

The trajectories of crime at places

Understanding the patterns of disaggregated crime types

Martin A. Andresen, Simon Fraser University
andresen@sfu.ca

Andrea S. Curman, Kwantlen Polytechnic University
Andrea.Curman@kpu.ca

Crime and place

- Crime is highly concentrated at micro-places
 - 5% of street segments account for 50% of crime
 - Sherman et al. (1989), and subsequent work
- Similar to Wolfgang et al. (1972) and chronic offenders
- Subset of crime and place literature investigates the trajectories of places

Trajectories of crime at places

- Seattle
 - The first such study
 - Group-based trajectory modeling
 - Weisburd, Groff, Yang, Morris, Bushway, and Lum
 - Crime is remarkably stable at places
 - Small set of street segments accounted for crime drop (14 percent)
 - Because of spatial heterogeneity

Trajectories of crime at places

- Boston
 - Braga, Hureau, Papachristos
 - Growth curve regression models
 - Most trajectories are stable
 - Robbery decline in Boston was a result of changes at a small group of micro places
 - Micro places is important because of spatial heterogeneity

Trajectories of crime at places

- Vancouver
 - Curman, Andresen, Brantingham
 - GBTM and k-means longitudinal
 - Similar to Seattle
 - All street segments stable or decreasing
 - Approximately 30% accounted for 40% crime drop in Vancouver

Trajectories of crime at places

- Albany
 - Wheeler, Worden, McLean
 - Zero-inflated Poisson trajectories
 - Similar to previous research, most similar to Vancouver
 - All clusters follow citywide trend in crime: 40% of streets had crime decline by 35 %
 - Clustering of trajectories: positive spatial autocorrelation for high and low trajectories

Where do we need to go from here?

- Incorporate crime at all locations
 - Similar to Braga et al. and Wheeler et al., include crime at intersections
- Consider disaggregate crime types
 - Braga et al.: robbery and gun violence
 - Wheeler et al.: Part I and II UCR
 - Seattle and Vancouver: all crime

Current analysis

- Vancouver, 1991 – 2006
- K-means trajectories
- Street segments and intersections
- Disaggregate crime types: assault, burglary, other (homicide, arson, drug arrests), robbery, theft from vehicle, theft, theft of vehicle, aggregate

Table 1. Counts by crime type, 1991 - 2006

	Assault	Burglary	Other	Robbery	Theft from vehicle	Theft	Theft of vehicle	Total
1991	10503	18069	3031	3336	22460	19844	5557	82800
1992	11187	18448	3011	3247	23122	20204	5177	84396
1993	10719	17973	2754	3337	22706	18656	4957	81102
1994	10009	18440	2079	2889	24081	19080	5008	81586
1995	10587	21943	1925	3452	26135	23517	6049	93608
1996	10030	23408	1635	3509	28853	23561	7914	98910
1997	9432	21427	1848	3017	25531	22753	6588	90596
1998	8801	17396	1967	3020	22660	20055	5688	79587
1999	7963	15469	1765	2811	20401	18286	6213	72908
2000	8103	13295	1791	1595	18924	16932	5954	66594
2001	7679	12996	1512	1367	16875	13576	6254	60259
2002	7822	11363	1560	2305	16274	13636	5778	58738
2003	9025	10674	541	1864	14078	14102	6056	56340
2004	9100	10665	640	1990	14285	13897	5720	56297
2005	9520	9312	2184	1851	13370	12994	4921	54152
2006	8682	8045	2544	1685	12458	11318	3862	48594

Table 2. Indexed trends by crime type, 1991 - 2006, 1991 = 100

	Assault	Burglary	Other	Robbery	Theft from vehicle	Theft	Theft of vehicle	Total
1991	100	100	100	100	100	100	100	100
1992	107	102	99	97	103	102	93	102
1993	102	99	91	100	101	94	89	98
1994	95	102	69	87	107	96	90	99
1995	101	121	64	103	116	119	109	113
1996	95	130	54	105	128	119	142	119
1997	90	119	61	90	114	115	119	109
1998	84	96	65	91	101	101	102	96
1999	76	86	58	84	91	92	112	88
2000	77	74	59	48	84	85	107	80
2001	73	72	50	41	75	68	113	73
2002	74	63	51	69	72	69	104	71
2003	86	59	18	56	63	71	109	68
2004	87	59	21	60	64	70	103	68
2005	91	52	72	55	60	65	89	65
2006	83	45	84	51	55	57	69	59

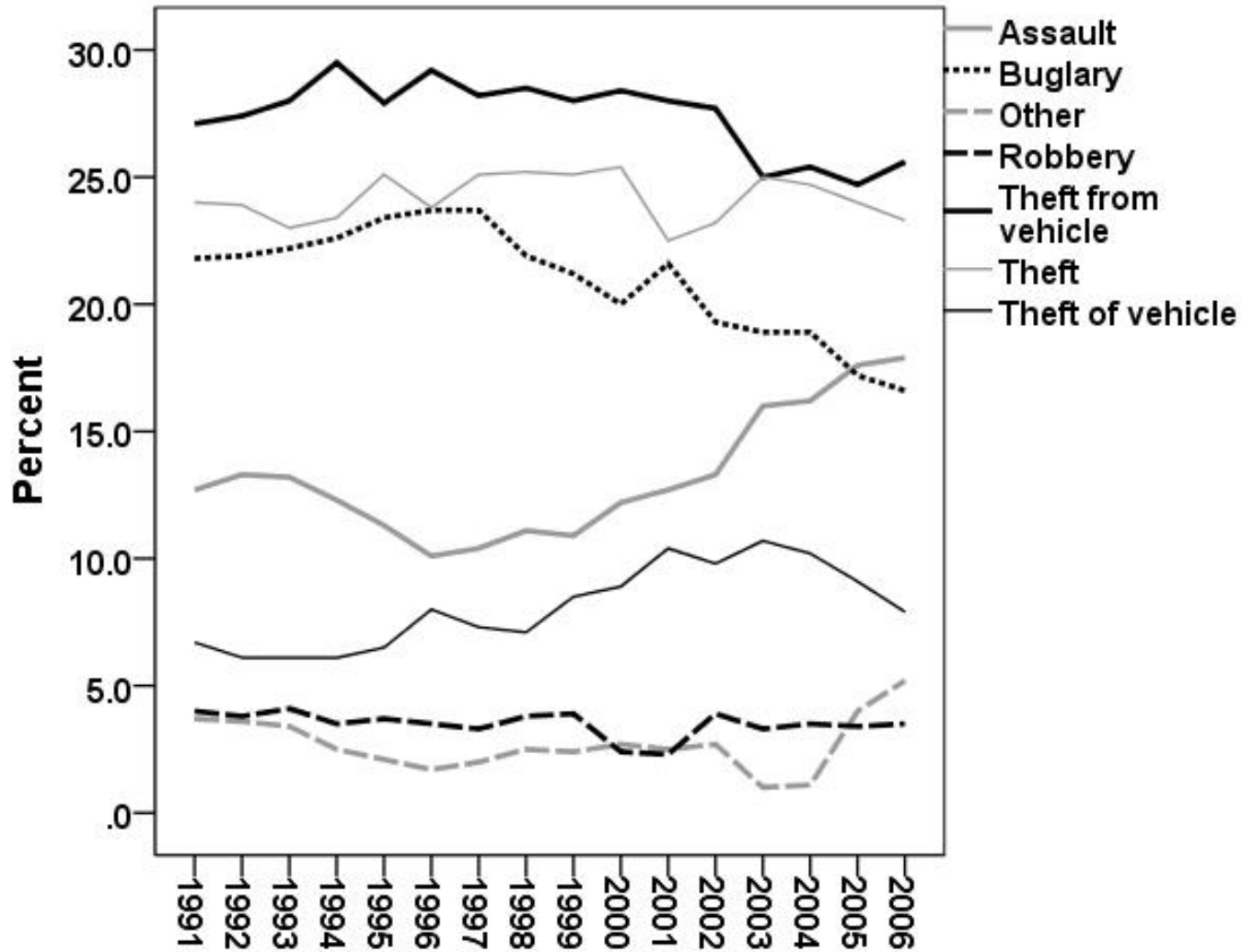
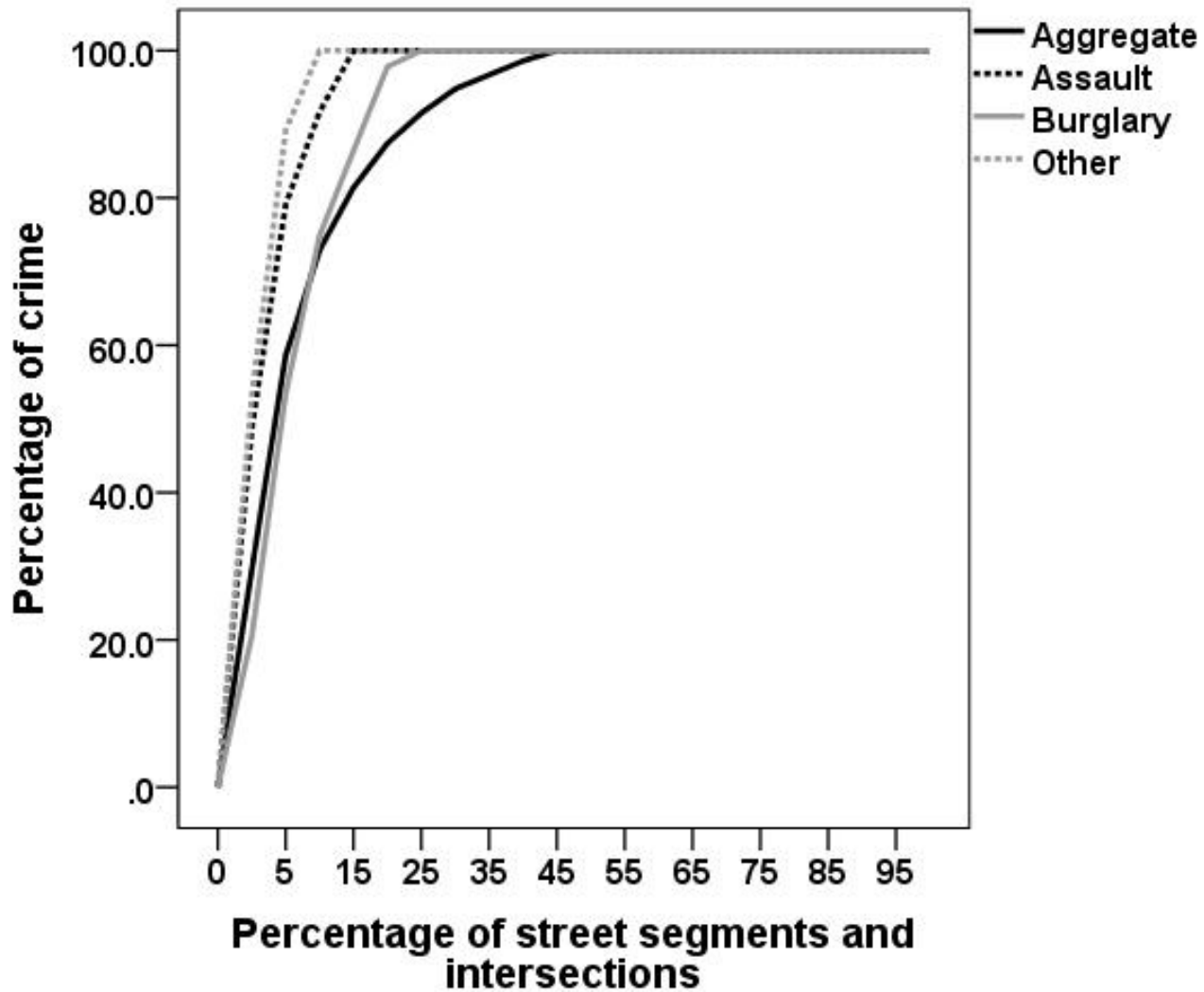
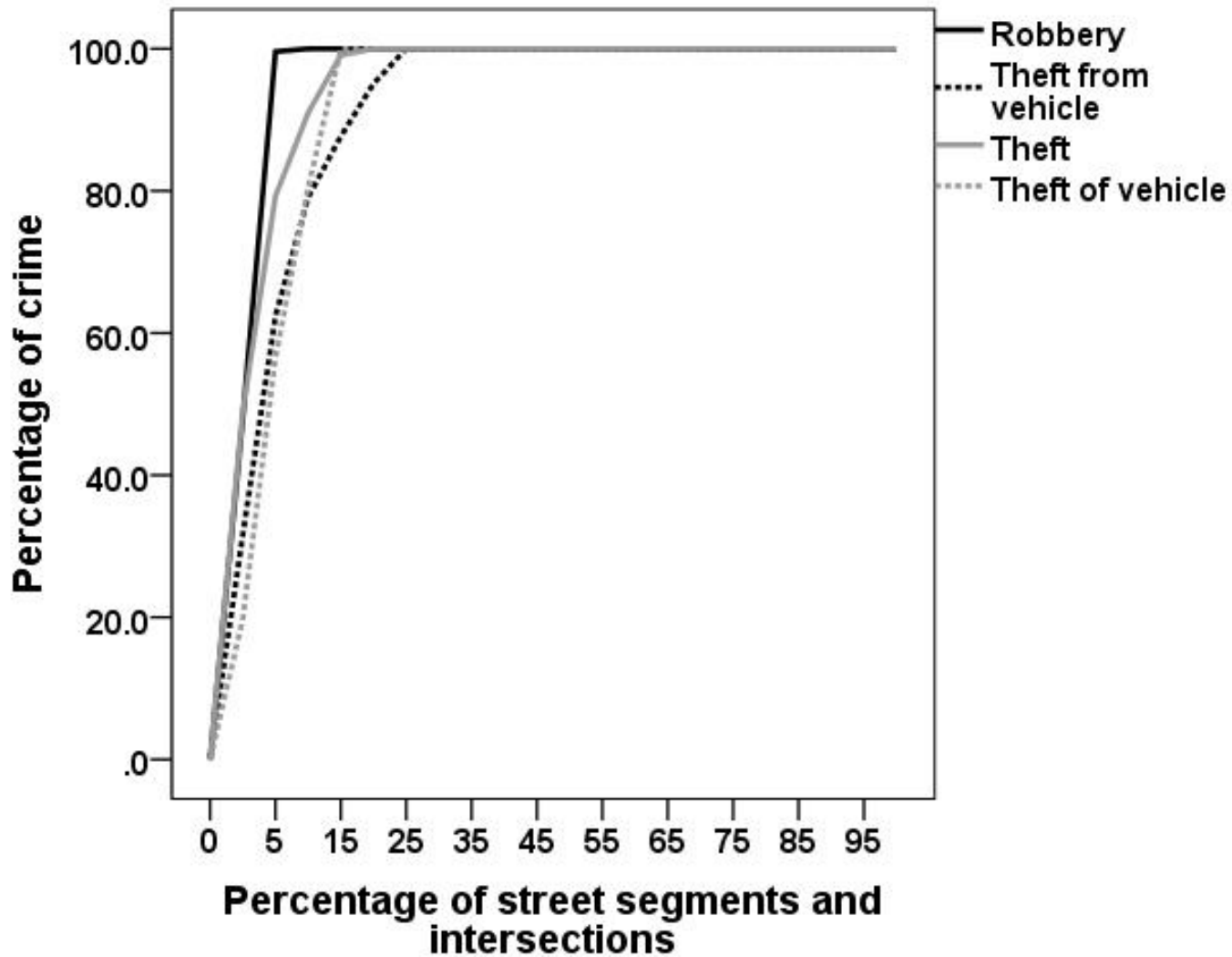


Table 3. Percentage of street segments and intersections accounting for 50 percent of crime

	Percentage of spatial units accounting for 50 percent of crime				Percentage of spatial units that have any crime				Percentage of spatial units with any crime that account for 50 percent of crime			
	1991	1996	2001	2006	1991	1996	2001	2006	1991	1996	2001	2006
Assault	1.59	1.50	1.24	1.08	16.89	16.48	13.40	13.92	9.40	9.08	9.27	7.75
Burglary	5.37	5.61	5.11	4.42	31.27	33.97	26.42	20.94	17.16	16.52	19.33	21.12
Other	0.19	0.51	0.33	0.85	5.93	4.46	3.85	6.49	3.20	11.44	8.58	13.11
Robbery	1.02	1.19	0.92	1.09	7.11	8.33	4.01	5.04	14.42	14.25	22.84	21.64
Theft from vehicle	3.81	2.42	2.14	2.81	33.87	33.65	25.76	23.29	11.25	7.20	8.29	12.06
Theft	2.30	2.08	1.31	1.06	27.56	28.63	18.49	15.53	8.34	7.25	7.07	6.81
Theft of vehicle	4.19	5.03	4.54	3.91	17.06	22.50	18.78	14.10	24.57	22.34	24.16	27.77
Total	4.35	4.04	3.55	3.25	52.79	55.04	47.13	43.72	8.25	7.34	7.53	7.44





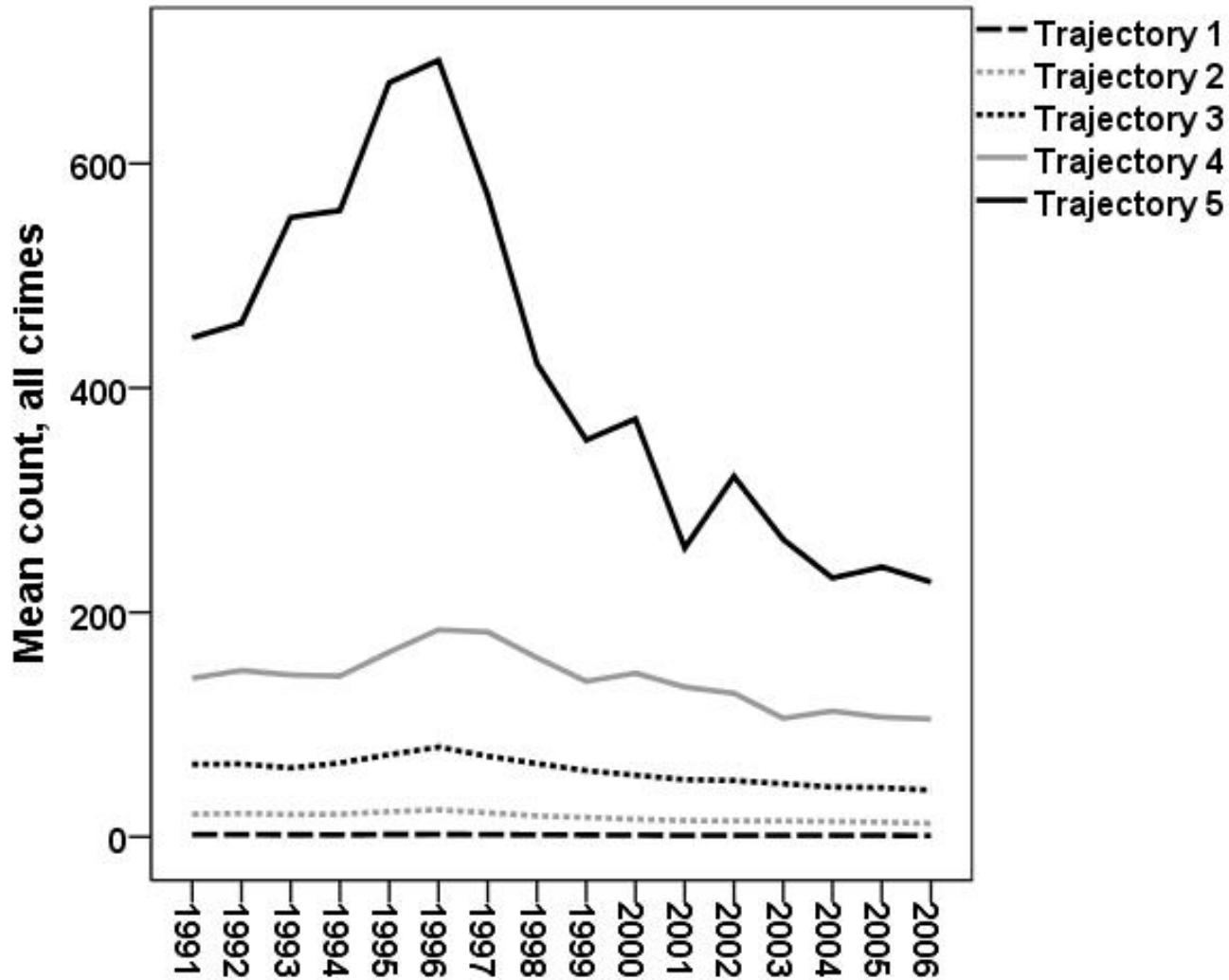
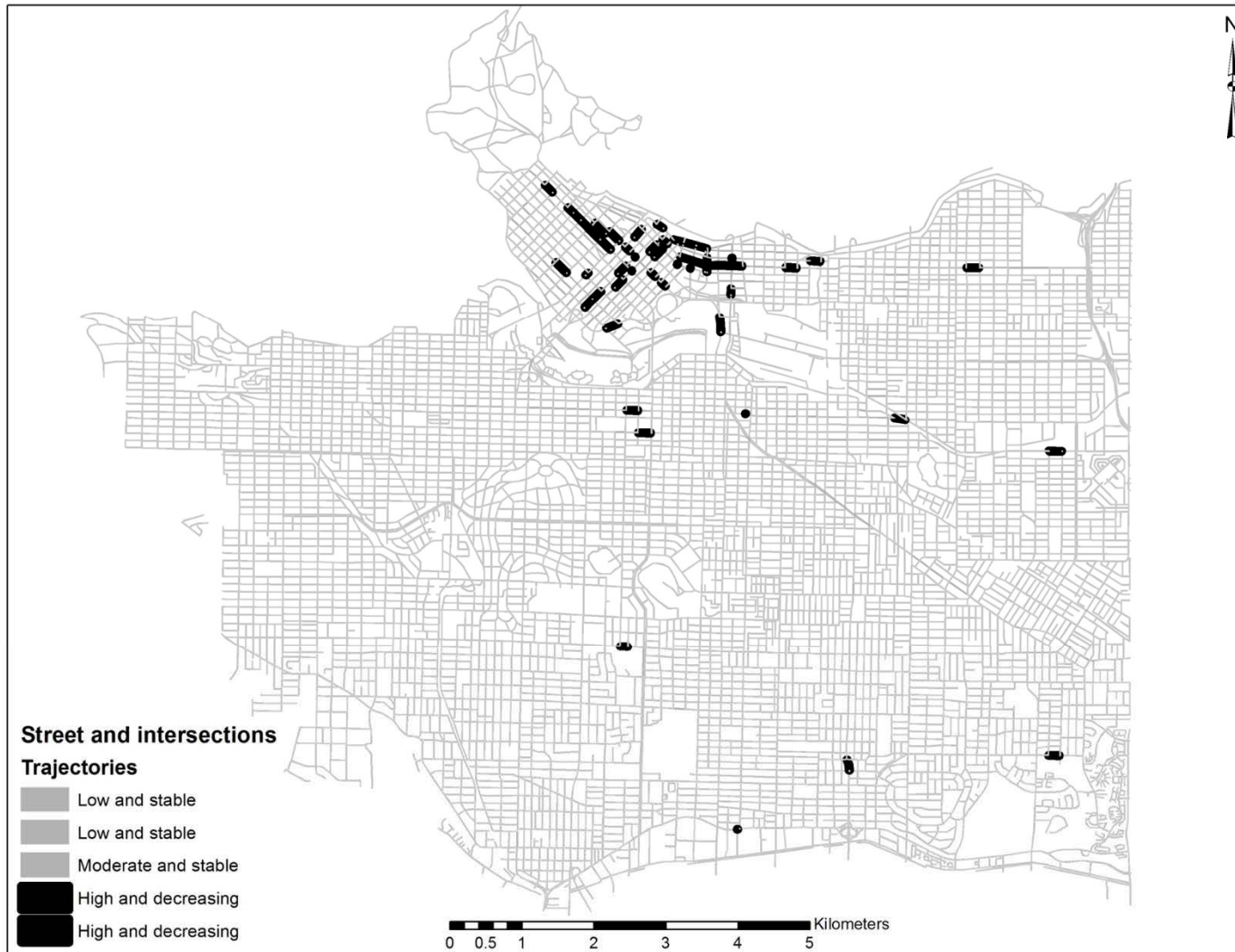
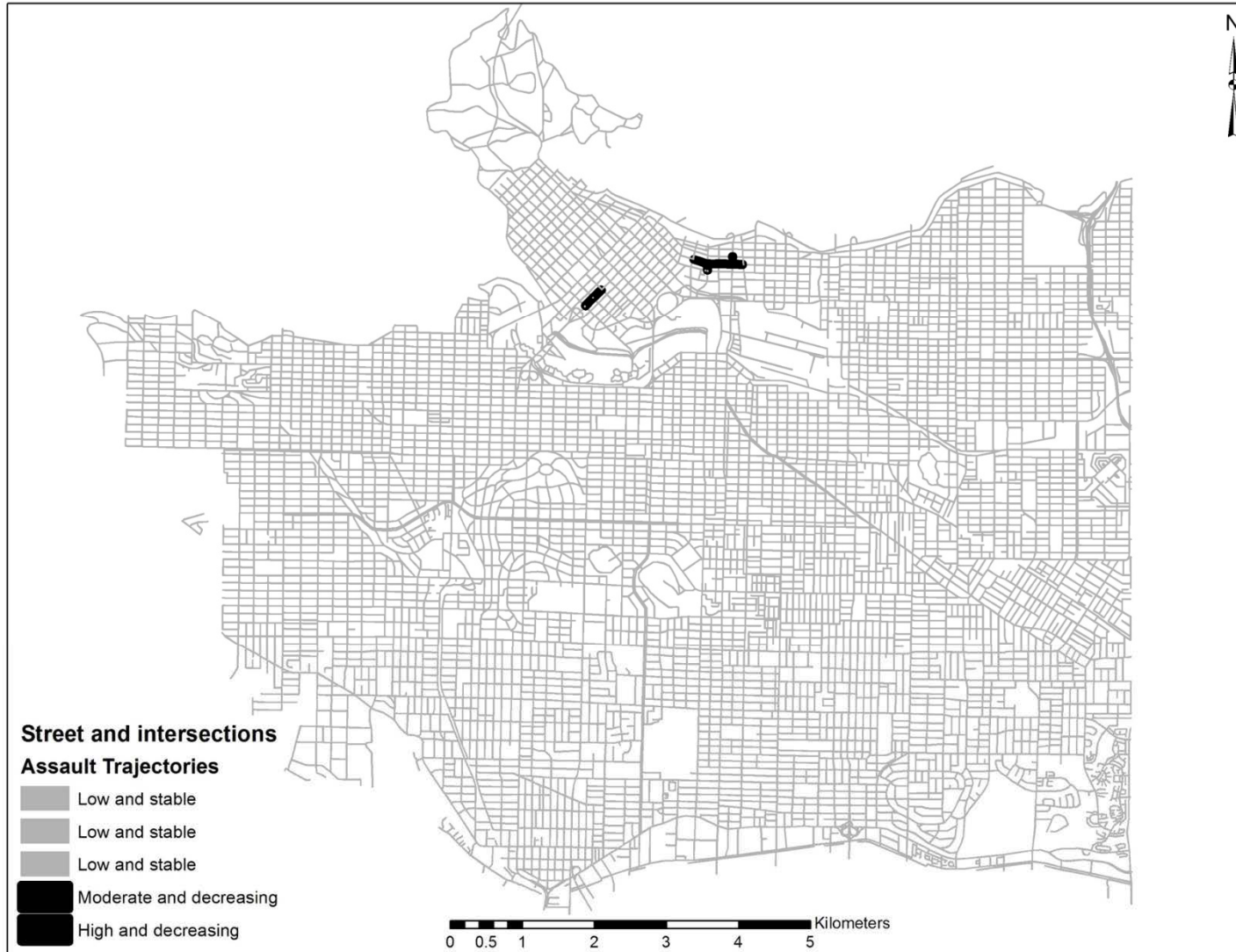


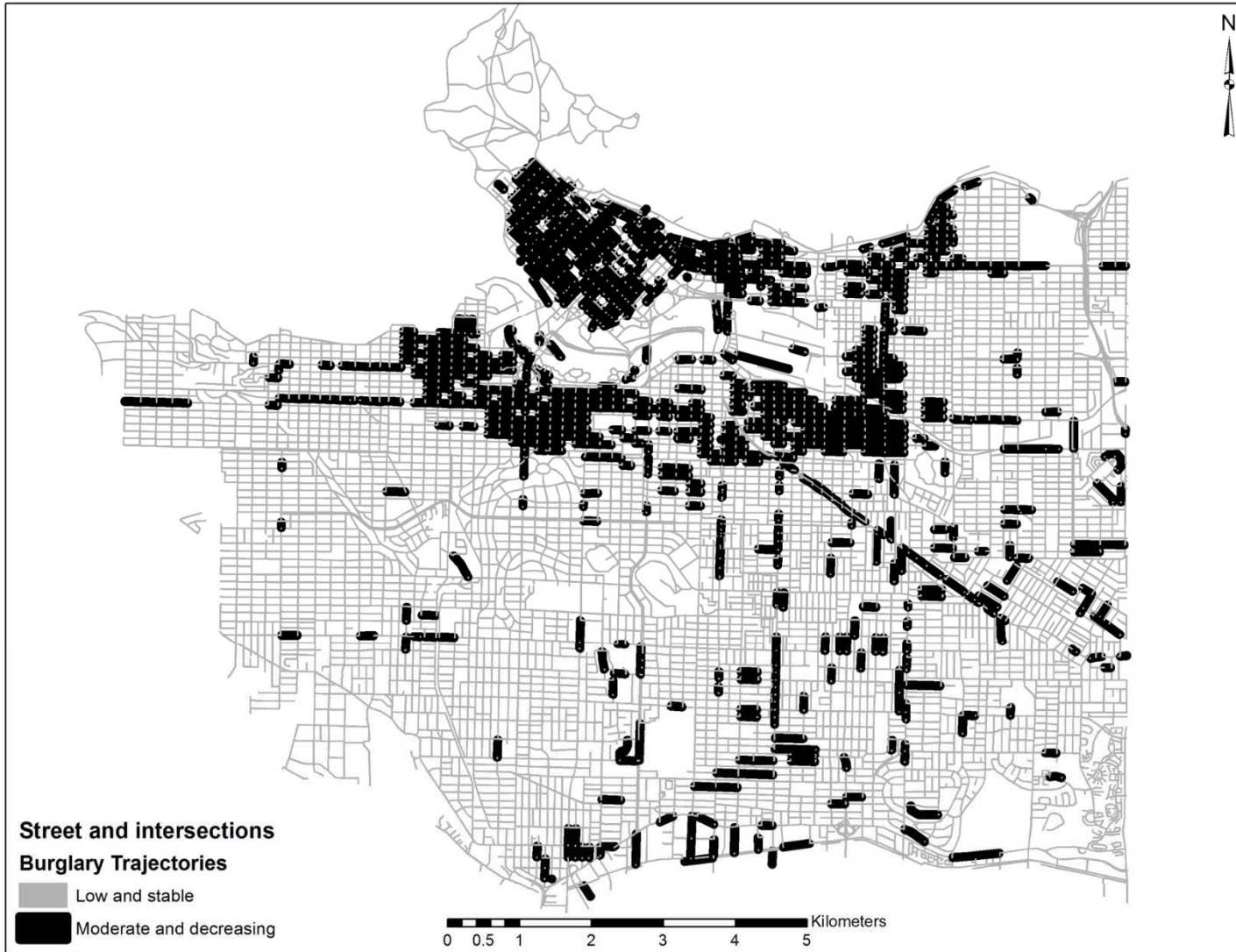
Table 4. Summary of k-means trajectories

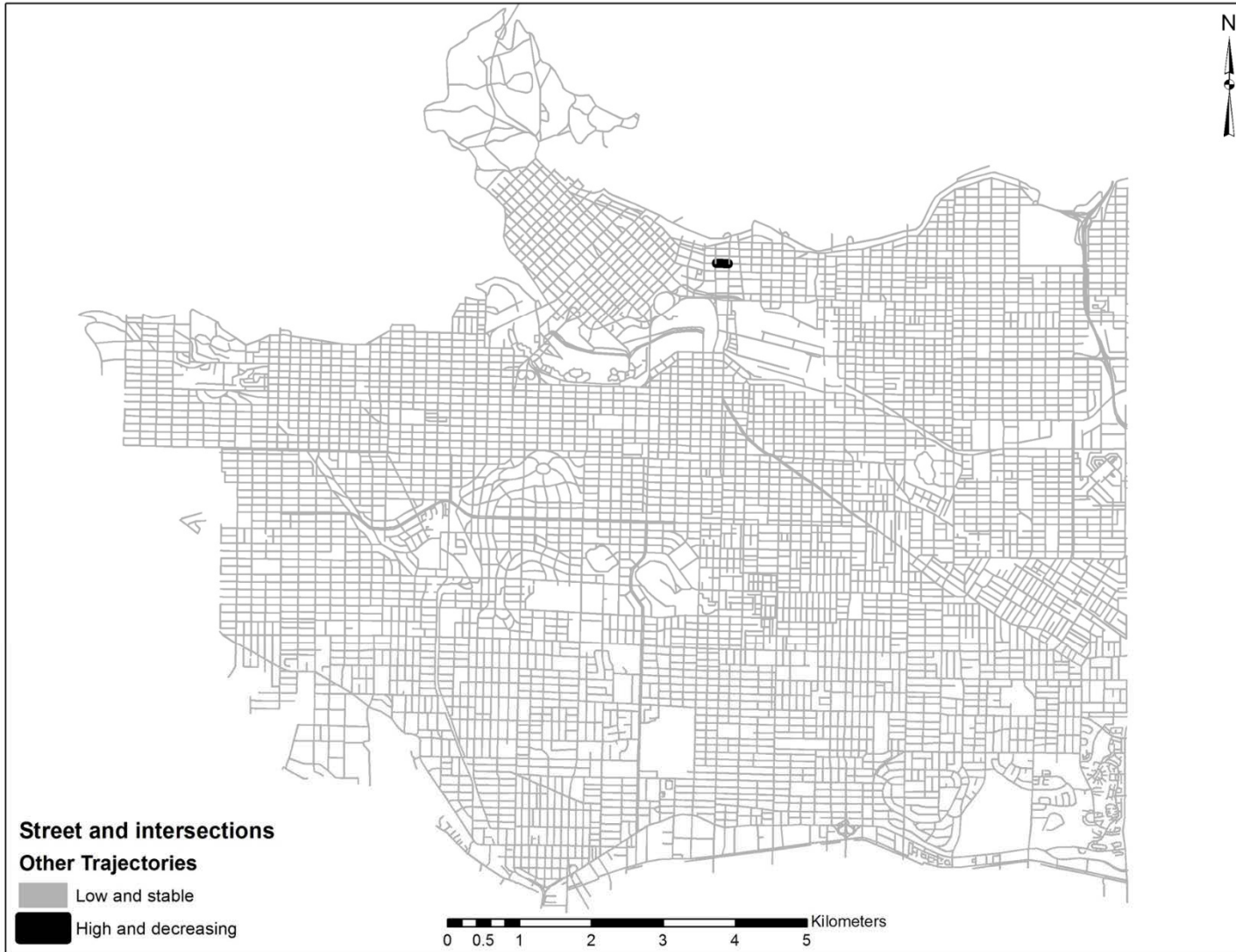
Crime type	Trajectory	Level	Base, 1991	Trend	Count
Total	1	Low	2	Stable (-)	16,871
	2	Low	24	Stable (-)	1268
	3	Moderate	75	Stable (-)	248
	4	High	170	Decreasing	54
	5	High	634	Decreasing	4
Assault	1	Low	0.3	Stable (-)	18,009
	2	Low	9	Stable (-)	372
	3	Low	29	Stable (-)	53
	4	Moderate	64	Increasing	10
	5	High	329	Decreasing	1
Burglary	1	Low	0.8	Stable (-)	17,478
	2	Moderate	10	Decreasing	967
Other	1	Low	0.1	Stable (-)	18,444
	2	High	336	Decreasing	1
Robbery	1	Low	0.1	Stable (-)	18,211
	2	Low	7	Decreasing	232
	3	High	66	Decreasing	2
Theft from vehicle	1	Low	1	Stable (-)	18,282
	2	High	45	Decreasing	163
Theft	1	Low	0.7	Stable (-)	17,978
	2	Moderate	16	Decreasing	421
	3	High	72	Decreasing	41
	4	High	294	Decreasing	5
Theft of vehicle	1	Low	0.2	Stable (-)	17,286
	2	Low	2	Stable (-)	1158
	3	High	54	Decreasing	1

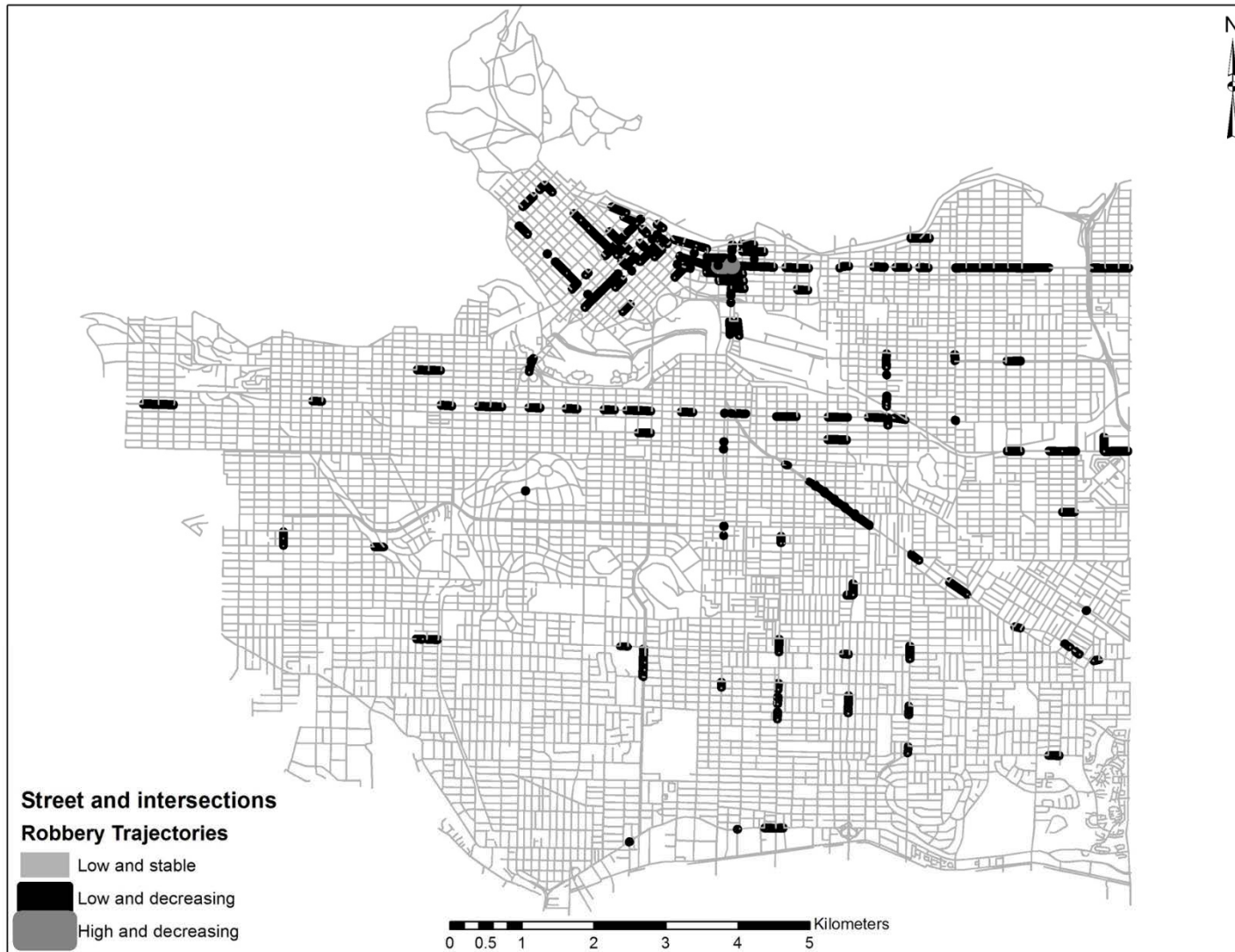
Note. Total number of street segments and intersections is 18,445.

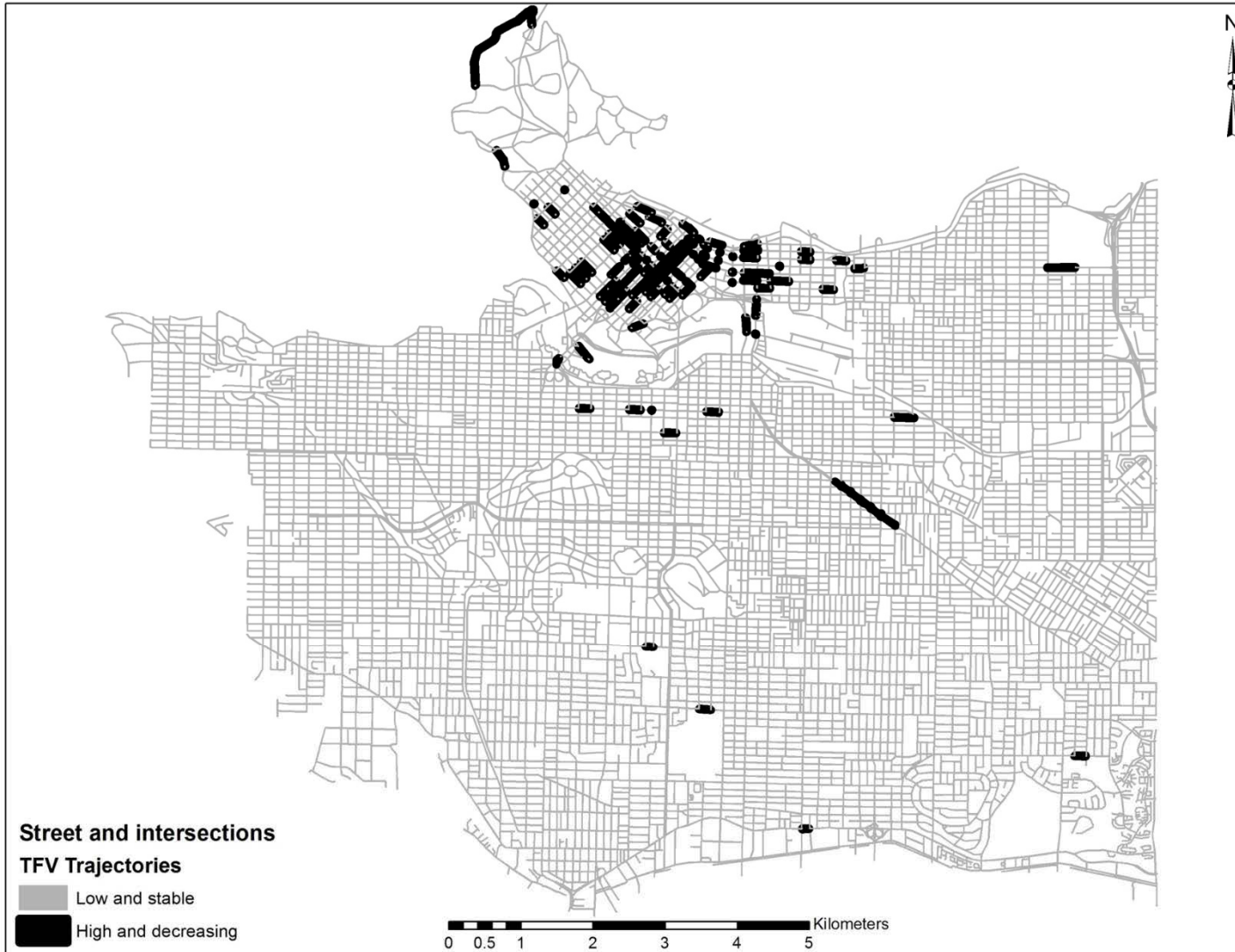


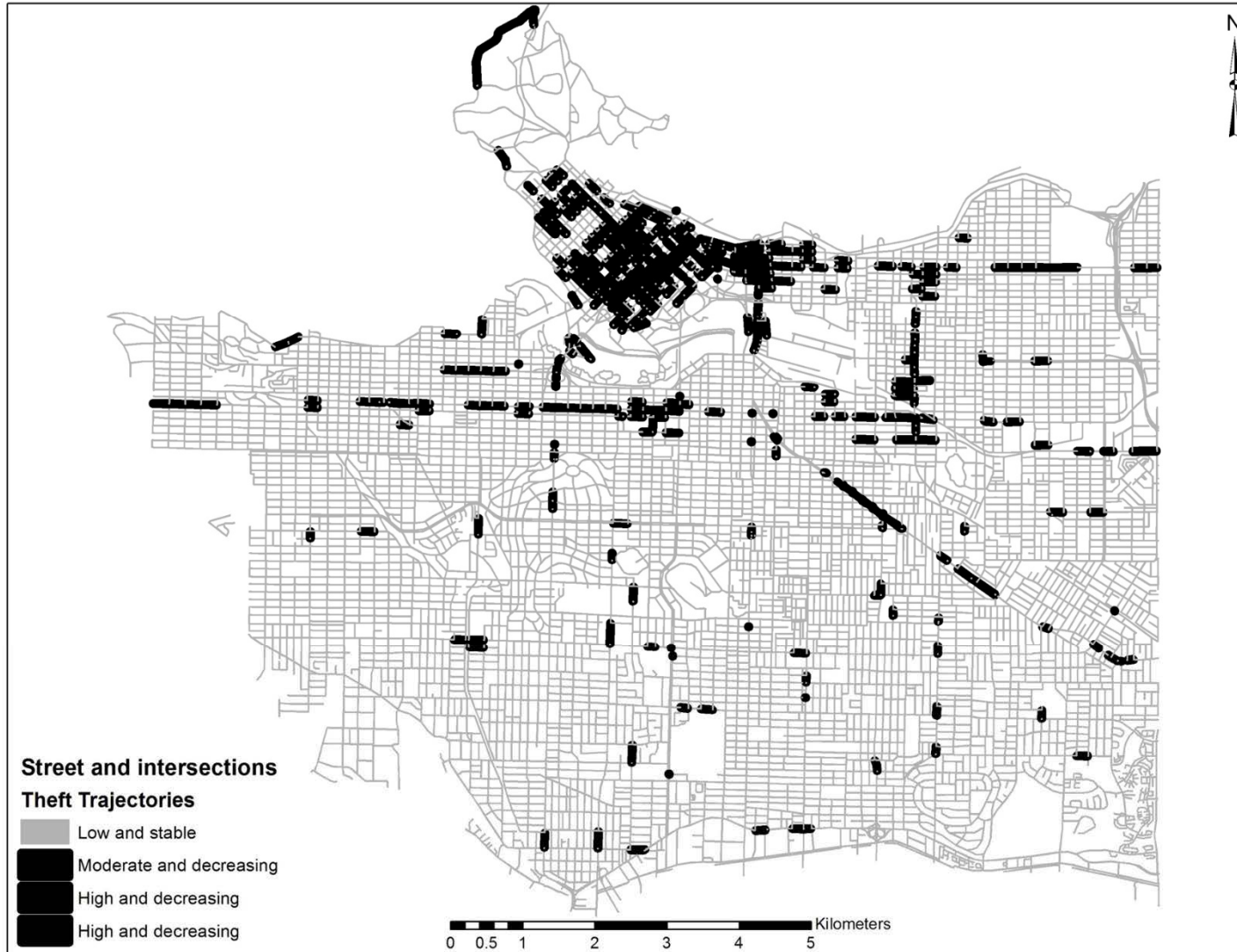


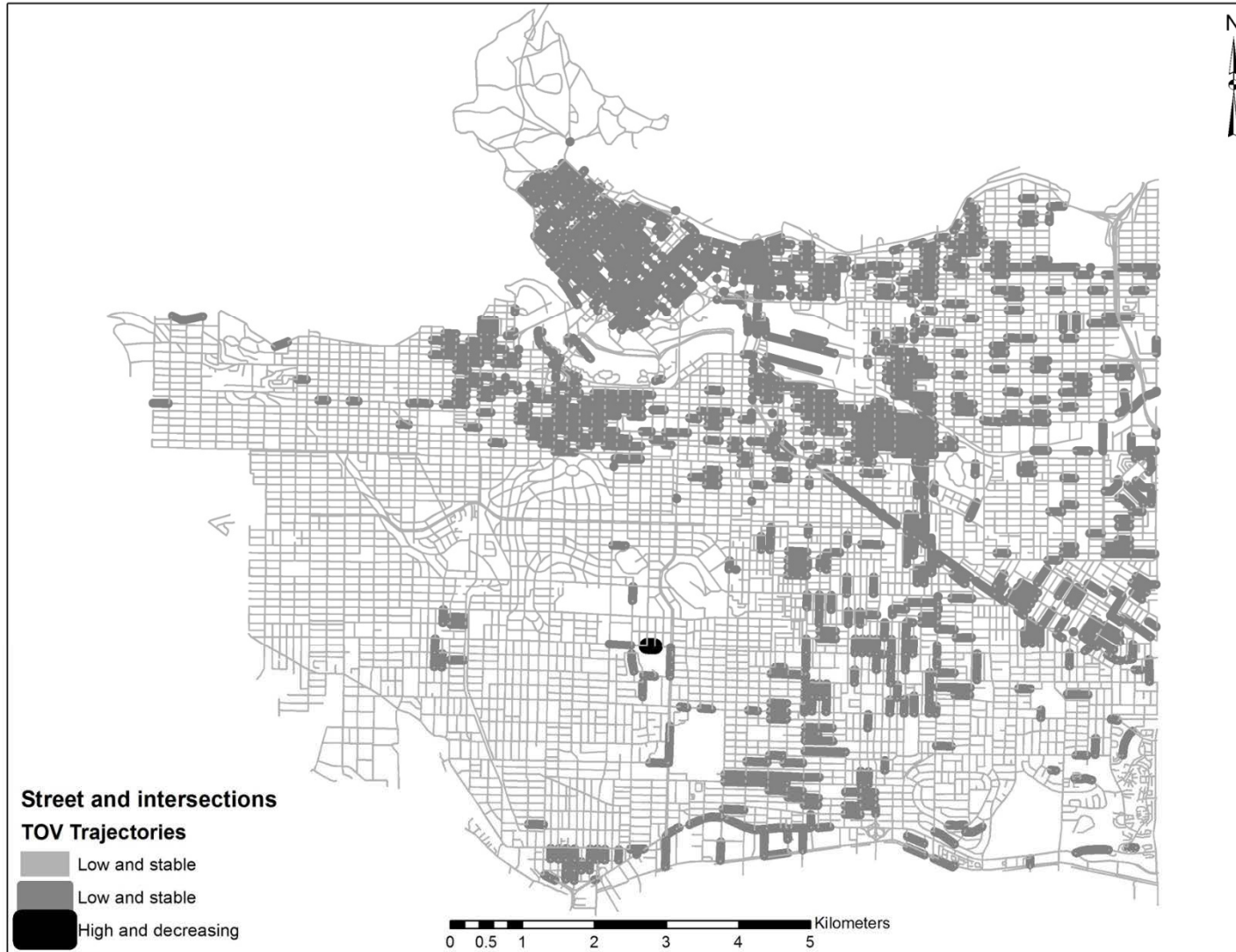












Conclusions

- Significant crime drop in Vancouver
 - Relatively stable relative frequencies of crime types
- Crime is concentrated, even when only considering places that have crime
- Different crime types have very different trajectories
- Spatial patterns of trajectories also vary

The trajectories of crime at places

Understanding the patterns of disaggregated crime types

Martin A. Andresen, Simon Fraser University
andresen@sfu.ca

Andrea S. Curman, Kwantlen Polytechnic University
Andrea.Curman@kpu.ca

