

A geographical study of child injury in Hong Kong: Spatial variation among 18 districts

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Key messages

1. Around 30% of injuries are avoidable

From 2001 to 2012, there are a total of 742,552 child injuries leading to AED (Accident and Emergency Department) attendances in Hong Kong. This is equivalent to 61,879 cases per year with a direct medical cost of HK\$43 million per year. The childhood injury rate varied widely among the 18 Districts. If the injury rate of all other districts can be reduced to the rate level of the lowest one, a total of 19,488 injuries could potentially be prevented per year, amounting to 31.5% reduction per year.

The concept of potentially avoidable injury encourages accountability for injury reduction among districts. It helps injury prevention planning as it can identify injury causes that are of high burden by comparison, quantifies the reduction target and encourages further injury reduction to the lowest achievable in the territory.

2. Injury pattern varies across districts

Risks of different injury types in children aged 0 to 19 showed considerable variations among the 18 districts. Although the attendance rate has decreased for all types of injury over the 12 years with the exception of child abuse, further heat-map analysis illustrates the improvement in rankings can be achieved in comparison with peer districts. The change in rankings for unintentional injury showed less variation in each district across years. In other words, those with higher rankings in the past are more likely to perform the same in later periods. For example, industrial injuries are clustered at industrial areas like Tai Po, Tuen Mun and Kwai Tsing and the ranking among 18 districts are similar across years. For traffic injuries, the districts located in the northern and southern part of Hong Kong

consistently had higher risks. This suggests that unintentional injury may be more related to environment and location.

3. Higher socioeconomic status (SES) districts associated with lower risk of injury

For child injury as a whole, regression analysis showed that injury is associated with socioeconomic status. Among the four social indicators, decreasing average household size, increasing median household income and increasing labour force participation rate are significant protective factors. Male is more susceptible to injury as well, after controlling for the four social indicators.

4. Current injury database should be improved and integrated with other databases

AED attendance records have 30% of unclassified cases and 70% of cases missing International Classification of Disease coding. In addition, district of occurrence and socio-economic status were not recorded. This poses difficulty for further analysis that aids resource planning such as preventive, medical and rehabilitation services.

An enhanced database adding the above information and further linked to other official databases such as traffic databases from police and Transport Department, child abuse databases from Social Welfare Department and industrial injury database from Labour Department would reveal the true injury burden in Hong Kong and facilitate resource planning.

5. Set up multi-disciplinary panels to advise on injuries

Injury is a major public health problem and requires joint effort from different expertise to investigate the underlying causes and devise practical prevention plan. The

multi-disciplinary team should include medical professionals, social workers, educators, engineers, police and psychologists. This can ensure that injury could be tackled with different disciplines and approaches. The panel will be able to summarize common injury causes with the use of integrated database mentioned above.

Introduction

Injury is a leading cause of child death and disability globally.¹ For children aged 1 to 14 years of age in Hong Kong, injury led to 3.1 deaths per 100,000 population.²

Hong Kong has a total population of 7.07 million in 2011 and children aged 0 to 19 years constituted 19.5%.³ Hong Kong is divided into 18 administrative districts and each of which has different characteristics, for example: demographics, housing types and geographical location. The variation of district characteristics can be considered as different environmental and risk factors across districts. Therefore, it is essential to investigate the geo-spatial variation of injury across districts, before identifying the underlying factors.

This study aimed to analyse the injury pattern of children aged 0 to 19 through geo-spatial analyses. Regression analysis was adopted to explore the relation with socio-economic status. The findings would be useful for injury prevention, constant monitoring and resource planning.

Methods

Project design

This study involved retrospective analysis of AED attendance record of children aged 0-19. Injury profiles were compiled and delivered to all 18 District Councils for their understanding of district situation with regards to injury. The profiles also aimed to help individual district to design injury prevention programmes that most suit its own district needs.

Target Group

Children of age 0-19 attended AED under HA due to injury related traumatic incidents from 2001 to 2012.

Outcome/Response

Child injury in Hong Kong by age group, sex and by district

From 2001 to 2012, there was a total of 742,552 injury related AED attendances in children aged 0 to 19 years. For the age groups of 0 to 4, 5 to 9, 10 to 14 and 15 to 19, AED attendance numbers were 192706 (25.95%), 160408 (21.60%), 192675 (25.95%) and 196763 (26.50%) respectively. Analysed by gender, there was a higher attendance number in males (495207, 67%) than females (247345, 33%) in each age group. Categorized by district, the highest AED attendance number was found in males aged 10 to 14 (12,758) living in Yuen Long, while the lowest in females aged 15-19 (916) living in Islands district. Concerning the total AED attendance numbers among districts, Yuen Long had the highest (68,561), while Wan Chai had the lowest (13,836). Table 1 provides a summary of injury related AED attendance numbers by age group, sex and district.

TABLE 1 SHOULD BE ATTACHED HERE

Child injury in Hong Kong by cause and district

Injury-related AED attendances were categorized into nine groups according to cause and intention, in descending order are domestic (39%), unclassified (30%), sports (18%), common assault (5%), traffic (4%), industrial (3%), self-harm (0.8%), child abuse (0.5%) and indecent

assault (0.1%). The top 3 injury types totalled to 87% of all injuries, although unclassified injuries were unable to analyse further.

The pattern of injuries among districts showed some variations and would require further analysis based on demographics, socio-economic status, and infrastructure of the districts. The three districts with the highest AED attendance counts throughout the period were Yuen Long (68,561), Kwun Tong (62,055) and Kwai Tsing (61,827). Counts assess if there are sufficient capacity and facilities to respond to the needs in the district.

Geo-spatial analysis of child injury in Hong Kong using AED attendance rate

In terms of annual attendance rates, Tai Po (6,500 per 100,000), North (5,290 per 100,000), Sai Kung (5,166 per 100,000) and Kwai Tsing (5,159 per 100,000) were the highest (Figure 1). Rates assess which district has higher risk of injury occurrence.

FIGURE 1 SHOULD BE ATTACHED HERE

Heat-map analysis

For each district, heat-map was used for further analysis of all injury types across time periods. Tai Po district is used as illustration as it has the highest overall injury rate (Figure 2). (Remark: Rank 1 represents the highest injury rate and hence it is the most severe)

The first row of the heat-map depicts the ranking of annual injury attendance rate in Tai Po among 18 districts from 2001 to 2012. Overall, intentional and unintentional annual attendance rate was ranked 1st, which was above the median severity (i.e. 9th to 10th).

Among the four intentional injuries, common assault attendance rates have the highest ranking (1st) while child abuse with the lowest (14th). Among the four unintentional injuries, traffic, industrial and sports have the highest (1st) while domestic with the lowest (3rd).

The heat-map can be analysed vertically for each injury type to examine the trend. By comparing the second row (2001-2004) and the fourth row (2009-2012), both indecent assault and self-harm have great improvement and its rankings better than peer districts respectively. For child abuse, common assault, domestic and industrial injuries, the improvement is relatively smaller. Sports have improvement but are neither better than nor less than peer districts. Traffic has improvement which still less than peer districts.

FIGURE 2 SHOULD BE ATTACHED HERE

Avoidable injury and medical cost by District

Annual avoidable injury number is the annual AED attendance number that could have been avoided if the district had attained the minimum rate across the 18 districts (reference rate). District with the lowest rate can be set as learning target/model (reference district) for other districts. For district with higher rate than mean level, they can first target to reduce the rate to the mean level and then to reference rate. After achieving the reference rate, districts should aim further reducing injury to the minimal in the district.

Avoidable medical cost in this report is calculated as avoidable injury number multiplied by average AED attendance cost of HK\$700. This has not yet included much higher indirect medical costs which are difficult to quantify such as permanent disability or death.

Figure 3 provides a summary of the concept of annual avoidable injury. From 2001 to 2012, Tai Po had the highest annual attendance rate (6,500 per 100,000) while Central and Western (reference district) had the lowest (3,054 per 100,000). The average rate across districts was 4,439 per 100,000. The annual injury number for the reference district was 1,355. By preventing the injury for all other districts to the rate level of the reference district (reference rate), a total of 19,488 injuries could be avoided per year, an equivalent medical cost of HKD 13,641,600. The excess of annual attendance rate over the reference rate is known as the annual avoidable injury rate. The annual avoidable injury number in each district is obtained by multiplying the annual avoidable injury rate with the annual population of the respective district. Among all districts, Tai Po had the highest annual avoidable injury number (2,164).

FIGURE 3 SHOULD BE ATTACHED HERE

Ranking of districts by AED attendances rates (per 100,000) by injury category

Table 2 is a summary of which districts have highest and lowest risks of a particular injury type. It provides comprehensive information for each district and which can also make comparison with other districts for different types of injury.

TABLE 2 SHOULD BE ATTACHED HERE

Injury ranking by age group and injury type

Analysed by injury types and age groups, the highest injury types for children aged 0 to 19 years are domestic, unclassified and sports injury, with the exception of children aged 0 to 4. For children aged 0 to 4, traffic injury, instead of sports, is in the top 3 causes (Table 3).

TABLE 3 SHOULD BE ATTACHED HERE

References

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Tables

Table 1 Injury related AED attendance numbers by age group, sex and district, 2001 – 2012

District	0 - 4 years		5 - 9 years		10 - 14 years		15 - 19 years		Total	
	F	M	F	M	F	M	F	M	F	M
Central and Western	1,867	2,537	1,276	2,279	1,351	2,956	1,201	2,797	5,695	10,569
Eastern	5,902	8,546	4,591	8,174	4,614	11,309	4,397	11,097	19,504	39,126
Islands	1,633	2,456	1,260	2,426	1,197	3,012	916	2,539	5,006	10,433
Kowloon City	2,812	4,066	1,893	3,703	1,877	4,573	1,742	4,237	8,324	16,579
Kwai Tsing	6,622	9,242	4,639	8,556	4,443	11,416	4,645	12,264	20,349	41,478
Kwun Tong	6,761	9,474	5,001	8,850	4,399	11,283	4,434	11,853	20,595	41,460
North	4,500	6,243	3,229	5,662	3,142	8,128	3,236	8,947	14,107	28,980
Sai Kung	6,168	8,553	4,335	7,492	4,033	10,082	3,641	9,966	18,177	36,093
Sha Tin	5,874	8,075	4,487	7,577	4,279	10,572	4,533	11,803	19,173	38,027
Sham Shui Po	4,580	6,397	3,141	5,886	2,736	6,918	2,683	6,907	13,140	26,108
Southern	2,811	3,904	2,074	3,735	2,165	5,188	2,174	5,335	9,224	18,162
Tai Po	4,714	6,254	3,392	5,964	3,837	9,620	4,094	11,107	16,037	32,945
Tsuen Wan	3,108	4,159	2,004	3,418	1,688	4,052	1,475	3,808	8,275	15,437
Tuen Mun	6,550	8,801	4,487	8,001	4,481	11,407	4,609	12,391	20,127	40,600
Wan Chai	1,506	2,060	1,266	2,034	1,172	2,646	1,001	2,151	4,945	8,891
Wong Tai Sin	3,475	5,098	2,721	5,158	2,813	6,884	3,072	7,661	12,081	24,801
Yau Tsim Mong	3,236	4,523	1,931	3,513	1,533	3,973	1,582	3,791	8,282	15,800
Yuen Long	7,770	10,924	5,183	9,741	4,862	12,758	4,587	12,736	22,402	46,159
Unknown	624	881	486	843	399	877	393	958	1,902	3,559
Total	80,513	112,193	57,396	103,012	55,021	137,654	54,415	142,348	247,345	495,207

Table 2 Ranking of Districts by AED attendances rates (per 100,000) by injury category

Common Assault		Indecent assault		Child abuse		Traffic		Industrial		Domestic		Sports		Deliberate self-harm		Unclassified		Total	
Central and Western	111.9	Tsuen Wan	2.3	Sha Tin	14.1	Tsuen Wan	121.7	Central and Western	48.4	Sha Tin	1046.6	Kowloon City	583.2	Tsuen Wan	7.8	Central and Western	627.0	Central and Western	3054.1
Tsuen Wan	150.1	Sha Tin	4.0	Central and Western	14.5	Islands	123.0	Kowloon City	66.4	Yuen Long	1340.0	Central and Western	593.4	Wan Chai	13.0	Kowloon City	700.6	Kowloon City	3107.4
Kowloon City	150.6	Yau Tsim Mong	4.1	Tsuen Wan	14.9	Central and Western	142.7	Wan Chai	71.2	Tuen Mun	1366.3	Yau Tsim Mong	598.8	Central and Western	16.1	Sham Shui Po	797.8	Tsuen Wan	3428.1
Wan Chai	156.1	Central and Western	4.1	Kwun Tong	15.9	Sham Shui Po	146.9	Tsuen Wan	78.4	Kowloon City	1394.9	Tsuen Wan	604.0	Kwai Tsing	19.9	Southern	867.1	Wong Tai Sin	3791.7
Sha Tin	174.8	Southern	4.3	Tai Po	16.3	Kwun Tong	149.8	Sha Tin	88.9	Wong Tai Sin	1457.4	Sha Tin	614.0	Yuen Long	22.6	Tsuen Wan	930.3	Sha Tin	3908.0
Southern	200.4	North	4.7	Yau Tsim Mong	17.1	Eastern	150.3	Eastern	89.0	Central and Western	1495.9	Yuen Long	701.2	Tuen Mun	22.9	Islands	1019.1	Yau Tsim Mong	3958.3
Islands	201.3	Eastern	4.7	Kowloon City	17.5	Yau Tsim Mong	152.9	Yau Tsim Mong	89.9	Tsuen Wan	1518.6	Wong Tai Sin	709.5	Kwun Tong	24.6	Wong Tai Sin	1030.2	Islands	4211.3
Yau Tsim Mong	202.7	Wan Chai	5.3	North	17.6	Kowloon City	157.6	Islands	96.3	Yau Tsim Mong	1604.7	Tuen Mun	831.9	Islands	25.4	Kwai Tsing	1033.0	Yuen Long	4310.3
Eastern	205.4	Tai Po	5.3	Sai Kung	17.8	Wong Tai Sin	160.5	Southern	98.6	Kwun Tong	1651.7	Islands	846.1	Sham Shui Po	25.8	Eastern	1214.9	Southern	4342.7
Sai Kung	218.3	Kwai Tsing	6.5	Eastern	18.2	Sai Kung	161.3	Kwun Tong	107.0	Islands	1872.6	Kwun Tong	868.6	North	26.1	Yau Tsim Mong	1228.5	Kwun Tong	4569.2
Wong Tai Sin	243.8	Islands	6.5	Wan Chai	18.7	Kwai Tsing	162.4	Sai Kung	116.0	North	1941.8	Southern	873.6	Kowloon City	29.8	Wan Chai	1456.3	Eastern	4575.3
Kwun Tong	247.5	Kowloon City	6.7	Wong Tai Sin	20.1	Sha Tin	164.7	Wong Tai Sin	116.7	Eastern	1945.5	Sham Shui Po	897.6	Southern	33.5	Kwun Tong	1495.9	Tuen Mun	4749.2
Sham Shui Po	260.7	Sham Shui Po	6.9	Islands	21.0	Southern	188.2	Yuen Long	130.7	Wan Chai	2017.8	Eastern	908.7	Sai Kung	38.5	Yuen Long	1548.8	Wan Chai	4874.0
Tuen Mun	268.9	Sai Kung	7.7	Sham Shui Po	21.3	Wan Chai	198.0	Sham Shui Po	135.1	Sai Kung	2026.7	North	925.2	Eastern	38.6	Sai Kung	1567.5	Sham Shui Po	4906.5
Kwai Tsing	281.2	Tuen Mun	7.7	Southern	22.0	Tuen Mun	204.0	North	172.1	Southern	2055.0	Wan Chai	937.7	Wong Tai Sin	44.0	North	1642.4	Kwai Tsing	5159.0
Yuen Long	282.5	Yuen Long	8.0	Kwai Tsing	23.3	Yuen Long	233.9	Tuen Mun	177.3	Tai Po	2188.2	Kwai Tsing	998.3	Tai Po	55.7	Sha Tin	1700.3	Sai Kung	5166.2
North	308.9	Kwun Tong	8.2	Tuen Mun	38.3	North	250.9	Kwai Tsing	181.3	Kwai Tsing	2453.1	Sai Kung	1012.5	Yau Tsim Mong	59.7	Tuen Mun	1831.7	North	5289.7
Tai Po	337.1	Wong Tai Sin	9.6	Yuen Long	42.6	Tai Po	266.4	Tai Po	217.5	Sham Shui Po	2614.5	Tai Po	1397.1	Sha Tin	100.6	Tai Po	2017.0	Tai Po	6500.5

Rank 1, 2 3, 4 5, 6 7, 8 9, 10 11, 12 13, 14 15, 16 17, 18

Table 3 Injury numbers among children aged 0 to 19 years by age group and cause

Type \ Age	0 - 4 years	5 – 9 years	10 - 14 years	15 - 19 years	Total
Common assault	756 (0.4%)	2,743 (1.7%)	14,776 (7.7%)	20,227 (10.3%)	38,502 (5.2%)
Indecent assault	95 (0.0%)	163 (0.1%)	307 (0.2%)	472 (0.2%)	1,037 (0.1%)
Child Abuse	806 (0.4%)	1,106 (0.7%)	1,246 (0.6%)	505 (0.3%)	3,663 (0.5%)
Traffic	4,339 (2.3%)	8,207 (5.1%)	9,072 (4.7%)	8,561(4.4%)	30,179 (4.1%)
Industrial	270 (0.1%)	190 (0.1%)	305 (0.2%)	19,290 (9.8%)	20,055 (2.7%)
Domestic	124,120 (64.4%)	71,854 (44.8%)	52,552 (27.3%)	37,667 (19.1%)	286,193 (38.5%)
Sports	3,979 (2.1%)	17,125 (10.7%)	53,862 (28.0%)	61,682 (31.3%)	136,648 (18.4%)
Self-harm	1,068 (0.6%)	1,106 (0.7%)	1,493 (0.8%)	2,332 (1.2%)	5,999 (0.8%)
Unclassified	57,273 (29.7%)	57,914 (36.1%)	59,062 (30.7%)	46,027 (23.4%)	220,276 (29.7%)
Total	192,706 (100%)	160,408 (100%)	192,675 (100%)	196,763 (100%)	742,552 (100%)

Figure 2: Heat-map of annual injury AED attendance rates, Tai Po district, 2001-2012

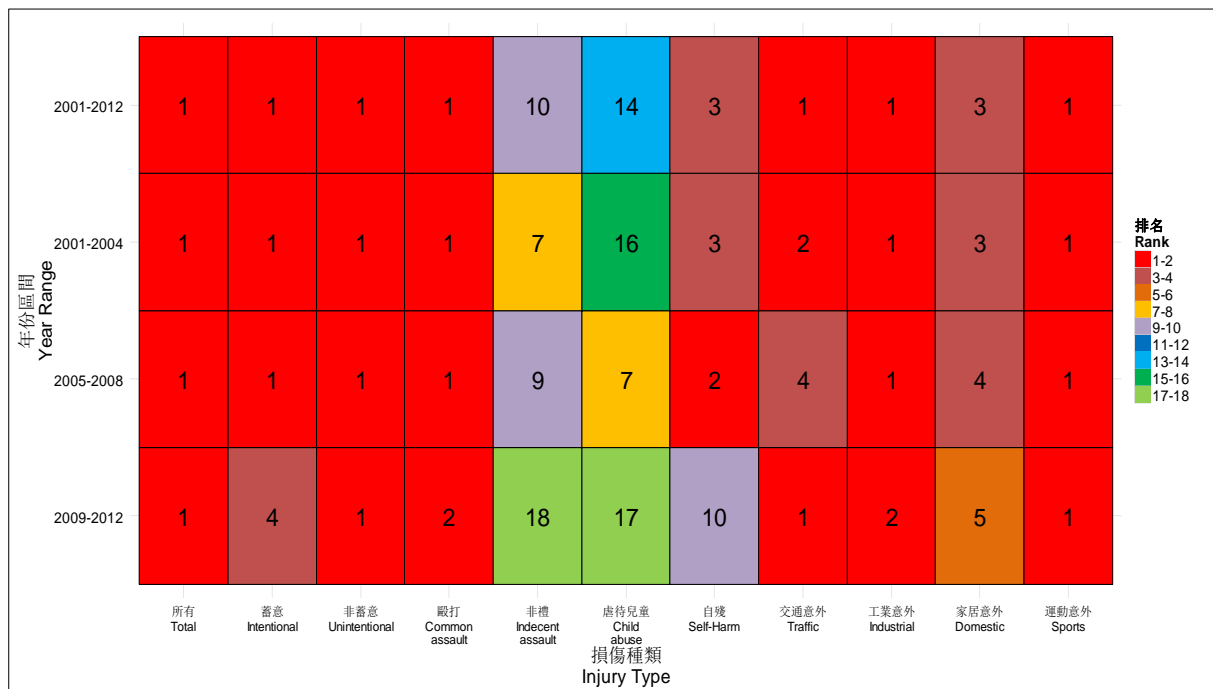


Figure 3: Annual AED attendance rates with annual avoidable injury numbers due to injury, by district, Hong Kong, 2001-2012

