

# Community Business Intelligence:

Early learnings from community health sector data

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The background is a solid blue color with several large, semi-transparent, overlapping circular and curved shapes in a lighter shade of blue, creating a layered, abstract effect.

# About Community Business Intelligence

# Business Case

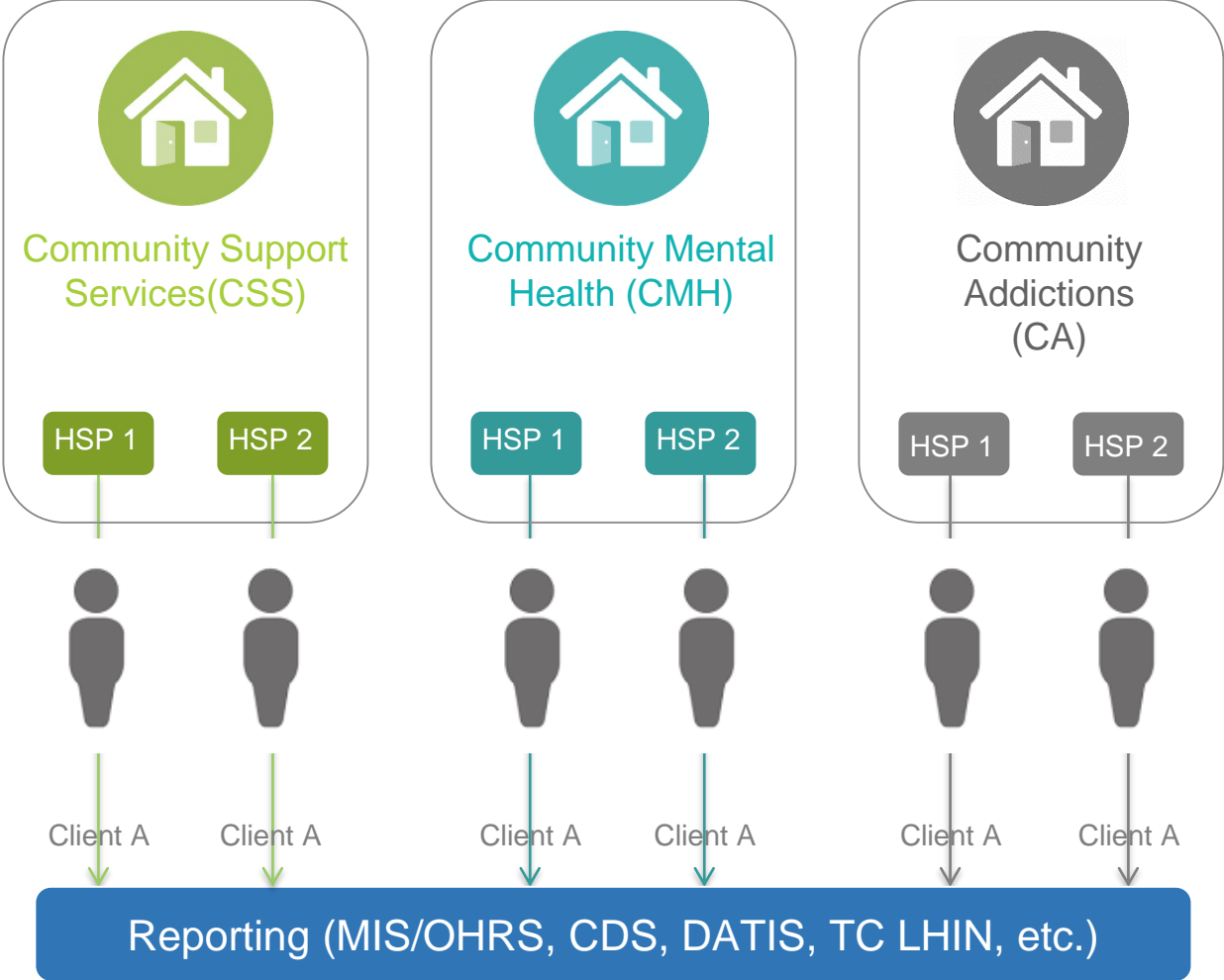
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The Toronto Central Local Health Integration Network wanted to answer the following questions to better understand the service utilization patterns across its 100+ community health service providers:

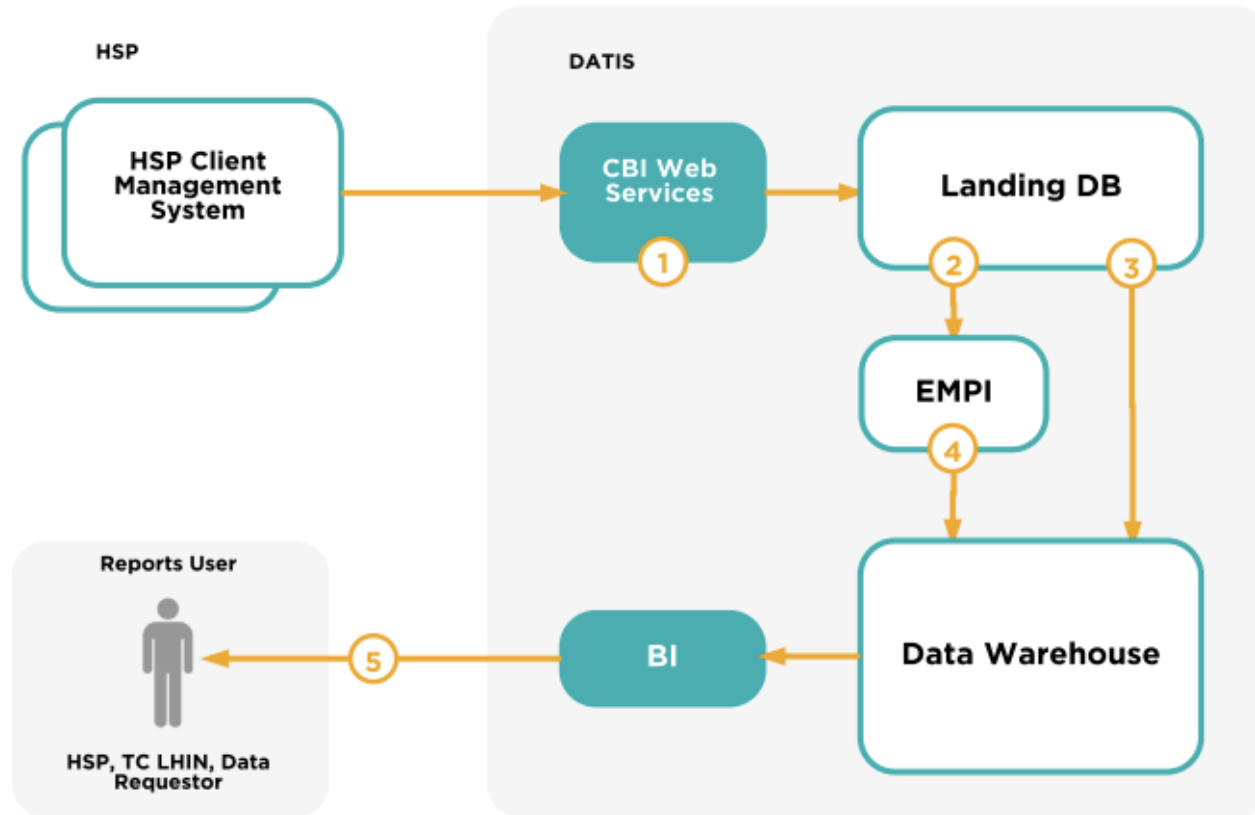
- What is the real time capacity and utilization for all community-funded services?
- What are client wait times?
- Where are people living who are accessing services?
- Who is using services, when and which services and for how long?
- What combination of services are they using?

# Traditional Reporting Paradigm

- Data are reported in aggregate for each health service provider on a quarterly basis; minimal continuity between fiscal years
- Clients are counted more than once if they access multiple health service providers or if they access services from multiple sub-sector service types
- Inability to count unique individuals engaged in community health system
- Data provide no representation of the experience at the client level: e.g. service pathway, geographical access, wait times, or length of stay



# CBI Approach



- Collect anonymized client-level records using a minimal dataset that is common to most health service organizations.
- Integrate with software vendors to provide an automated, back-end data transfer that does not require health service provider intervention
- Leverage existing data warehousing infrastructure (DATIS)
- Use an Enterprise Master Person Index to match records from unique individuals prior to anonymization
- Have a community-based service provider lead the implementation (Reconnect)

# CBI Reporting Paradigm

- Ability to track client service pathways through the system
- Understanding of service utilization and capacity across sectors
- New insights into:
  - total number of unique individuals engaged in community health services
  - geography of utilization
  - wait times
  - length of stay
  - data quality



# CBI Dataset

# Data Elements

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Discarded after EMPI	Available in CBI Dataset
First Name	Org ID*
Last Name at Birth	EMPI ID (Client ID)*
Current Last Name	Age
Middle Name	Gender
Date of Birth	Postal Code
Health Card Number	LHIN of Residence
Address 1	Functional Centre Code*
Address 2	Program Enrollment ID*
City	Referral Date
Phone	Admission Date*
	Service Initiation Date
	Discharge Date

\*Mandatory data element

- Number of fields is small:  
12 data elements in final dataset;  
only 5 mandatory data elements
- Nearly 100 health service providers  
on-boarded
- ~100,000 unique client records and  
~200,000 service records after four  
years of data collection



# Data Elements

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	Service Initiation Date
	Discharge Date

Can be linked to other administrative data (e.g. ICES)

Lat/lon reference can be used to link to other spatial data (e.g. census)

Can be used to identify single service and multiple service users. For multi-service users, concurrent needs and sequence represent "service pathways"

Time to decision date } Total wait time

Time to service initiation }

Length of stay

\*Mandatory data element

# Highlights from CBI Analysis

# Service Utilization by TC LHIN Sub-Region

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## Question:

- What is the geographic distribution of people accessing specific community health services in the TC LHIN sub-regions?

## Data used:

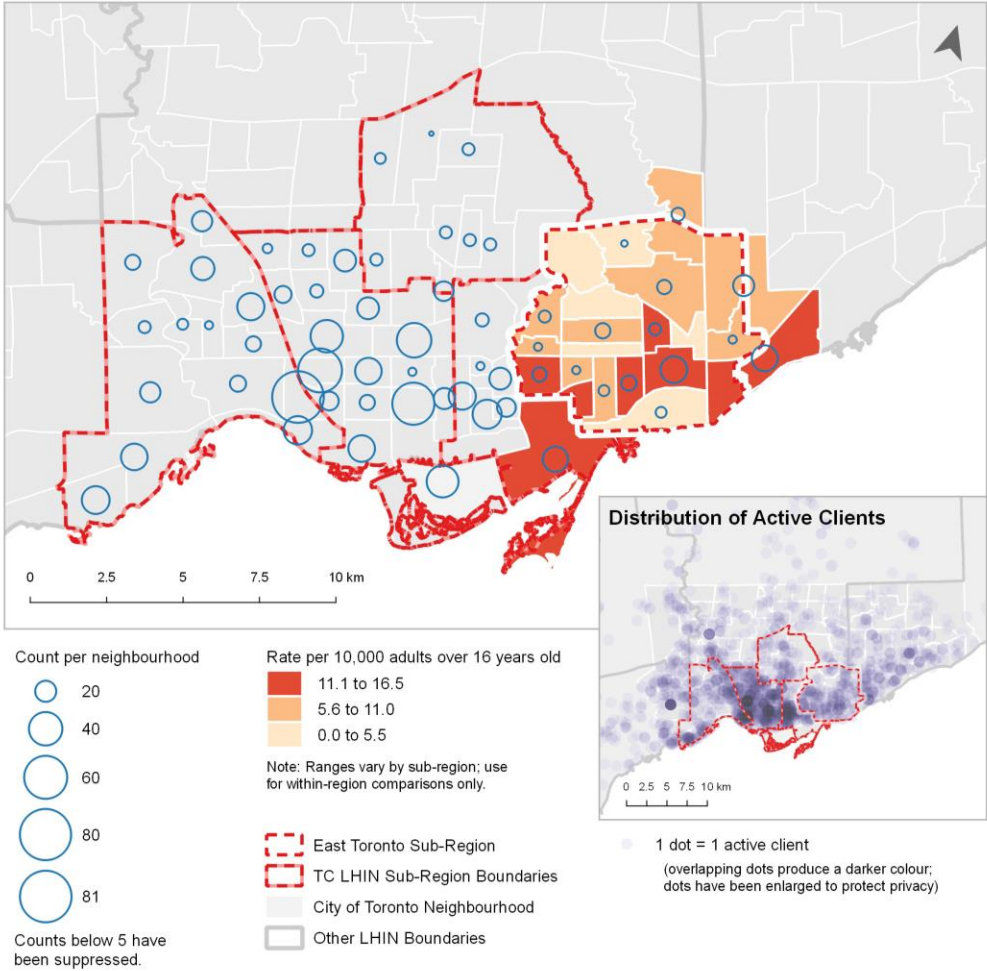
- CBI: clients that were enrolled in services between 2014 and 2016
- 2011 Census: total population by City of Toronto social planning neighbourhood

## Analysis:

- Multiple maps: choropleth, proportional symbol, and dot density

# Service Utilization by TC LHIN Sub-Region

## Community Addiction Treatment Utilization, 2014-16



Sources: Community Business Intelligence, extracted May 19, 2016; Statistics Canada.

### Question:

- What is the geographic distribution of people accessing specific community health services in the TC LHIN sub-regions?

### Story:

- Choropleth shows highest rates in South Riverdale, Blake-Jones, Woodbine Corridor, East-End Danforth, Woodbine-Lumsden, Birchcliffe-Cliffside
- Proportional symbols show that utilization in most East neighbourhoods is lower than the the Mid-West, but higher than the North, and less variable than the West
- Dot density provides context. Wide extent beyond TC LHIN boundaries tells us that there is large inflow for this service

# Baskets of Services For Seniors

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Question:

- What services do seniors (65 years old and over) use in combination?

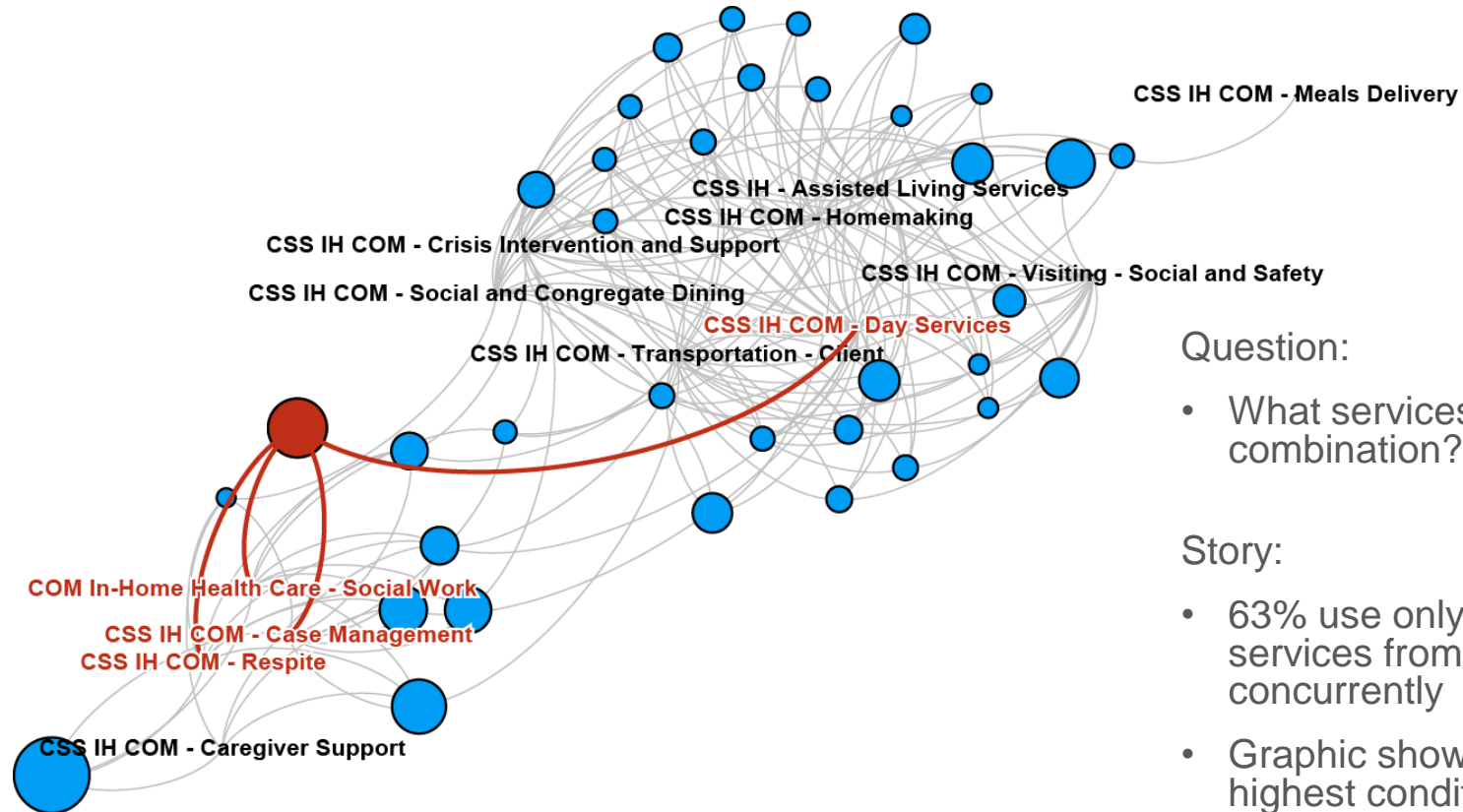
Data used:

- CBI: clients that were enrolled in multiple concurrent services between 2015 and 2017

Analysis:

- Market Basket Analysis

# Baskets of Services For Seniors



## Question:

- What services do seniors (65 years old and over) use in combination?

## Story:

- 63% use only one service at a time; less than 10% use services from more than one service provider concurrently
- Graphic shows combinations of services with the highest conditional probability (e.g. when services A and B are commonly together, service C is also likely used as well). Node sizes represent most prevalent groups.
- Two visually identifiable clusters of services
- Example in red shows a common service combination

# Identifying Patterns in Functional Centre Sub-populations

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Question:

- Using demographic and service utilization data, what are the similarities between the populations served in each of the functional centres?

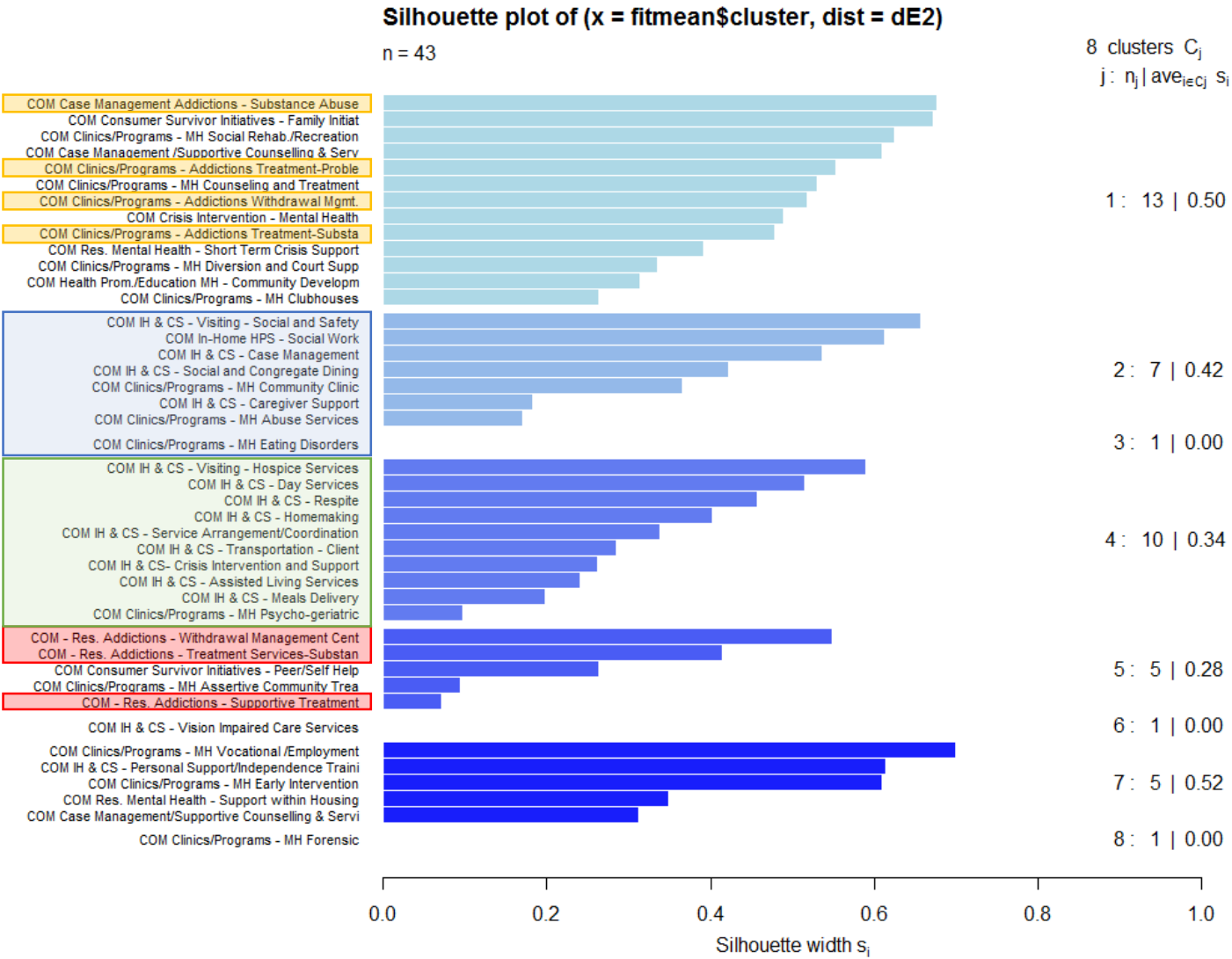
Data used:

- CBI: clients that were enrolled in services between 2014 and 2016
- HSP360: Total cost and number of FTEs in each functional centre

Analysis:

- *k*-means cluster analysis

# Identifying Patterns in Functional Centre Sub-populations



Question:

- Using demographic and service utilization data, what are the similarities between functional centres?

Story:

- Two seniors clusters (blue & green): one with lower average age and low cost per individual; another with higher average age and high cost per individual
  - Residential addictions services (yellow & red) are separated from outpatient addictions services. The former skews male and the latter skews female.
- \*\*Clusters do not represent real-world overlaps in people, just overlaps in characteristics.**



# Take Aways & Opportunities

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- You can do a lot with a relatively small number of data elements
- The CBI dataset is a subset of a much richer dataset collected at the point of care; therefore, these analytic approaches may be useful to individual health service providers.
- Potential enhancements to CBI:
  - Integrate with 2016 Census
  - Incorporate HSP 360 Supplemental Data (e.g. service locations and opening hours can facilitate geographic accessibility analysis)
  - On-boarding of other GTA LHINs (to provide full picture of in-flow and out-flow)
  - Introduce new data elements (e.g. visit dates would capture service intensity)