SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Crime Basket Analysis

Amir Ghaseminejad
Patricia Brantingham
Paul Brantingham

Crime and Justice System Analysis

- **Historically, crime analysts and criminal case operations analysts have been limited by small and impoverished data sets.**
- **The development of comprehensive digital records management systems have created big and rich data sets.**
  - Limited computational power remains an impediment to analysis of big data for most justice analysts.
  - Few conceptual approaches to analysis of big justice data have been developed to date.
- **We propose *crime baskets* as a useful approach to understanding big justice data.**

Events and Baskets of Attributes

- **Events are occurrences in space time**
- **Events dealt with by the justice system have two aspects:**
  - A Person aspect
  - A Case aspect
- **Both aspects have a *basket of attributes***
  - Some attributes are *inherent*
    - *Person* – age, gender, race, weight, height, education, economic status
    - Case – time, location, specific risk or harm
  - Some attributes are *assigned* by the justice system
    - Person – complainant, victim, witness, suspect, convict, parolee
    - Case – civil matter/criminal matter, crime type, cleared by charge, prosecuted, dismissed, convicted, sentenced
- **We speak of *Crime Baskets* as a convenient shorthand**

Basket of Crimes is new concept

- **Crime Baskets can relate criminal acts but also link to:**
  - alcohol,
  - drugs,
  - cars,
  - residences,
  - interactions with people
- **Crime baskets can lead us to exploration of:**
  - Event complexity
  - Criminal careers
  - Social service careers
  - Criminal typologies
  - Justice system behavior
  - Social system behavior

Crime Baskets can be analyzed in many ways:

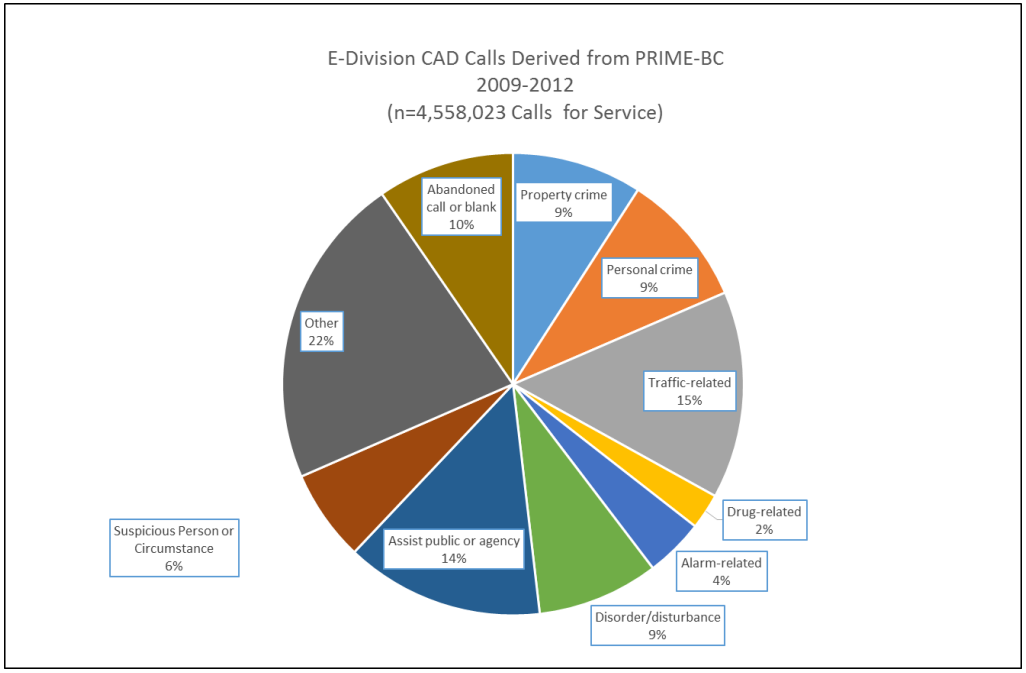
- **Individual or Aggregate**
- **Case or Person**
- **Spatial or Temporal**
- **Functional or Procedural**

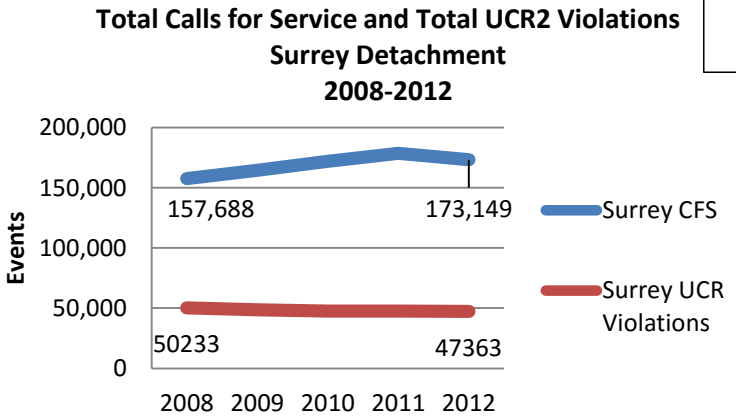
Some Types of crime baskets

- **Police function**
  - Calls for service basket: principal and subsidiary attributes
  - Crime mix basket: principal and subsidiary attributes
  - Charge recommendation baskets (crimes that occur together)
- **Court level**
  - Charge baskets (crimes that are prosecuted as a group)
  - Conviction baskets (convictions that occur together as a group)
- **System handling**
  - Tracing charge baskets from police to prosecutor to conviction
  - Tracing process and procedure in case handling baskets
- **Offender baskets (sets of crimes in criminal events)**
  - Occasional Offenders (group crime type baskets)
  - Prolific Offenders
    - Individual crime baskets over time

Calls for service basket – RCMP E-Division

- **Less than a third of CFS would be recorded in the standard crime rate**
- **Current debate on police resources mostly focuses on declining CRIME rate rather than CALLS FOR SERVICE rate**





Crime dropped 6%

Calls for service increased 10%

Big Data

- **Prior research based on small/ moderate samples**
- **Current research possible on Big Data**
  - Size
  - Complexity
- **Can explore variety of possible patterns of offending and justice system response**

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Basket of Crimes Analysis Using the *ICURS Secure data facility*

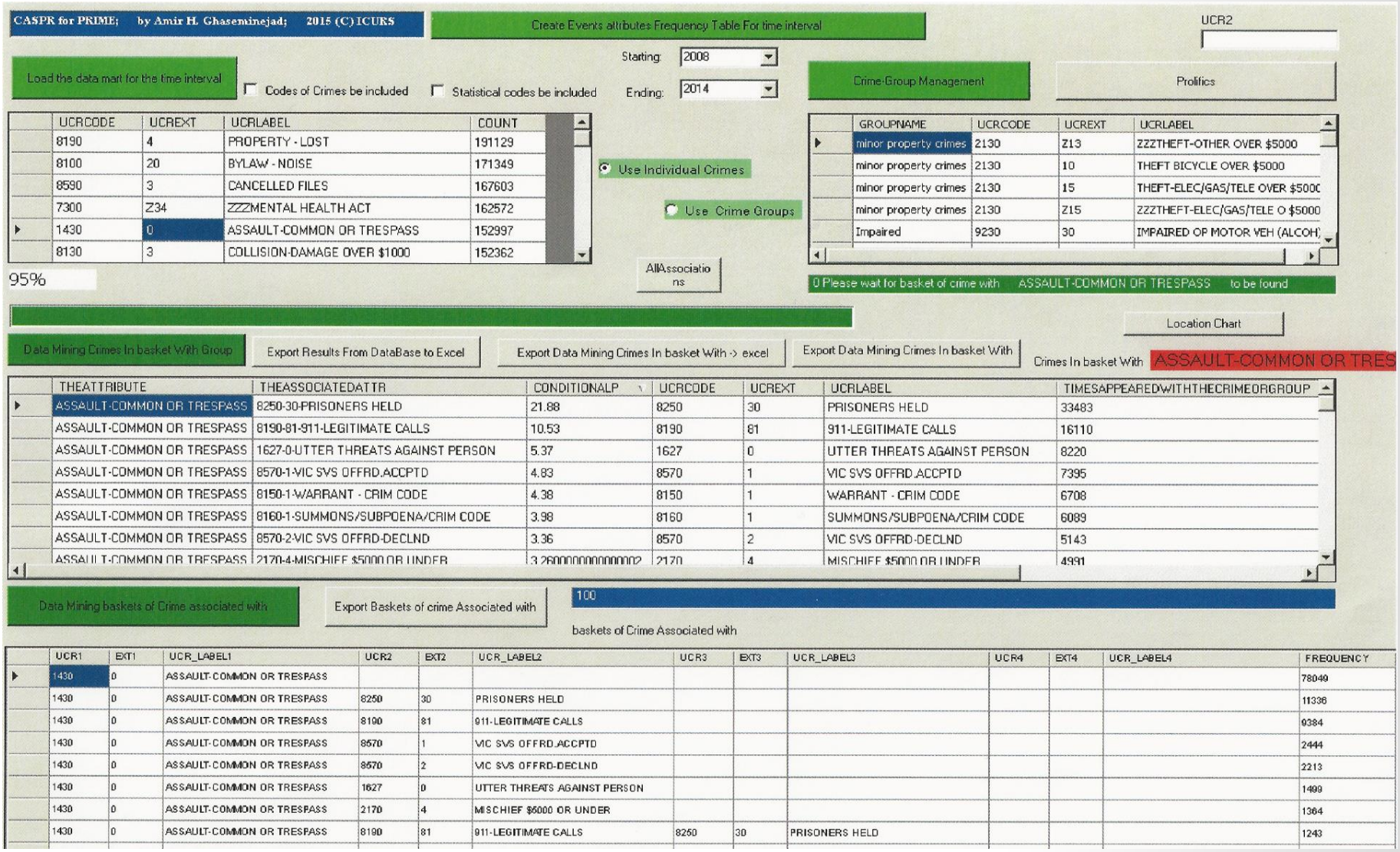
- **ICURS secure lab**
- **PRIME BC RMS for RCMP E-Division**
  - 182 of 193 police jurisdictions in British Columbia
  - ICURS holdings are de-identified but entity matched
- **Data base records all calls for service & all police action**
- **Data base allows entry of up to four attributes for each CFS – these can be event (e.g., crime) type or police action type**
  - Similar to NIBRS in this -- but comprehensive national coverage
- **Data base contains much detailed information about the event.**
- **PRIME data base can be linked to COUR-BC**

Overview of CasPR

- **CasPR is an ICURS developed analytic tool for working with the PRIME BC data base**
  - Originally developed to work with Ministry of Solicitor General Uniform Crime Reporting monthly returns
- **Provides tools for quickly identifying and analyzing trends in both the prevalence and quantum of:**
  - Calls for Service
  - Criminal Events
  - Clearance Rates
- **Ability to combine crime and other encounters with police involving**
  - Anti-Social Behavior
  - Nuisance
  - Drug, alcohol and mental health driven events
- **Can now do Crime Basket Analysis**

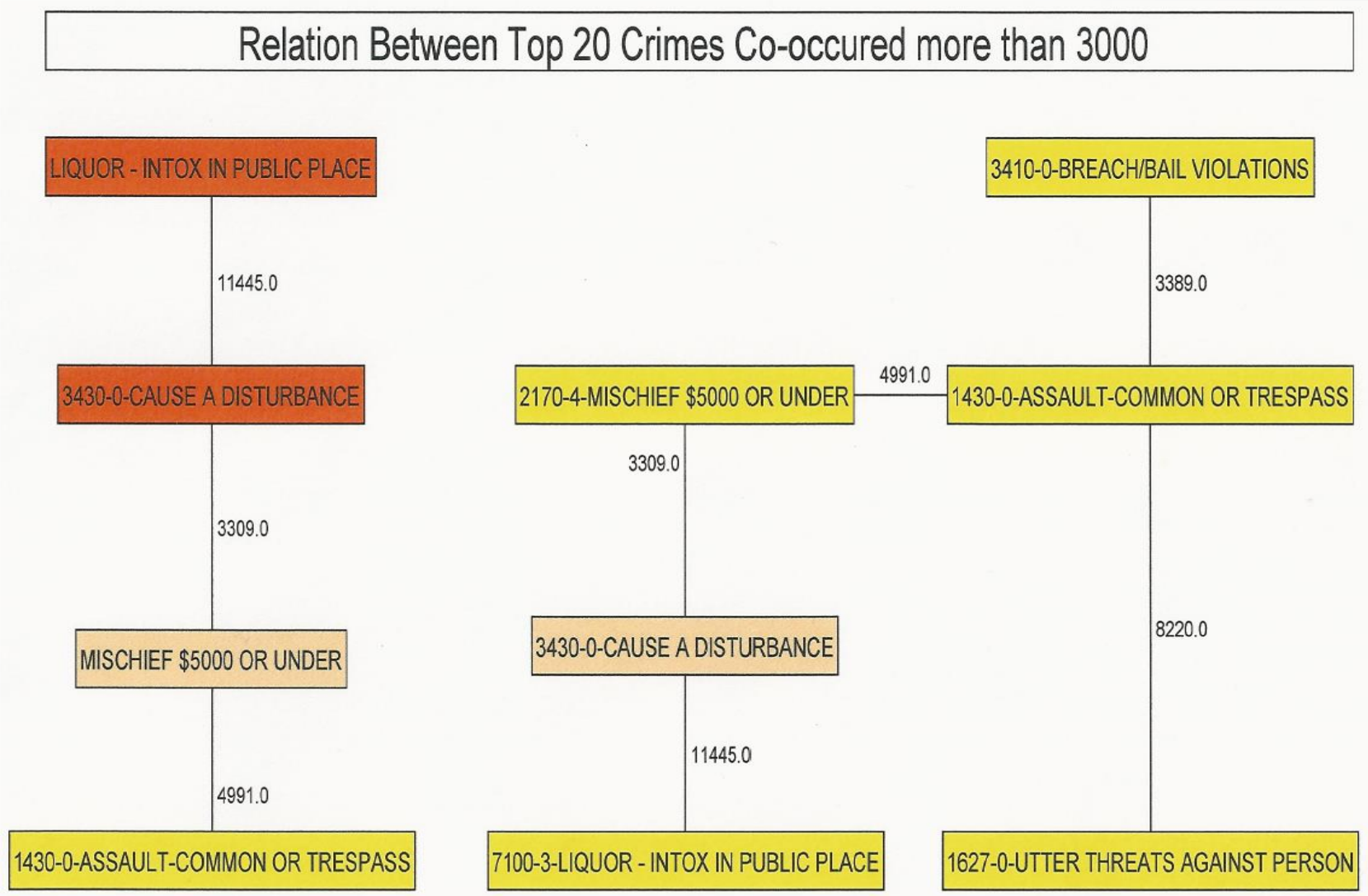
Background on how Crime Basket works in CasPR

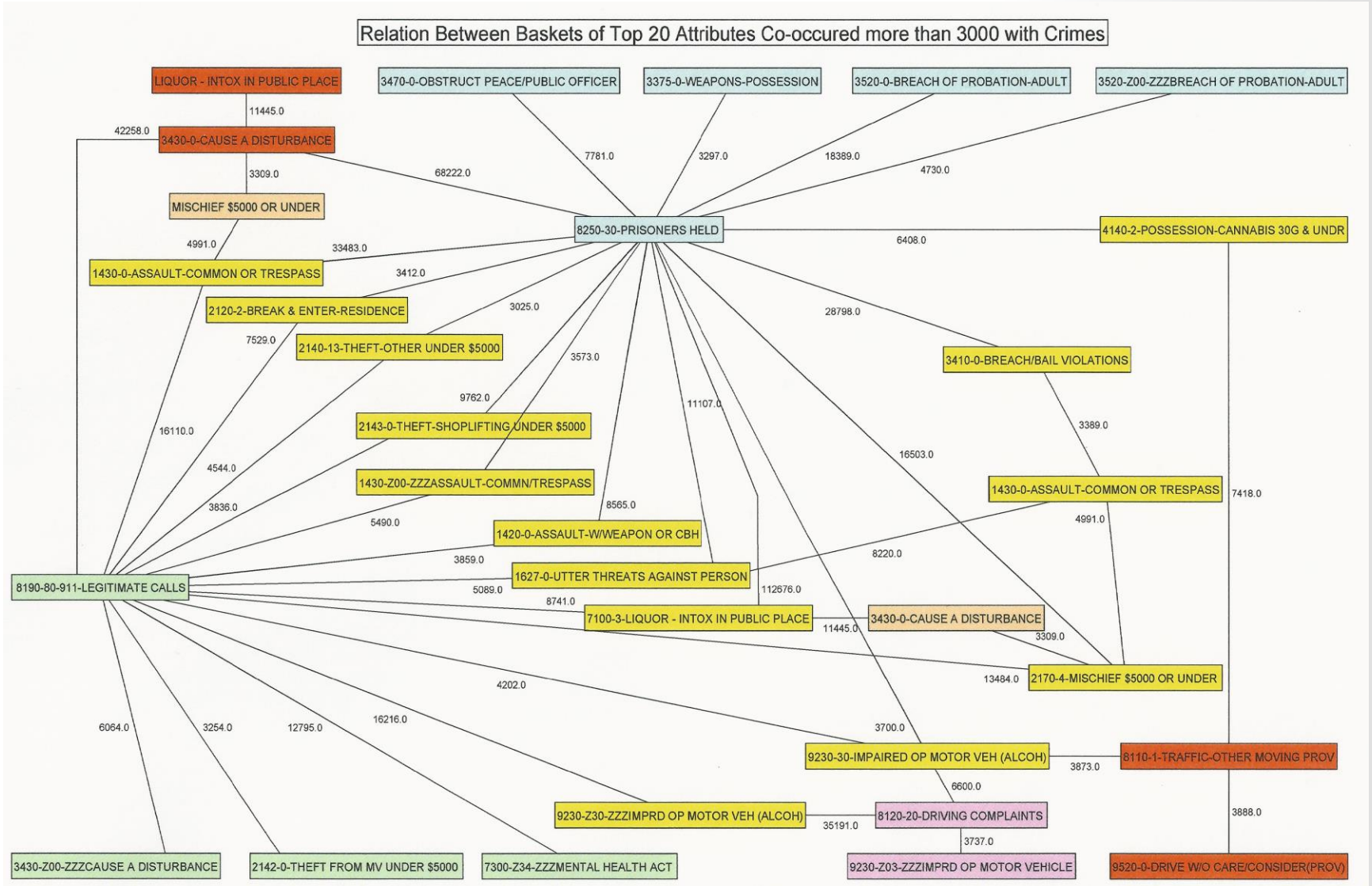
- **Examines all calls for service in BC and sorts through up to four event attributes**
- **Identifies highest types of calls and their associated baskets of attributes**
- **Identifies all entities (de-identified persons) involved in calls and their associated baskets of attributes**
- **Identifies highest repeat offenders by type of call**
- **Identifies entities who are high in multiple types of crimes**
- **Identifies procedural actions associated with crime types**

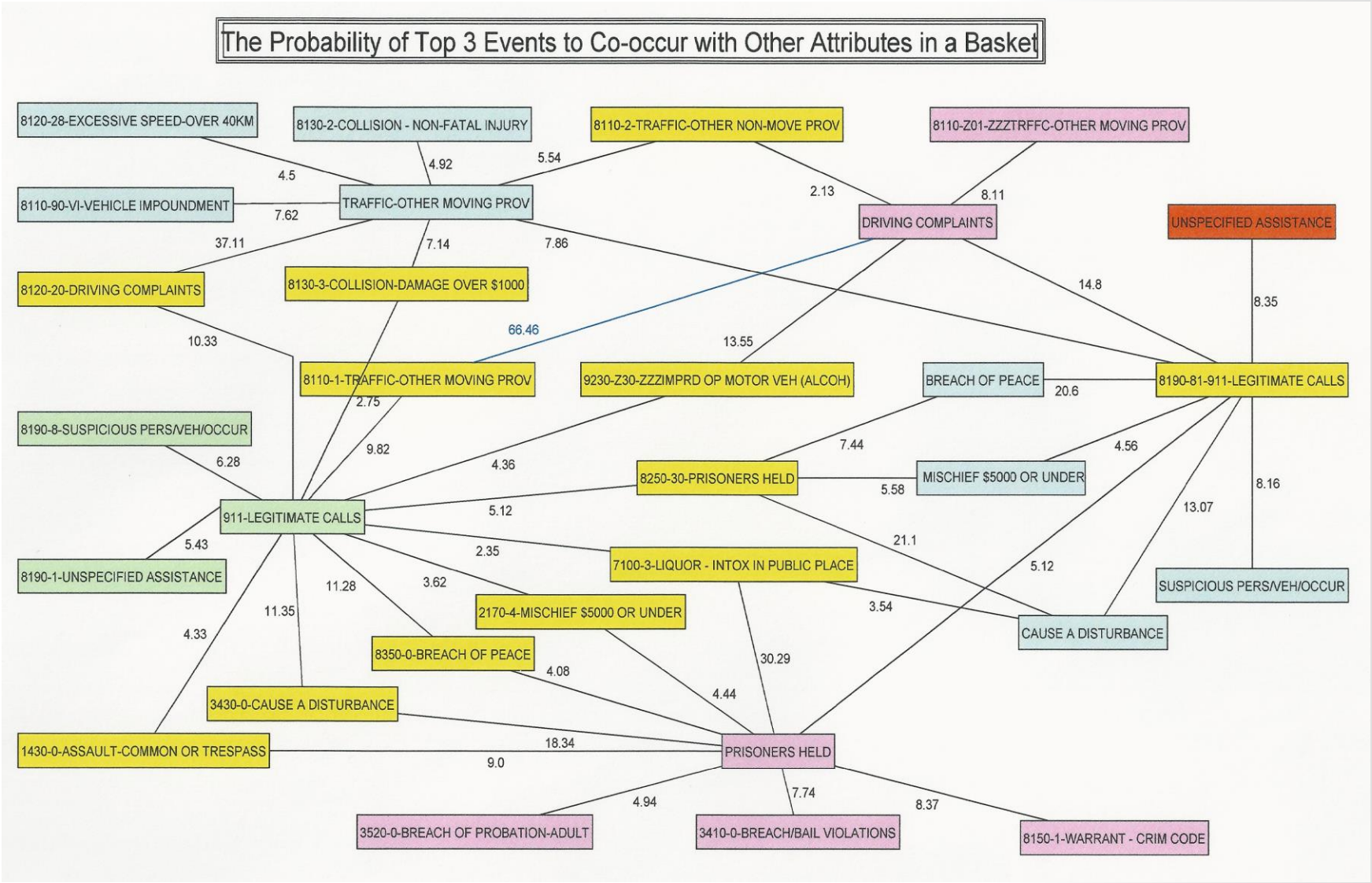

CASPR for PRIME; by Amir H. Ghaseminejad; 2015 (C) ICURS
Create Events attributes Frequency Table For time interval
UCR2
Load the data mart for the time interval
Codes of Crimes be included
Statistical codes be included
Starting: 2008
Ending: 2014
Crime-Group Management
Prolifics
UCRCODE UCREXT UCRLABEL COUNT
8190 4 PROPERTY - LOST 191129
8100 20 BYLAW - NOISE 171349
8590 3 CANCELLED FILES 167603
7300 Z34 ZZZMENTAL HEALTH ACT 162572
1430 0 ASSAULT-COMMON OR TRESPASS 152997
8130 3 COLLISION-DAMAGE OVER $1000 152362
Use Individual Crimes
Use Crime Groups
GROUPNAME UCRCODE UCREXT UCRLABEL
minor property crimes 2130 Z13 ZZZTHEFT-OTHER OVER $5000
minor property crimes 2130 10 THEFT BICYCLE OVER $5000
minor property crimes 2130 15 THEFT-ELEC/GAS/TELE OVER $5000
minor property crimes 2130 Z15 ZZZTHEFT-ELEC/GAS/TELE O $5000
Impaired 9230 30 IMPAIRED OP MOTOR VEH (ALCOH)
95%
AllAssociations
0 Please wait for basket of crime with ASSAULT-COMMON OR TRESPASS to be found
Location Chart
Data Mining Crimes In basket With Group
Export Results From DataBase to Excel
Export Data Mining Crimes In basket With -> excel
Export Data Mining Crimes In basket With
Crimes In basket With ASSAULT-COMMON OR TRES
THEATTRIBUTE THEASSOCIATEDATTR CONDITIONALP UCRCODE UCREXT UCRLABEL TIMESAPPEAREDWITHTHECRIMEORGROUP
ASSAULT-COMMON OR TRESPASS 8250-30-PRISONERS HELD 21.88 8250 30 PRISONERS HELD 33483
ASSAULT-COMMON OR TRESPASS 8190-81-911-LEGITIMATE CALLS 10.53 8190 81 911-LEGITIMATE CALLS 16110
ASSAULT-COMMON OR TRESPASS 1627-0-UTTER THREATS AGAINST PERSON 5.37 1627 0 UTTER THREATS AGAINST PERSON 8220
ASSAULT-COMMON OR TRESPASS 8570-1-VIC SVS OFFRD.ACCPTD 4.83 8570 1 VIC SVS OFFRD.ACCPTD 7395
ASSAULT-COMMON OR TRESPASS 8150-1-WARRANT - CRIM CODE 4.38 8150 1 WARRANT - CRIM CODE 6708
ASSAULT-COMMON OR TRESPASS 8160-1-SUMMONS/SUBPOENA/CRIM CODE 3.98 8160 1 SUMMONS/SUBPOENA/CRIM CODE 6089
ASSAULT-COMMON OR TRESPASS 8570-2-VIC SVS OFFRD-DECLND 3.36 8570 2 VIC SVS OFFRD-DECLND 5143
ASSAULT-COMMON OR TRESPASS 2170-4-MISCHIEF $5000 OR UNDER 3.2600000000000002 2170 4 MISCHIEF $5000 OR UNDER 4991
Data Mining baskets of Crime associated with
Export Baskets of crime Associated with
100
baskets of Crime Associated with
UCR1 EXT1 UCR_LABEL1 UCR2 EXT2 UCR_LABEL2 UCR3 EXT3 UCR_LABEL3 UCR4 EXT4 UCR_LABEL4 FREQUENCY
1430 0 ASSAULT-COMMON OR TRESPASS 78049
1430 0 ASSAULT-COMMON OR TRESPASS 8250 30 PRISONERS HELD 11336
1430 0 ASSAULT-COMMON OR TRESPASS 8190 81 911-LEGITIMATE CALLS 9384
1430 0 ASSAULT-COMMON OR TRESPASS 8570 1 VIC SVS OFFRD.ACCPTD 2444
1430 0 ASSAULT-COMMON OR TRESPASS 8570 2 VIC SVS OFFRD-DECLND 2213
1430 0 ASSAULT-COMMON OR TRESPASS 1627 0 UTTER THREATS AGAINST PERSON 1499
1430 0 ASSAULT-COMMON OR TRESPASS 2170 4 MISCHIEF $5000 OR UNDER 1364
1430 0 ASSAULT-COMMON OR TRESPASS 8190 81 911-LEGITIMATE CALLS 8250 30 PRISONERS HELD 1243

The Crime			InBasket			InBasket			Frequency
2120	2	BREAK & ENTER-RESIDENCE							73643
2120	2	BREAK & ENTER-RESIDENCE	8190	81	911-LEGITIMATE CALLS				5899
2120	2	BREAK & ENTER-RESIDENCE	8570	2	VIC SVS OFFRD-DECLND				3965
2120	2	BREAK & ENTER-RESIDENCE	8570	1	VIC SVS OFFRD.ACCPTD				1770
2120	2	BREAK & ENTER-RESIDENCE	2140	13	THEFT-OTHER UNDER $5000				1255
2120	2	BREAK & ENTER-RESIDENCE	8250	30	PRISONERS HELD				799
2120	2	BREAK & ENTER-RESIDENCE	2142	0	THEFT FROM MV UNDER $5000				786
2120	2	BREAK & ENTER-RESIDENCE	2170	4	MISCHIEF $5000 OR UNDER				622
2120	2	BREAK & ENTER-RESIDENCE	8190	81	911-LEGITIMATE CALLS	8570	2	VIC SVS OFFRD-DECLND	348
2120	2	BREAK & ENTER-RESIDENCE	8150	1	WARRANT - CRIM CODE				198
2120	2	BREAK & ENTER-RESIDENCE	8190	81	911-LEGITIMATE CALLS	8570	1	VIC SVS OFFRD.ACCPTD	183
2120	2	BREAK & ENTER-RESIDENCE	2131	1	THEFT OF AUTO OVER $5000				164
2120	2	BREAK & ENTER-RESIDENCE	2130	13	THEFT-OTHER OVER $5000				147
2120	2	BREAK & ENTER-RESIDENCE	8570	2	VIC SVS OFFRD-DECLND	8190	81	911-LEGITIMATE CALLS	137
2120	2	BREAK & ENTER-RESIDENCE	2135	1	THEFT OF AUTO OVER $5000				135
2120	2	BREAK & ENTER-RESIDENCE	2131	2	THEFT OF TRUCK OVER $5000				113
2120	2	BREAK & ENTER-RESIDENCE	2141	3	THEFT MOTORCYCLE UNDER $5000				100

Break & Enter Residence	Theft other under $5,000	1255
Break & Enter Residence	Theft from MV under	786
Break & Enter Residence	Mischief under $5000	622
Break & Enter Residence	Theft of auto over $5000	164
Break & Enter Residence	Theft other over $5000	147
Break & Enter Residence	Theft of Truck over $5000	113
Break & Enter Residence	Theft of Motorcycle under	100


Relation Between Top 20 Crimes Co-occured more than 3000
LIQUOR - INTOX IN PUBLIC PLACE
11445.0
3430-0-CAUSE A DISTURBANCE
3309.0
MISCHIEF $5000 OR UNDER
4991.0
1430-0-ASSAULT-COMMON OR TRESPASS
3410-0-BREACH/BAIL VIOLATIONS
3389.0
2170-4-MISCHIEF $5000 OR UNDER
4991.0
1430-0-ASSAULT-COMMON OR TRESPASS
3309.0
3430-0-CAUSE A DISTURBANCE
11445.0
7100-3-LIQUOR - INTOX IN PUBLIC PLACE
8220.0
1627-0-UTTER THREATS AGAINST PERSON


Relation Between Baskets of Top 20 Attributes Co-occured more than 3000 with Crimes
LIQUOR - INTOX IN PUBLIC PLACE
3470-0-OBSTRUCT PEACE/PUBLIC OFFICER
3375-0-WEAPONS-POSSESSION
3520-0-BREACH OF PROBATION-ADULT
3520-Z00-ZZZBREACH OF PROBATION-ADULT
3430-0-CAUSE A DISTURBANCE
MISCHIEF $5000 OR UNDER
8250-30-PRISONERS HELD
4140-2-POSSESSION-CANNABIS 30G & UNDR
1430-0-ASSAULT-COMMON OR TRESPASS
2120-2-BREAK & ENTER-RESIDENCE
2140-13-THEFT-OTHER UNDER $5000
3410-0-BREACH/BAIL VIOLATIONS
2143-0-THEFT-SHOPLIFTING UNDER $5000
1430-Z00-ZZZASSAULT-COMMN/TRESPASS
1430-0-ASSAULT-COMMON OR TRESPASS
1420-0-ASSAULT-W/WEAPON OR CBH
8190-80-911-LEGITIMATE CALLS
1627-0-UTTER THREATS AGAINST PERSON
7100-3-LIQUOR - INTOX IN PUBLIC PLACE
3430-0-CAUSE A DISTURBANCE
2170-4-MISCHIEF $5000 OR UNDER
9230-30-IMPAIRED OP MOTOR VEH (ALCOH)
8110-1-TRAFFIC-OTHER MOVING PROV
9230-Z30-ZZZIMPRD OP MOTOR VEH (ALCOH)
8120-20-DRIVING COMPLAINTS
3430-Z00-ZZZCAUSE A DISTURBANCE
2142-0-THEFT FROM MV UNDER $5000
7300-Z34-ZZZMENTAL HEALTH ACT
9230-Z03-ZZZIMPRD OP MOTOR VEHICLE
9520-0-DRIVE W/O CARE/CONSIDER(PROV)
11445.0
42258.0
7781.0
3297.0
18389.0
4730.0
3309.0
68222.0
4991.0
33483.0
6408.0
3412.0
3025.0
28798.0
7529.0
3573.0
9762.0
11107.0
3389.0
16110.0
16503.0
4544.0
7418.0
3836.0
8565.0
4991.0
5490.0
3859.0
8220.0
5089.0
112676.0
8741.0
11445.0
3309.0
13484.0
4202.0
6064.0
3254.0
12795.0
16216.0
3700.0
3873.0
6600.0
35191.0
3888.0
3737.0


The Probability of Top 3 Events to Co-occur with Other Attributes in a Basket
8120-28-EXCESSIVE SPEED-OVER 40KM
8130-2-COLLISION - NON-FATAL INJURY
8110-2-TRAFFIC-OTHER NON-MOVE PROV
8110-Z01-ZZZTRFFC-OTHER MOVING PROV
8110-90-VI-VEHICLE IMPOUNDMENT
TRAFFIC-OTHER MOVING PROV
DRIVING COMPLAINTS
UNSPECIFIED ASSISTANCE
8120-20-DRIVING COMPLAINTS
8130-3-COLLISION-DAMAGE OVER $1000
8110-1-TRAFFIC-OTHER MOVING PROV
9230-Z30-ZZZIMPRD OP MOTOR VEH (ALCOH)
BREACH OF PEACE
8190-81-911-LEGITIMATE CALLS
8190-8-SUSPICIOUS PERS/VEH/OCCUR
8250-30-PRISONERS HELD
MISCHIEF $5000 OR UNDER
911-LEGITIMATE CALLS
8190-1-UNSPECIFIED ASSISTANCE
7100-3-LIQUOR - INTOX IN PUBLIC PLACE
SUSPICIOUS PERS/VEH/OCCUR
2170-4-MISCHIEF $5000 OR UNDER
CAUSE A DISTURBANCE
8350-0-BREACH OF PEACE
3430-0-CAUSE A DISTURBANCE
1430-0-ASSAULT-COMMON OR TRESPASS
PRISONERS HELD
3520-0-BREACH OF PROBATION-ADULT
3410-0-BREACH/BAIL VIOLATIONS
8150-1-WARRANT - CRIM CODE
4.5
4.92
5.54
2.13
8.11
7.62
37.11
7.14
7.86
14.8
8.35
66.46
10.33
13.55
2.75
20.6
9.82
7.44
4.56
6.28
4.36
5.58
8.16
5.12
13.07
5.43
21.1
2.35
5.12
11.28
3.62
3.54
11.35
4.33
30.29
4.08
4.44
18.34
9.0
4.94
7.74
8.37

Future of research

- **Case history analysis**
- **Trajectory analysis**
  - Offenders
  - Co-offenders
  - Crime sets
- **Unstructured text analysis of description of events in relation to baskets**
- **Other roles of people besides offending:**
  - Complainant
  - Victim
  - Witness
- **Bunch of stuff we don’t yet know enough about crime baskets to realize we need to research as yet!**

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

Thank you!