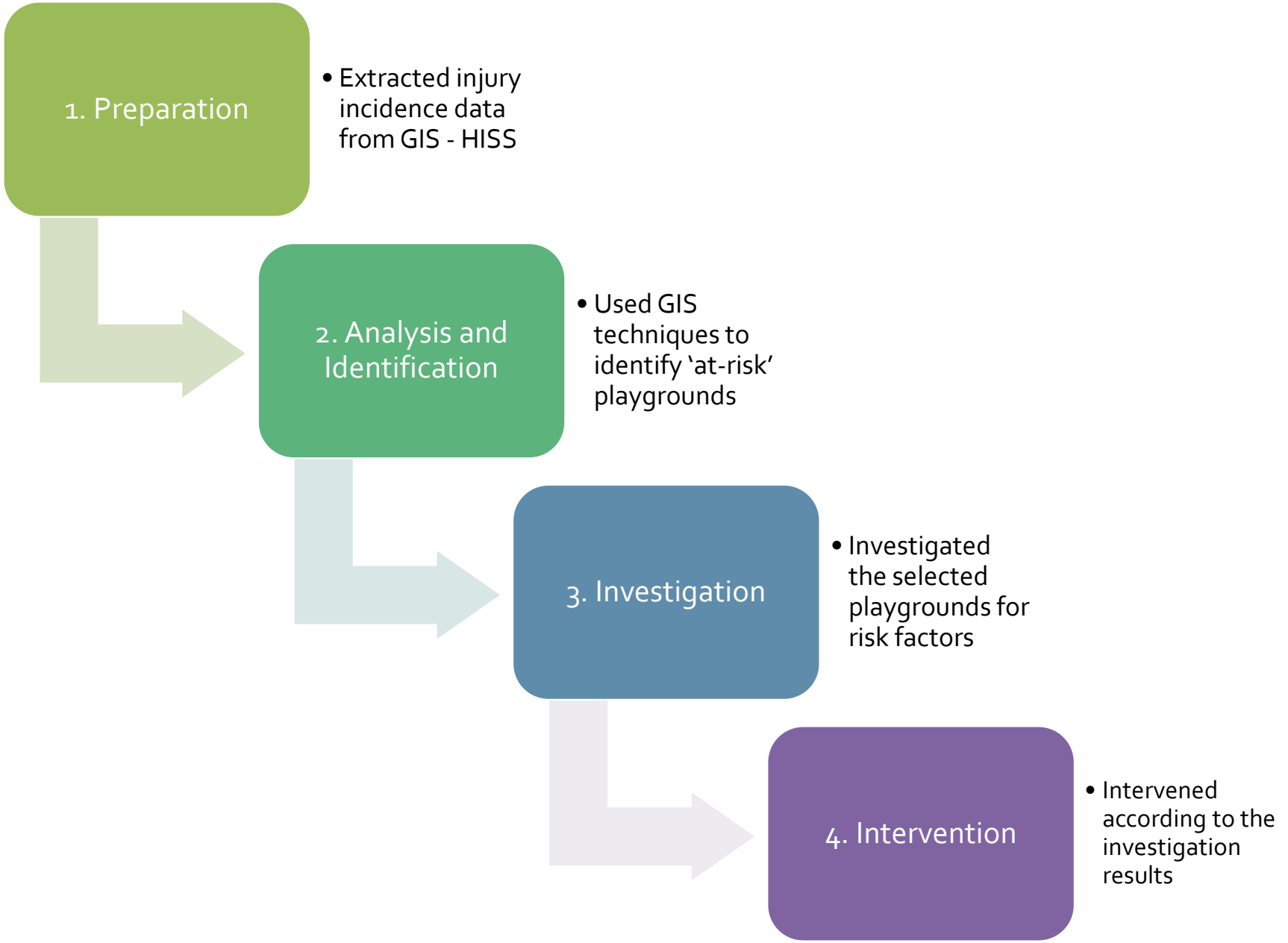
- **Identify the risk factors** for playground injuries in Kwai Tsing and Sham Shui Po
- **Illustrate how the GIS hospital injury surveillance system** (GIS-HISS) **could facilitate injury research** and help to reduce playground injury in Hong Kong

* The project was funded by the Health Care Promotion Fund

# PROJECT PHASES OUTLINE



# Methods – Flowchart of study



# Methods –

# 1. Preparation

**Extracted injury incidence data from GIS -HISS of**
**Princess Margaret Hospital (PMH) and Caritas Medical Centre (CMC)**

- HISS is a injury surveillance system implemented in **hospital AED**
  - Implemented since 2002
  - Data **shown reliable previously**[1]
- Injury episodes were included if:
  - The patients attended AED in PMH and CMC from January 2009 to June 2011
  - The patients aged below 13
  - The injury was playground or sports related
- The data was then geocoded and input into a **Geographical Information System** (GIS) for analysis

1. Chow, C.B., et al., *Development of an electronic emergency department-based geo-information injury surveillance system in Hong Kong.* Injury, 2012. **43**(6): p. 739-48.

# Methods –

# 2. Analysis and Identification

**Used GIS techniques to identify 'at-risk' playgrounds**

- Spatial scan statistics were used to find **injury spatial clusters**
- Constructed **spatial buffer circles for each playground** in the two districts
- Counted the number of relevant injury episodes for each playground
- Selected 10 'at-risk' playgrounds that had the highest **number of injury episodes in proximity** and were **near public housing estates**
- Examined the temporal pattern of injury for site survey

# Spatial mapping

- Injury data retrieved from HISS was analysed according to the number of injury among aged 0 to 14 recorded in each of the Tertiary Planning Unit in Kwai Tsing and Sham Shui Po districts.
- Injury incident locations were coded in coordinates using the Hong Kong 1980 grid projection scheme in HISS. These coordinates with other clinical information were retrieved and input into a geographic information system (GIS) using the same projection scheme.
- Base map and administrative partitioning data used were provided by the Lands Department. Environmental data, including playground size, location and number of equipment, accessibility and estimated distance to surrounding community were obtained from the Leisure and Cultural Services Department with Google Map satellite images as supplement and site survey observations.

# Methods –

# 3. Investigation

**Investigated the selected playgrounds for risk factors**

- Site surveys were conducted in the 10 selected playgrounds by a Certified Playground Safety Inspector (CPSI)
- During the investigation, the CPSI observed using a standard checklist:
  - **Equipment** risk factors, and
  - **Behavioural** risk factors

# Results –

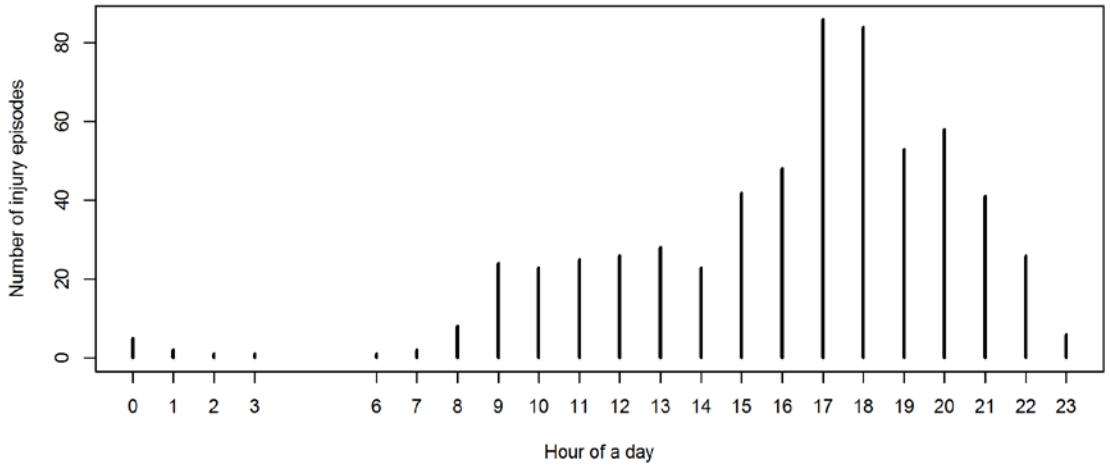
# Data retrieved from HISS

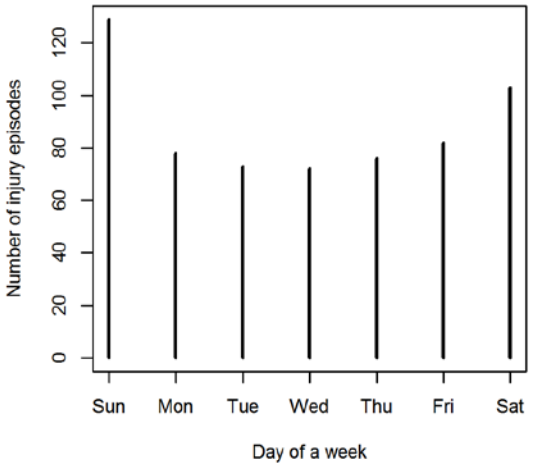
- Totally 613 relevant AED attendance were identified in Sham Shui Po and Kwai Tsing

| | n | % |
|---|---|---|
| **Age** | | |
| 3 or below | 106 | 17.3 |
| 4 to 6 | 161 | 26.3 |
| 7 to 9 | 147 | 24.0 |
| 10 to 12 | 199 | 32.5 |
| **Gender** | | |
| Female | 179 | 29.2 |
| Male | 434 | 70.1 |
| **District** | | |
| Kwai Tsing | 295 | 48.1 |
| Sham Shui Po | 318 | 51.9 |
| **Outcome** | | |
| Admitted | 105 | 17.1 |
| AED FU / Refer to OPD | 126 | 20.5 |
| Discharged home | 367 | 59.9 |
| Others | 15 | 2.4 |
| **Total** | **613** | **100.0** |

# Results –

# Temporal pattern



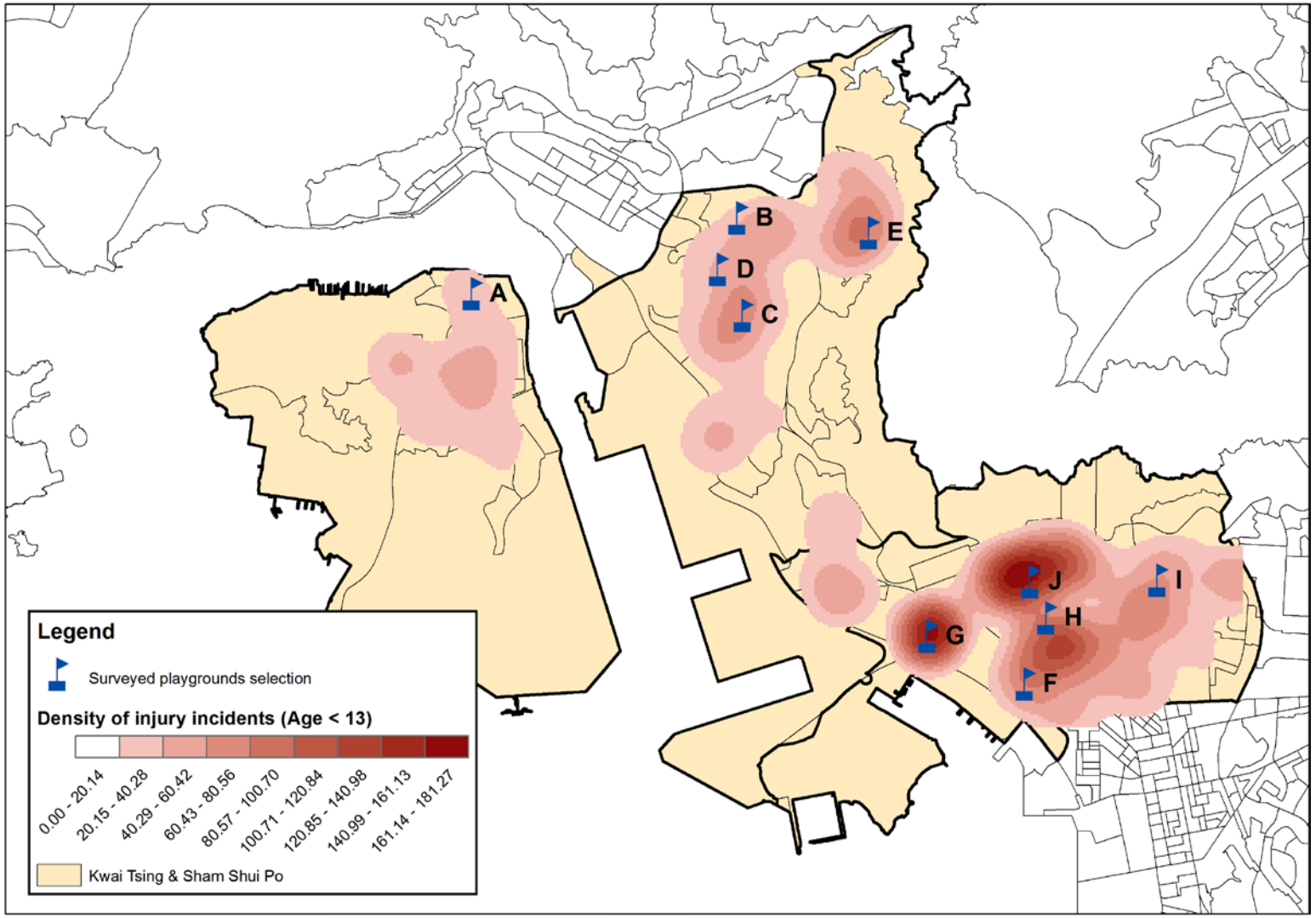

- Attendance **clustered at afternoon and early evening** in **Saturdays** and **Sundays**
- Consider time lag between injury and AED attendance, we decided to conduct the site surveys on Saturdays and Sundays, from 10:30 to 13:00 and 14:00 to 16:30

# Results –

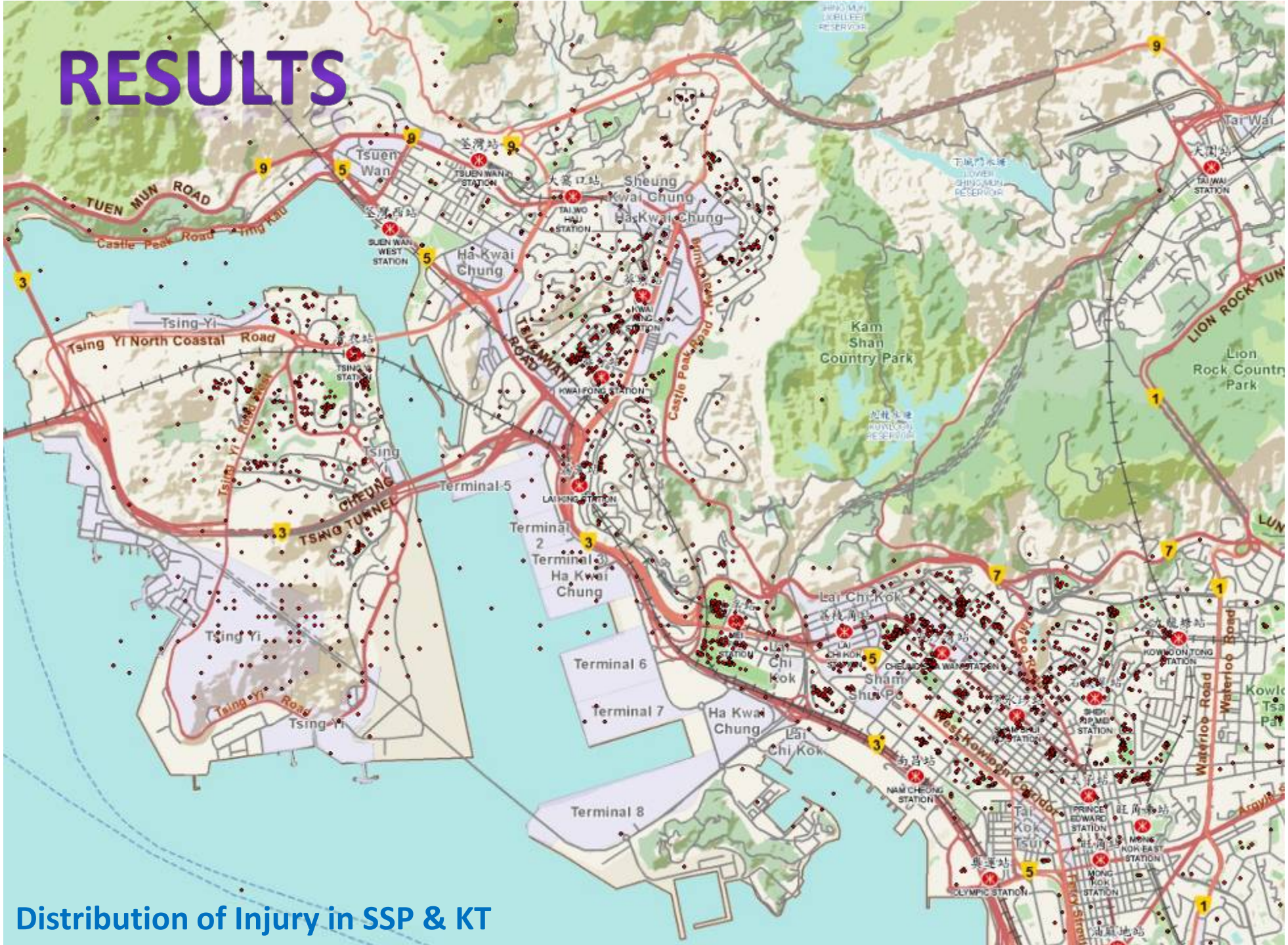
# ‘At-risk’ Playgrounds selected

Consistent with previous reports, there were **significant spatial clustering** in relevant injury episodes

Moran’s I = 0.12 ($p < 0.0001$)

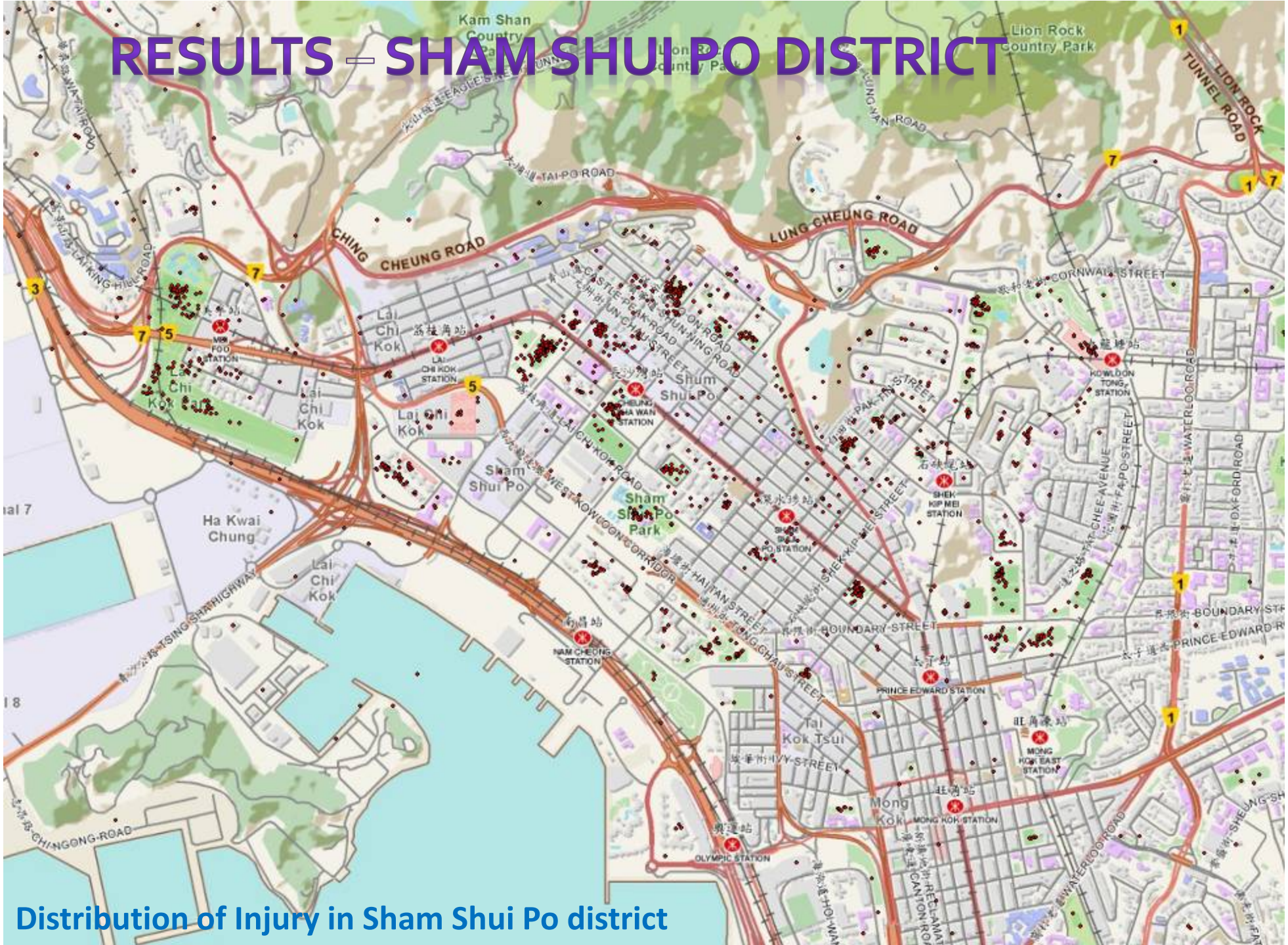


# RESULTS




## Distribution of Injury in SSP & KT

# RESULTS – SHAM SHUI PO DISTRICT




**Distribution of Injury in Sham Shui Po district**

# RESULTS – KWAI TSING DISTRICT

## Table 3: Surrounding environment of the selected playgrounds in the Kwai Tsing district

| Playground | Kwai Chung Sports Ground | Hing Fong Road Playground | Tsing Yi Sports Ground | Lai King Hill Road Playground | Wo Yip Hop Road Sports Ground | Tai Loong Street Playground |
|---|---|---|---|---|---|---|
| Housing[1] | - Kwai Shing West Estate<br>- New Kwai Fong Gardens<br>- Kwai Fong Estate | - Kwai Fong Estate<br>- Hang King Garden<br>- Sun Kwai Hing Garden<br>- Kwai Hong Court | - Tierra Verde<br>- Tivoli Garden<br>- Serene Garden | - Lai King Estate<br>- Cho Yiu Chuen<br>- Yin Lai Court<br>- Yuet Lai Court | - Shek Wai Kok Sun Estate<br>- Shek Yam Estate<br>- Ning Fung Court | - Shek Lei Estate<br>- The Apex<br>- Po Sing Centre<br>- Kwai Sing Centre |
| No. of schools | | | | | | |
| Kindergarten | 4 | 5 | 8 | 3 | 8 | 6 |
| Primary | - | 4 | 5 | 3 | 5 | 2 |
| Secondary | 4 | 3 | 1 | 3 | 3 | 3 |
| Large shopping mall | - Metroplaza<br>- Kwai Chun Plaza | - | - Maritime Square | - | - | - Shek Lei Shopping Centre and Market |
| MTR station | Kwai Fong | Kwai Hing | Tsing Yi | Lai King | - | - |

[1]Included housing types: Private, public and shared ownership housing scheme.

# RESULTS – SHAM SHUI PO DISTRICT

## Table 4: Injury incidents in selected playground areas of Sham Shui Po district

| Playground | Shek Kip Mei Park (n=223) | Fa Hui Park (n=223) | On Road Playground (n=130) | Sham Shui Po Park (n=79/80) | Lai Chi Kok Park (n=31/54/79) | Cheung Sha Wan Sports Ground (n=225) |
|---|---|---|---|---|---|---|
| Area name (Code[1]) | Yau Yat Tsuen (F19) | Yau Yat Tsuen (F19) | Lei Cheng (F17) | Fu Cheong (F8)/ Lai Kok (F9) | Mei Foo South (F12)/ Mei Foo Central (F13)/ Mei Foo North (F14) | Fortune (F10) |
| Population[1] | 15,631 | 15,631 | 13,069 | 16,655/ 15,501 | 17,724/ 13,580/ 16,599 | 19,692 |
| No. of injuries among aged 0-15 (%) | 53 (23.77) | 53 (23.77) | 41 (31.54) | 36 (45.57)/ 36 (45.00) | 7 (22.58)/ 11 (20.37)/ 14 (17.72) | 60 (26.67) |
| No. of hospital admission | 12 | 12 | 6 | 7/6 | 1/1/3 | 16 |
| Day(s) of hospitalization | 1-6 | 1-6 | 1-6 | 1-11/ 1-5 | 1/1/1-5 | 1-3 |

[1]Area code and population are based on the categorization of the Electoral Affairs Commission, Hong Kong: version 2007 used in this table and version 2010 for GIS mapping

# Site inspection

- Safety inspection – to identify any potential safety hazards that may cause playground accidents
  - Results: all conformed to basic requirement of standards

# Results –

# Playground equipment risk factors

| | Kwai Tsing | | | | | Sham Shui Po | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Playground** | Cheung Fat | Kwai Chung | Kwai Fong | Kwai Shing East | Shek Lei | Fu Cheong | Hoi Lai | Lai Kok | Pak Tin | Un Chau | **Total** |
| **Label** | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) | |
| **Equipment checklist** | | | | | | | | | | | |
| **Head / Neck Entrapment Hazard** | | | | ✓ | | | ✓ | ✓ | | ✓ | 4 |
| **Sharp points / edges** | | ✓ | | ✓ | | | | | | | 2 |
| **Impalement Hazard** | | | | | | | | | | | - |
| **Entanglement Hazard** | | | | | | | | | | | - |
| **Crush and shear points** | | | | | | | | | | | - |
| **Suspended Hazard** | | | | | | | | | | | - |
| **Tripping Hazard** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| **Fall Hazard** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| **Impact Hazard** | ✓ | ✓ | ✓ | | | | ✓ | | | ✓ | 5 |
| **Finger Entrapment Hazard** | | | | | | | | | | | - |
| **Foot Entrapment Hazard** | | | | | | | | | | | - |
| **Body Entrapment Hazard** | | | | | | | | | | | - |

# Playground observations

- Observation of play activity in playground - to observe children's activities and risk-taking behaviour on playgrounds; and to assess any playground injuries that associated with children's activities and behaviours

- Ten observations were carried out on Saturdays during the period of March to June 2012.
- For each of the selected playground, CPSI conducted observation at two time intervals, morning session: 10:30 to 13:00 and afternoon session: 14:00 to 16:30,

# Results –

# Playground behavioural risk factors

| | Kwai Tsing | | | | | Sham Shui Po | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Playground** | Cheung Fat | Kwai Chung | Kwai Fong | Kwai Shing East | Shek Lei | Fu Cheong | Hoi Lai | Lai Kok | Pak Tin | Un Chau | **Total** |
| **Label** | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) | |
| **Play pattern checklist** | | | | | | | | | | | |
| **Play on the play equipment with improper clothing** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| **Carry out age inappropriate activities** | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| **Improper use of equipment** | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| **Biking / skateboarding on playground** | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| **Play on the play equipment with improper footwear** | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| **Play on areas with abrupt level change** | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 8 |
| **Undertaking unnecessary risk** | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 8 |
| **Play on equipment lacking maintenance** | | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | 6 |
| **Play on slippery surface** | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | 5 |
| **Play on equipment under repair** | ✓ | | | | | | ✓ | ✓ | | ✓ | 4 |
| **Dress code / Belongings checklist** | | | | | | | | | | | |
| **Clothes with drawing hoods** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| **Jewellery / neck drawstrings** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| **School bags / backpacks** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | 9 |
| **Plastic bags / handy bags** | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 9 |
| **Slippers** | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| **High-heeled shoes** | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | 7 |
| **Caps / hats** | | | | | ✓ | | ✓ | ✓ | | | 3 |
| **Bare foot** | | | | | | | ✓ | | | | 1 |

# Summary of play pattern and dress code checklists in playground site survey

| | Kwai Tsing | | | | | Sham Shui Po | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Playground | Cheung Fat | Kwai Chung | Kwai Fong | Kwai Shing East | Shek Lei | Fu Cheong | Hoi Lai | Lai Kok | Pak Tin | Un Chau | |
| Playground label | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) | |
| Play pattern checklist | | | | | | | | | | | |
| Play balls or toys on play equipment | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| Play on the play equipment with improper clothing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| Eating on play equipment | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| Play on equipment occupied by adults | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| Play alone without adult supervision | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 9 |
| Carry out age inappropriate activities | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| Improper use of equipment | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| Biking / skateboarding on playground | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| Play on the play equipment with improper footwear | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| Play on areas with abrupt level change | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 8 |
| Undertaking unnecessary risk | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 8 |
| Play without proper supervision | | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ | 7 |
| Play on unclean equipment | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | 7 |
| Play on equipment lacking maintenance | | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | 6 |
| Play on slippery surface | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | 5 |
| Play on equipment under repair | ✓ | | | | | | ✓ | ✓ | | ✓ | 4 |
| Dress code / Belongings checklist | | | | | | | | | | | |
| Clothes with drawing hoods | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| Jewellery / neck drawstrings | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| School bags / backpacks | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | 9 |
| Plastic bags / handy bags | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | 9 |
| Slippers | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 9 |
| High heeled shoes | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | 7 |
| Caps / hats | | | | | ✓ | | ✓ | ✓ | | | 3 |
| Bare foot | | | | | | | ✓ | | | | 1 |

# Summary of supervision checklist in playground site survey

| | Kwai Tsing | | | | | | Sham Shui Po | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Playground | Cheung Fat | Kwai Chung | Kwai Fong | Kwai Shing East | Shek Lei | | Fu Cheong | Hoi Lai | Lai Kok | Pak Tin | Un Chau | | Total |
| Playground label | (A) | (B) | (C) | (D) | (E) | | (F) | (G) | (H) | (I) | (J) | | |
| Duration of unsupervised play | | | | | | | | | | | | | |
| Child not supervised for > 30 min | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 10 |
| Child not supervised for > 1 hour | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | 8 |
| Adult carers related (including parents and grandparents) | | | | | | | | | | | | | |
| Carers overlooked children's risk taking behaviours | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 10 |
| Carers did not providing adequate guidance | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 10 |
| Carers occupied seating and circulation spaces of play equipment | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 10 |
| Carers encouraged children to eat on play equipment | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 9 |
| Carers did not close monitor pre school child | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | 8 |
| Carers helped children to bring toys / fitness items | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | | 7 |
| Carers allowed child using elderly fitness facilities | | ✓ | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | 6 |
| Carers allowed inappropriate activities | | | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | | 5 |
| Carers occupied play equipment for sport games | | | ✓ | | ✓ | | | ✓ | | ✓ | ✓ | | 5 |
| Carers went directly elsewhere without monitoring children | | | ✓ | | ✓ | | | ✓ | | | ✓ | | 4 |
| Carers exercised using play equipment | | | ✓ | | | | | | | | | | 1 |
| Elder siblings / peers related | | | | | | | | | | | | | |
| Child learnt risk taking behaviours from peers | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 10 |
| Elder siblings forced child to take unnecessary risk | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 9 |
| Elder siblings did not properly supervise child | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | 9 |
| Elder siblings forced child to misuse equipment | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | | 5 |
| Child learnt risk taking behaviours from elder | | | | | | | | | | | | | |

- Trapping hazard


- Necklace

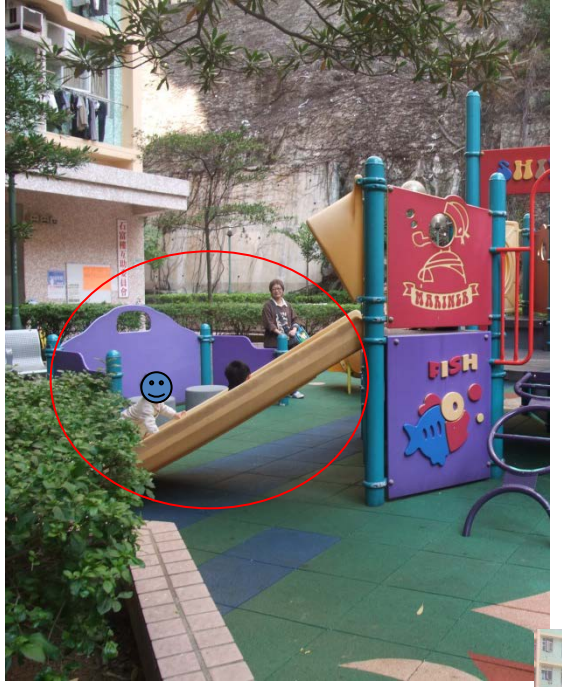
- Age inappropriate activities

- Taking unnecessary risk
- Entrapment hazard

- Taking unnecessary risk
- Improper use of equipment

- Taking unnecessary risk

- Taking unnecessary risk
- Fall hazard



# Risks activities

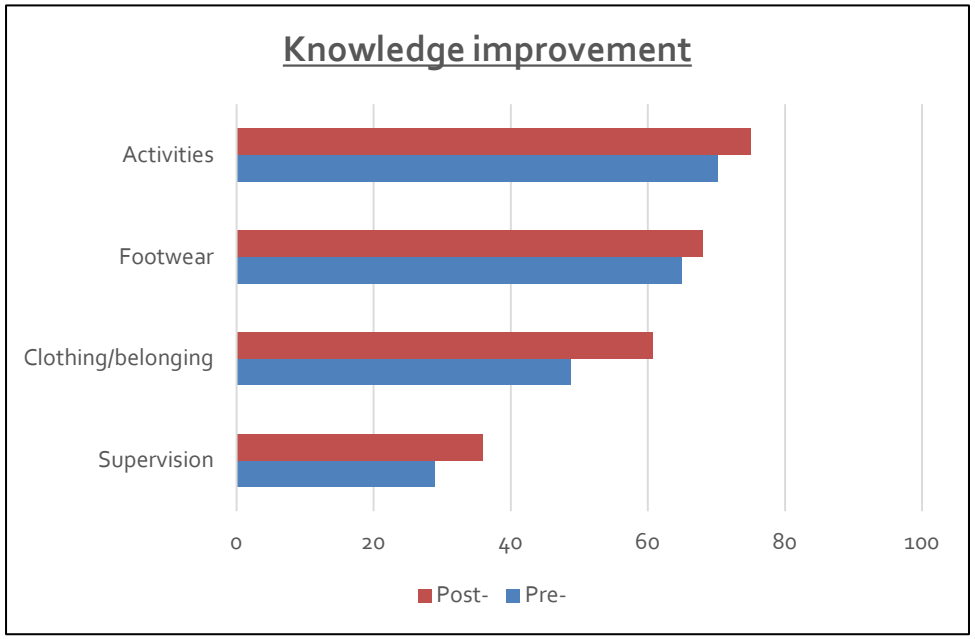
- The top four play risks which observed in all surveyed playgrounds were:
  - Play balls or toys on play equipment
  - Play equipment with improper clothing
  - Eating on play equipment
  - Play on equipment occupied by adults

# 10 risk behaviours

- Improper dressing
  - Slippers
  - Wearing of strings or necklace
  - School bags
- Improper way of playing
  - Climbing
  - Running
  - Jumping
- Improper supervision
- Access to nearby car parks
- Improper equipments – for elderly
- Improper age – 2 to 12 years

# Design of Intervention based on play pattern problems


- Observing the play pattern problems, **10 educational play booths** were conducted to educate the concept of 'play safe'
  - Used pre-post quasi-experimental design to evaluate knowledge gain




* All improvements were statistically significant ($p < 0.01$)

# Interventions –

with support from District Council, local community, LCSD, NGO - playright

2.1 Summary of the Core Activities

**物品不宜**

**Response to Finding:**
Improper Clothing

**Description:**
This activity is a searching game which carries the message that some accessories items such as necklaces, caps and backpacks are not suitable for children to bring with them in the playground because of potential strangulation hazards.

**腳上注意**

**Response to Finding:**
Improper Footwear

**Description:**
This activity is a slippers-kicking game which carries the message that wearing slippers and high-heeled shoes are easy to cause fall or impact on the play equipment or strike another.

**足球籃球禁止**

**Response to Finding:**
Playing Balls or Toys on the Play Equipment

**Description:**
This activity is a soft-ball bowling game which carries the message that playing football or basketball on the playground may cause impact hazards.

**成人看顧**

**Response to Finding:**
Lack of Supervision

**Description:**
This activity is puzzle games which carries the message that adult supervision is needed for children under age 12 playing on the playground. The extra large size puzzle is available also.

- Education materials to KG
- Education games & booths
- Pre- and Post questionnaire - Attitude & knowledge change

# Pre-Intervention Assessment

- Children & Parents are required to fill in a short questionnaire to show their knowledge on playground's behaviors

## For Children:

*( Canadian Paediatric Society, 2002 )*

- Choose suitable activities
- Wear proper clothing & footwear
- Long hair should be tied up
- Don't go in front of swings
- Don't climb over any guardrails
- Always slide sitting down facing forward
- Don't sit at the bottom of the slides
- Climb stairs or steps slowly
- Hold onto the handrails

## For Parents ( given a case ):

*( B A Morrongiello, A W Howard, L Rothman, M Sandomierski, 2009 )*

- The suitable age of their children behave in that way
- Whether their children perform the same behavior & whether they were worried about
- Whether children will be injured by performing such behavior
- How serious of the injuries you think

# Post-Intervention evaluation

- **Children / Parents will be asked to fill in the same questionnaire as before after they have fun in the Play Booth**
  - To find out whether they understand more about the safety behaviors in playground

# Summary of play booth intervention

| Playground | | Date of play booth event | Number of questionnaires | | |
|---|---|---|---|---|---|
| | | | Pre- | Post- | Matched |
| Kwai Tsing | Cheung Hong (A) | 24 November 2012 | 93 | 87 | 83 |
| | Kwai Chung (B) | 18 August 2012 | 94 | 77 | 76 |
| | Kwai Fong (C) | 1 September 2012 | 37 | 30 | 30 |
| | Kwai Shing East (D) | 29 September 2012 | 59 | 44 | 44 |
| | Shek Lei (E) | 15 September 2012 | 119 | 114 | 113 |
| Sham Shui Po | Fu Cheong (F) | 6 October 2012 | 100 | 69 | 69 |
| | Hoi Lai (G) | 25 August 2012 | 83 | 71 | 71 |
| | Lai On (H) | 27 October 2012 | 131 | 121 | 121 |
| | Pak Tin (I) | 13 October 2012 | 112 | 98 | 97 |
| | Un Chau (J) | 11 August 2012 | 150 | 140 | 136 |
| Total number of questionnaires collected | | | 978 | 851 | 840 |

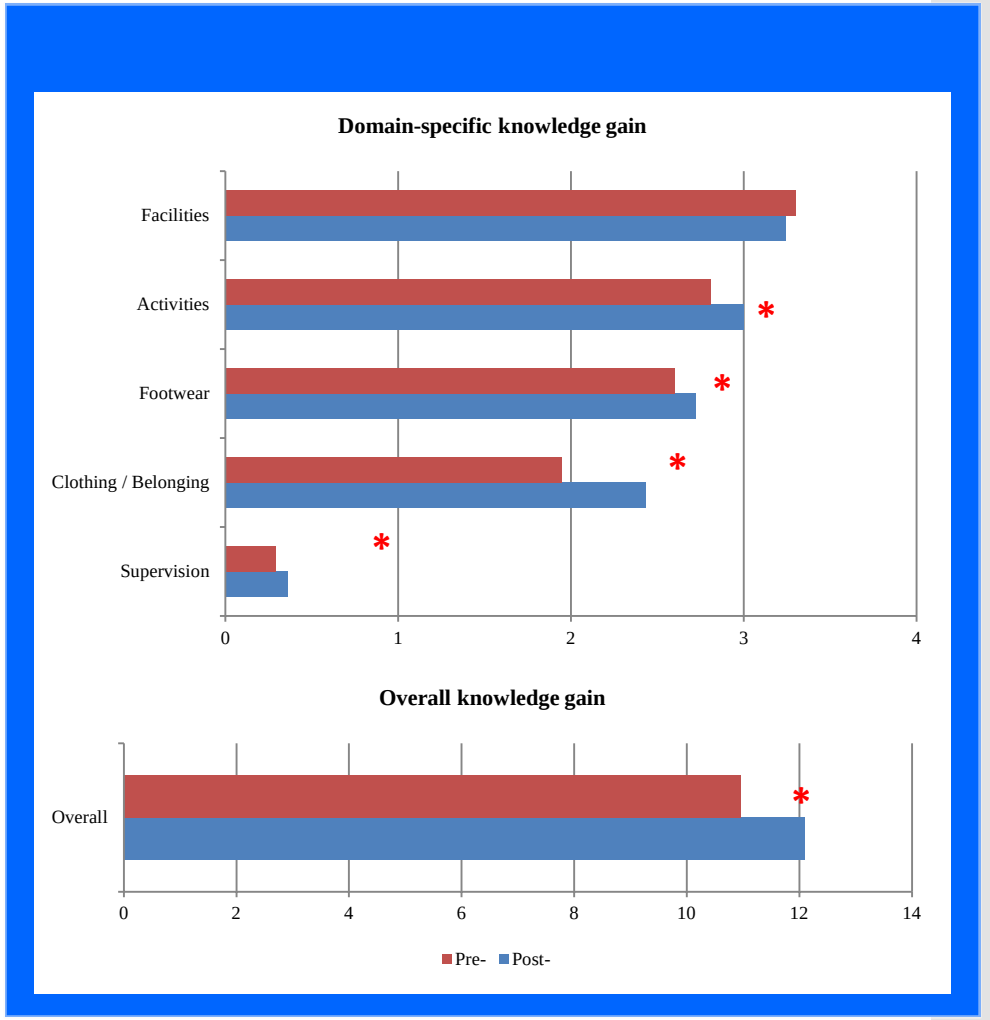
| Determinants | Coefficient Estimate | 95% CI | p value | |
|---|---|---|---|---|
| Age of child | | | | |
| ≤ 3 | 1.61 | 0.12 to 3.10 | 0.04 | * |
| 4 5 | 1.69 | 0.23 to 3.14 | 0.02 | * |
| 6 7 | 1.61 | 0.16 to 3.06 | 0.03 | * |
| 8 9 | 1.37 | -0.11 to 2.86 | 0.07 | |
| 10 12 | 1.69 | 0.10 to 3.27 | 0.04 | * |
| ≥ 12 | Ref | - | - | |
| Sex of child | | | | |
| Female | 0.05 | -0.40 to 0.50 | 0.83 | |
| Male | - | - | | |
| Age of parent | | | | |
| ≤ 25 | 1.26 | -0.45 to 2.98 | 0.15 | |
| 25 34 | 0.02 | -0.78 to 0.82 | 0.96 | |
| 35 44 | -0.23 | -1.00 to 0.54 | 0.56 | |
| 45 54 | -0.75 | -1.85 to 0.35 | 0.18 | |
| 55 64 | -0.46 | -1.49 to 0.57 | 0.38 | |
| > 64 | Ref | - | - | |
| Sex of parent | | | | |
| Female | 0.26 | -0.41 to 0.93 | 0.45 | |
| Male | Ref | - | - | |
| Education attainment of parent | | | | |
| Primary | -0.79 | -1.58 to -0.01 | 0.05 | * |
| Secondary Lower | -1.36 | -2.08 to -0.64 | 0.00 | ** |
| Secondary Upper | -0.64 | -1.37 to 0.08 | 0.08 | |
| Tertiary | Ref | - | - | |
| Parental perception of playground safety | | | | |
| Very safe | -0.05 | -1.70 to 1.61 | 0.95 | |
| Somewhat safe | 0.25 | -1.28 to 1.88 | 0.77 | |

# Knowledge gain of play booth intervention

| Questionnaire | Pre-test mean score | Post-test mean score | Mean score difference | p-value |
|---|---|---|---|---|
| Domain | | | | |
| Supervision | 0.29 | 0.36 | 0.07 | <0.01 |
| Clothing/belonging | 1.95 | 2.43 | 0.49 | <0.01 |
| Footwear | 2.60 | 2.72 | 0.12 | <0.01 |
| Activities | 2.81 | 3.00 | 0.17 | <0.01 |
| Facilities | 3.30 | 3.24 | -0.08 | 0.01 |
| Total | 10.95 | 12.10 | 1.18 | <0.01 |

# Results of education booth

- The use of educational play booth has successfully increased parents' knowledge level as well as attitude towards playground safety within a very short period of time.
- How long and any reduction in injury – not evaluated



# Conclusion

- This study has illustrated a systematic method in developing intervention for playground injuries:
  - Use of HISS data analysed spatially to locate injury hotspots
  - Provide the prerequisite for playground selection that to conduct site survey
  - Make use of site survey findings to develop educational play booth.
- In view of the heavy burden of playground injury among children, it is advisable to apply the current project's practice in 18 districts of Hong Kong to reduce the risk of injury in playgrounds.

# Implication and Conclusion

- Play equipment was generally safe
  - Attention should be particularly paid to mats that may cause tripping
- **Behavioural risk factors** in playgrounds appeared to be quite common
  - Improper clothing
  - Taking unnecessary risk
  - Improper supervision
- **Educating** parents and children the concept of 'play safe' may be useful
- The **HISS served as an important tool** for conducting tailored epidemiological research and intervention in injury