

Data Partnership between the Community Business Intelligence Project and ICES

Prepared By
Atif Kukaswadia, Julie Yang, Paul Kurdyak

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Authors' Affiliations

Atif Kukaswadia, PhD

Senior Epidemiologist, Institute for Clinical Evaluative Sciences (ICES)

Julie Yang, MA

Senior Research Project Manager, Institute for Clinical Evaluative Sciences

Paul Kurdyak MD PhD FRCPC

Core Senior Scientist and Lead, Mental Health and Addictions Research Program, Institute for Clinical Evaluative Sciences

Director, Health Outcomes and Performance Evaluation (HOPE) Research Unit, Social and Epidemiological Research (SER) Program, Centre for Addiction and Mental Health

Associate Professor, Department of Psychiatry and Institute for Health Policy, Management and Evaluation, Faculty of Medicine, University of Toronto

Corresponding Author

Dr. Paul Kurdyak

Institute for Clinical Evaluative Sciences

2075 Bayview Avenue, G106

Toronto, ON M4N 3M5

Tel: 416-535-8501, ext. 6134

Paul_kurdyak@camh.ca

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Definitions

Acute care sector:	This is used to refer to all ICES-data holdings, which includes care delivered in the hospital, outpatient and emergency department settings.
Client:	This is used to refer to an individual in the CBI data repository. Upon registration with a community-based care program, a unique client ID is assigned to that individual. Our data consisted of 25,240 unique clients.
Community-based care:	Services offered in the community by health service providers, such as Reconnect Community Health Services, are defined as community-based care in this report.
Enrollment:	Once a client ID has been assigned, the client is given a program enrollment ID for every program they use within a functional centre. A client can therefore have multiple enrollments in a functional centre and use multiple functional centres in the system. There were 48,615 enrollments in our data. This is used synonymously with “record” when describing the CBI dataset as each enrollment is a separate record.
Functional centres:	Functional Centre ID numbers and names are created by the Ministry of Health and Long-Term Care and assigned by the LHIN for funding and planning purposes. An example of a functional centre is “72 5 40 78 45,” corresponding to “COM Residential – Addictions – Withdrawal Management Centres.”
Functional category:	This report collapses functional centres into 15 functional centre categories which are used by the Toronto Central Local Health Integration Network (TC LHIN). In order to have sufficiently large sample sizes, this is the smallest unit provided in Chapter 3. A list of functional centres included in each functional category can be found in Appendix A.
Functional sector:	Functional centre category can be further collapsed into three functional sectors: Community Support Services, Community Mental Health and Community Addictions. Appendix A provides additional information about the types of functional centres delivered in each sector.
Health service providers:	Health service providers administer programs within a functional centre. For example, four different health service providers in the TC LHIN oversee programs that use the functional centre above (“72 5 40 78 45”).

Patient

Patients are those who receive care in the acute care sector. This is in contrast to “clients,” who are defined in this report as those who are receiving community-based care.

List of Abbreviations

CBI	Community Business Intelligence
CI	Confidence Interval
CIHI	Canadian Institute for Health Information
DAD	Discharge Abstract Database
ED	Emergency Department
HSP	Health Service Provider
ICES	Institute for Clinical Evaluative Sciences
IKN	ICES Key Number
IRCC	Immigration, Refugees and Citizenship Canada (IRCC, formerly Citizenship and Immigration Canada – CIC)
LHIN	Local Health Integration Network
MOHLTC	Ministry of Health and Long-Term Care
NACRS	National Ambulatory Care Reporting System
OHIP	Ontario Health Insurance Plan
OMHRS	Ontario Mental Health Reporting System
RPDB	Registered Persons Database
TC LHIN	Toronto Central Local Health Integration Network

Additional data from ICES holdings

The ICES data repository includes a broad range of linked, encoded, Ontario health-related data. For this report, the following data sources were used in addition to the data provided by CBI.

Census	To determine area-level measures, data from the 2006 Census is used. This can be used to assign area-level characteristics such as neighbourhood-level income to an individual.
DAD	The Discharge Abstract Database (DAD) captures administrative, clinical and demographic information on hospital discharges (including deaths, sign-outs and transfers).
IRCC	Immigration, Refugees and Citizenship Canada (IRCC, formerly Citizenship and Immigration Canada – CIC) data from Ontario are available for use at ICES. This includes immigration application records for people who initially applied to land in Ontario. The data contains permanent residents' demographic information such as country of citizenship, level of education, mother tongue, and landing date. This can also be used to determine if individuals are born in Canada, refugee immigrants, or non-refugee immigrants.
NACRS	The National Ambulatory Care Reporting System (NACRS) contains data for all hospital-based and community-based ambulatory care, such as day surgery, outpatient clinics and emergency department visits.
OHIP	OHIP claims data received by ICES contain most claims paid for by the Ontario Health Insurance Plan. These data cover all health care providers who can claim under OHIP (including physicians, groups, laboratories, and out-of-province providers). Therefore OHIP billing reflects the utilization of physician services in Ontario.
OMHRS	The Ontario Mental Health Reporting System (OMHRS) collects data on patients in adult designated inpatient mental health beds. This includes beds in general, provincial psychiatric, and specialty psychiatric facilities.
RPDB	The Registered Persons Database (RPDB) provides demographic information about anyone who has ever received an Ontario health card number. This includes their date of birth and sex, as well as the address on their health card.

Participating Community Health Service Providers

- Accommodation Information and Support Inc.
- Alternatives
- The Barbra Schlifer Commemorative Clinic
- Central Toronto Youth Services - New Outlook
- Centre for Addiction and Mental Health
- CMHA Toronto
- Community Resource Connections of Toronto
- Copernicus Lodge
- Eden Community Homes
- Etobicoke Services for Seniors
- Fred Victor Centre
- Gerstein Crisis Centre
- The Good Neighbours' Club
- Good Shepherd Non-Profit Homes Inc.
- Harmony Hall (Call-A-Service, Inc.)
- Houselink Community Homes Inc.
- Humber Community Seniors' Services Inc.
- Les Centres d'Accueil Heritage
- LOFT Community Services
- Madison Community Services
- Mood Disorders Association of Ontario
- Native Canadian Centre of Toronto
- Parkdale Activity - Recreation Centre
- Pilot Place Society
- Pine River Institute
- Progress Place Rehabilitation Centre (Metropolitan Toronto) Inc.
- Reconnect Community Health Services
- Regeneration House Inc.
- Sistering - A Woman's Place
- Spinal Cord Injury Ontario
- SPRINT, Senior Care Toronto
- St. Clair O'Connor Community Inc.
- St. Clair West Services for Seniors
- St. Joseph's Health Centre
- St. Jude Community Homes
- St. Matthew's Bracondale House
- St. Michael's Homes
- St. Michael's Hospital
- Storefront Humber Inc.
- Street Haven at the Crossroads
- Street Health Community Nursing Foundation
- Tobias House Attendant Care Inc.
- Toronto Public Health (The Works), City of Toronto
- Transition House Incorporated
- Trinity Square Café Inc.
- University Health Network
- Warden Woods Community Centre
- West Neighbourhood House
- West Toronto Support Services for Seniors
- WoodGreen Community Services
- YMCA of Greater Toronto
- YWCA

Chapter 1: Introduction to the CBI-ICES collaboration

Overview

Reconnect Community Health Services and the Institute for Clinical Evaluative Sciences (ICES) have implemented a data sharing partnership as part of the Community Business Intelligence (CBI) project. This partnership allows for the linkage of CBI data from the community sector to ICES health administrative data holdings. These data complement each other; data from CBI capture client encounters with community-based care programs and data from ICES capture contact with the acute care sector (hospital, emergency department, and physician visits). These linked data will therefore provide an improved understanding of how clients are using both community-based and acute care services available through the Canadian health care system.

About Reconnect Community Health Services

Established in 1981, Reconnect Community Health Services (Reconnect) is a community-based mental health and addictions health service provider, located in the Toronto Central Local Health Integration Network (TC LHIN). Reconnect is governed by a volunteer board of directors, and has over 100 staff.

Reconnect has two streams of services:

1. **Reconnect Clinical Services** helps individuals achieve their health care goals using a recovery focused approach. Case management services offer clients access to a number of services and entitlements (assessment, counselling, planning, linkage, advocacy, monitoring, etc.).
2. **Reconnect Project Management Services** offers community health service providers with unique ways to build capacity and infrastructure in their sector, including systems integration expertise, capacity building tools, and leadership aptitude and knowledge with the support of the TC LHIN.

About the Community Business Intelligence Project

The Toronto Central Local Health Integration Network (TC LHIN) identified a need to improve upon current decision support capabilities within the community sector and is supporting the implementation of the Community Business Intelligence tool which includes client level information about service utilization within TC LHIN funded Health Service Providers (HSP) across three sub-sectors: Community Mental Health (CMH), Community Addiction (CA), and Community Support Services (CSS).

Reconnect Community Health Services was chosen by the TC LHIN as the Project Sponsor to lead the development of the CBI tool to address this need. The CBI Project began in 2012 and has taken the TC LHIN to an enhanced level of data quality and reporting. It enables the TC LHIN to analyze and report on individual-level service utilization data (not including individual health records) in addition to the current

aggregate data that is available. Uploading to a single data repository provides the TC LHIN and HSPs with information on how many individuals are receiving a service by functional centre, HSP, and sector, what the HSP wait times for these services are, and how many services each client is accessing within and across the three sectors. Report types include client journey, key service date analysis and data quality reports.

In fiscal year 2014/15, a copy of the CBI data repository was sent to the Institute for Clinical Evaluative Sciences. With the support of the TC LHIN and the CBI working group, the Community Business Intelligence initiative and ICES have entered into a partnership that will allow for research opportunities and enhanced reporting for Health Service Providers and the TC LHIN. An addendum to the Electronic Service Provider Agreement signed by all HSPs participating in CBI allowed CBI data to flow to ICES for the purpose of aggregate reporting and research.

About the Institute for Clinical Evaluative Sciences

The Institute for Clinical Evaluative Sciences is an independent, non-profit organization that uses population-based health information to produce knowledge on a broad range of health care issues. ICES' unbiased evidence provides measures of health system performance, a clearer understanding of the shifting health care needs of Ontarians, and a stimulus for discussion of practical solutions to optimize scarce resources. Key to ICES' work is its ability to link population-based health information, at the patient level, in a way that ensures the privacy and confidentiality of personal health information. Linked databases reflecting 13 million of 34 million Canadians allow researchers to follow patient populations through diagnosis and treatment, and to evaluate outcomes.

ICES receives core funding from the Ontario Ministry of Health and Long-Term Care. In addition, ICES scientists and staff compete for peer-reviewed grants from federal funding agencies, such as the Canadian Institutes of Health Research, and project-specific funds from provincial and national organizations. ICES knowledge is highly regarded in Canada and abroad, and is widely used by government, hospitals, planners, and practitioners to make decisions about health care delivery and to develop policy.

Report Overview and Objective

This report aims to provide an overview of a unique opportunity to understand when and how clients interact with both acute care and community care services, as well as afford an understanding of critical gaps in service delivery that would not be revealed by either data source alone. The three specific objectives of this report are to: 1) summarize the data linkage process, 2) describe the population accessing community-based care using key ICES indicators of acute care use, and 3) report on a specific project that uses these linked data as an example of the kinds of questions these data can answer.

Chapter 2 outlines the CBI data structure and describes the technical aspects of how records can be linked in the absence of complete data on individuals. Chapter 3 uses these linked data to describe the clients in the CBI dataset using ICES data holdings. This includes demographic characteristics such as age and sex, as well as three select ICES indicators: rates of emergency department visits, hospitalizations, and use of outpatient services from April 1, 2014 to March 31, 2015. Chapter 4 highlights a specific project that uses both CBI and ICES data to illustrate the potential opportunities that arise from this data linkage. This analysis was limited to individuals who were admitted to selected community-based addictions functional centres. For these individuals, their rates of emergency department visits, hospitalizations, and outpatient visits were determined for the one year before and one year after admission. Finally, Chapter 5 provides a summary of the findings, future directions for the CBI-ICES collaboration, and the effectiveness of this project as a proof of principle for future data linkages.

Chapter 2: Data collection and linkage

Overview

CBI data are combined with ICES data through a specific linkage process. This can be done in one of two ways. The first is deterministic linkage, where a health card number is used to directly match a CBI record to a specific ICES record. The second is probabilistic linkage, where a combination of age, gender/sex, first name, last name and postal code is used to calculate how likely two records are related to the same individual based on those demographic characteristics. The first part of this chapter describes the CBI data structure, and how CBI data were collected. The chapter then provides an overview of how the linkage was conducted at ICES. The linkage rate was then examined by functional centre and time to determine how the linkage rate differed by these two characteristics.

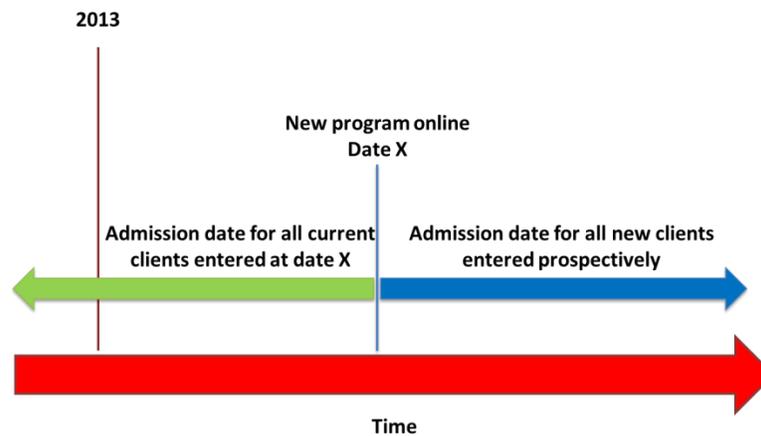
CBI data structure

As part of the data collection process, CBI mandated that five data elements be provided by all health service providers, with a sixth that was only mandatory for those in the addictions sector. These elements were:

1. Client ID This uniquely identifies a client within a software and agency record, allowing us to determine how many services a client is using.
2. Functional centre ID Functional centres were selected for collection rather than collecting at the program level since the LHIN control over functional centre identification has made naming and numbering conventions more consistent across different health service providers.
3. Organization ID This identifies specific health service providers.
4. Program enrollment ID This variable identifies each new program enrollment. Within a single functional centre, clients may be enrolled in multiple programs.
5. Admission date The date when the health service provider admits a client into a functional centre for service.
6. Last name at birth This was only mandatory for health service providers in the addictions sector.

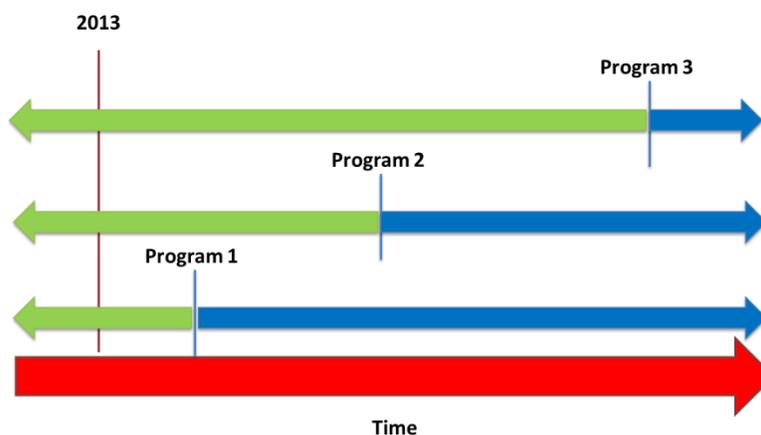
In addition to these, other common data elements were collected where available, including: health card number, first name, current last name, middle names, date of birth, current age, gender, postal code, as well as program specific variables such as referral date, service initiation date, and discharge date. Health service providers started uploading data on their active programs after April 1, 2013. For each program, providers uploaded data on all prevalent cases as of the upload date (Exhibit 1). After this date, all new clients were entered prospectively, and their data automatically uploaded to the CBI server.

Exhibit 1 Entry of existing and future clients into the CBI database



A provider may offer several different programs. While some providers started uploading all of their programs on a single day, others had staggered upload dates. This leads to an example like the one below, where, within a health service provider, there are multiple dates when new programs start uploading their data to CBI (Exhibit 2). Since each program will have a different date of data upload, the number of programs uploading data to CBI within a health service provider will increase over time. An important caveat is that some health service providers elected to upload all client records in their system to CBI as of their upload date, including those who had been discharged prior to the upload date. As a result, the CBI data housed at ICES also contains records of clients who have since been discharged from community-based care.

Exhibit 2 Data upload process when multiple programs exist within a single health service provider



This is analogous to the nesting of programs within functional centres, as programs are classified within health service providers, and, separately, within functional centres.

A practical consequence of this upload process is that only providers that were online as of March 31, 2015 are included in this report. As more data are uploaded to CBI and subsequently transferred and linked to ICES holdings, these data will be more comprehensive and thus more accurately reflect the entirety of agencies reporting to CBI.

The data linkage process

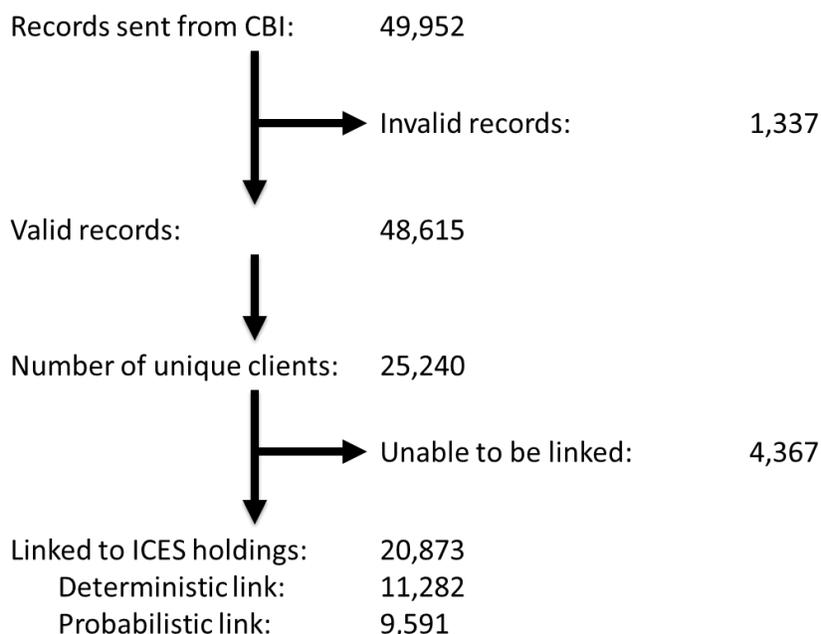
ICES records use an anonymized, unique ICES Key Number (IKN) to identify individuals. The IKN allows for ICES researchers to link an individual across all ICES data holdings. Therefore, in order to leverage the power of both community-based and acute care data, individuals in the CBI dataset have to be assigned their corresponding IKN. This is done through record linkage, a process of bringing together corresponding records from two or more files or finding duplicates within files (Winkler, 2001). CBI records were assigned an IKN using a combination of deterministic and probabilistic record linkage.

Deterministic record linkage is when exact values within data fields match between records. This uses unique identifying information such as a health card number, ideally with minimal missing or incorrect information. If two records have identical information, such as the same health card number, then they are linked. This approach is very efficient, and records are classified as either a link or non-link using this method.

However, not all records are complete or the identifiers are not unique. In these instances, probabilistic matching is used. This approach is recommended when there are no unique identifiers, such as when health card numbers are missing, when there may be recording or transcription errors, or if there is missing data. Probabilistic matching uses computer algorithms to determine the likelihood of two records being a match based on criteria selected by the data linkage analyst. The records are then assigned a “weight” of how close a match they are. Records above a certain weight are deemed matches, and those below a specific weight are rejected. Records with intermediate weights are then reviewed manually, and each designated a match or rejected. This process is repeated for rejected matches, using different criteria to calculate the probability of two records being a match until all records are either matched or rejected. Once this process is completed, the overall linkage rate can be calculated.

The March 31, 2015 CBI data transfer included 49,952 records from 52 of the 119 health service providers in the TC LHIN. After excluding invalid records, this corresponded to 48,615 valid records that represent 25,240 unique individuals. Of these unique individuals, 20,873 (83 percent) were linked to an ICES Key Number: 11,282 (54 percent) using deterministic methods, and 9,591 (46 percent) using probabilistic methods (Exhibit 3).

Exhibit 3 Flowchart of data linkage process



Linkage rates for unique individuals were examined by functional centre to determine if specific centres were more likely to match using deterministic or probabilistic methods, or to not match with ICES holdings. Most of these data were from the community support services sector, accounting for 64.8 percent of all unique records (n = 16,361). For all three sectors, between 35-44 percent of all records were linked deterministically, and 45-52 percent were linked probabilistically (Exhibit 4). Between 12-19 percent of records were unable to be linked.

There were 12 functional categories available in our data. The two largest functional categories were “in-home and community services” and “primary care - clinics/programs.” These two categories accounted for 79.3 percent of all records (63.3 and 16.0 percent respectively) (Exhibit 4). Linkage rates by functional category were high, and seven of the functional categories had overall linkage rates above 80 percent (in-home and community services, primary care - clinics/programs, case management, residential services, residential – addictions, crisis intervention, and in-home professional services). Five functional categories were combined in Exhibit 4 due to small cell sizes, defined as less than or equal to five observations in any one strata: consumer/survivor/family initiatives, assisted living services, addictions home care, health promotion and education, and information and referral services. In order to answer research questions about these specific functional categories, efforts will need to be made to increase the sample size and linkage rate (if possible). Note that no data were received for day/night care, information and referral, and community support initiatives.

Exhibit 4 Data linkage rate by functional centre sector and category, sorted by total number of matched individuals (n = 25,240)

	Type of Match			No match N (row %)	Total N (col %)
	Deterministic match N (row %)	Probabilistic match N (row %)	Total matched* N (row %)		
Functional Sector					
Community support services	5,860 (35.8)	7,424 (45.4)	13,284 (81.2)	3,077 (18.8)	16,361 (64.8)
Community mental health	2,980 (43.8)	2,782 (40.9)	5,762 (84.7)	1,038 (15.3)	6,800 (26.9)
Community addictions treatment	751 (36.1)	1,076 (51.8)	1,827 (87.9)	252 (12.1)	2,079 (8.2)
Functional Category					
In-home and community services	5,723 (35.8)	7,261 (45.4)	12,984 (81.3)	2,995 (18.7)	15,979 (63.3)
Primary care - clinics/programs	1,743 (43.3)	1,635 (40.6)	3,378 (83.9)	649 (16.1)	4,027 (16.0)
Case management	940 (39.4)	1,128 (47.3)	2,068 (86.8)	315 (13.2)	2,383 (9.4)
Residential services	427 (39.4)	568 (52.4)	995 (91.9)	88 (8.1)	1,083 (4.3)
Residential - addictions	356 (58.8)	203 (33.6)	559 (92.4)	46 (7.6)	605 (2.4)
Crisis intervention	258 (38.4)	290 (43.2)	548 (81.5)	124 (18.5)	672 (2.7)
In-home professional services (HPS)	118 (46.5)	105 (41.3)	223 (87.8)	31 (12.2)	254 (1.0)
Other**	26 (11.0)	92 (38.8)	118 (49.8)	119 (50.2)	237 (0.9)

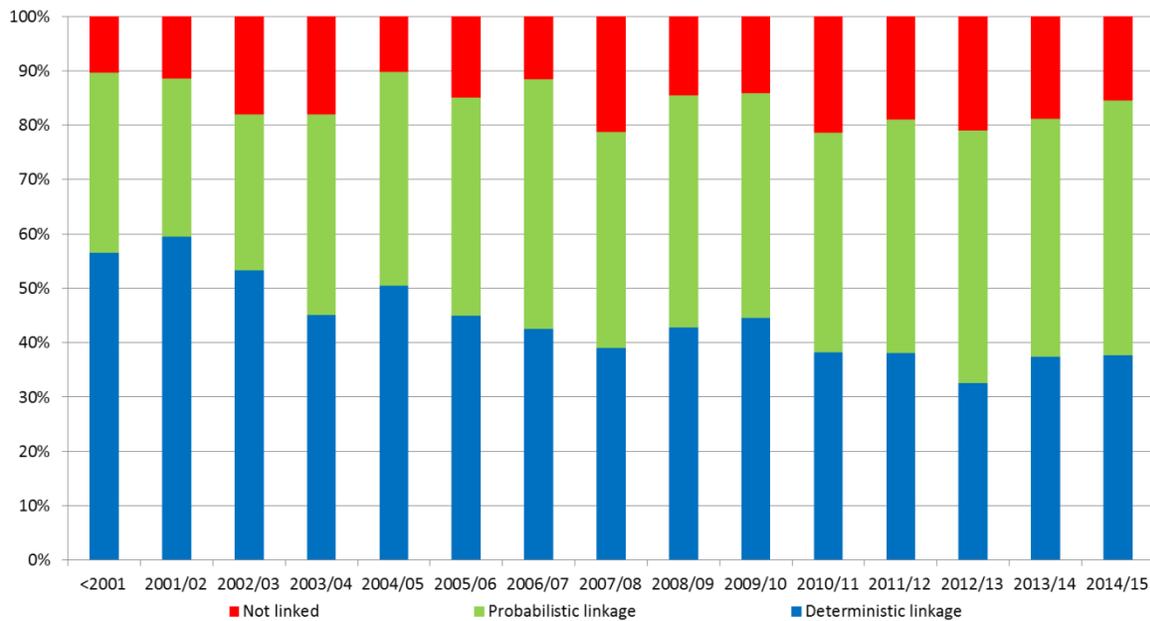
Note: These data use one count per individual, and the entire CBI cohort (i.e., no exclusion criteria were applied).

*The "total match" category includes both deterministic and probabilistic matches

** The "other" category includes Consumer/Survivor/Family Initiatives, Assisted Living Services, Addictions Home Care, Health Promotion and Education, and Information and Referral services. These were combined due to small cell sizes within some strata (<= 5) No data were received for day/night care, information and referral, and community support initiatives.

Linkage rates were examined by fiscal year of first admission to community-based care services to determine if there had been changes over time, with admission dates prior to April 1, 2001 combined due to small annual cell sizes (approximately 414 records, or 1.6 percent of all records). Overall linkage rates varied between 79-90 percent (Exhibit 5). The percentage of records linked deterministically fell from 59.5 percent in 2001/02 to 37.6 percent in 2014/15, while there was an increase in the percentage of records linked probabilistically in that same time period (29.1 to 46.9 percent). Annually, less than 20 percent of all records could not be linked to ICES data holdings.

Exhibit 5 CBI linkage rates by fiscal year of first admission and type of link (note: records prior to 2001 were combined due to small sample sizes)



Summary

Of the 25,240 unique records provided to ICES as part of the March 31, 2015 data transfer, 20,873 (83 percent) were linked to ICES Key Numbers using deterministic and probabilistic methods. The linkage rate was high, with seven of the functional categories reporting overall linkage rates above 80 percent. In addition, the linkage rate was relatively stable over time. Data on these linked records can be augmented using ICES data holdings to track these individuals through both community-based treatment and the acute care system.

Chapter 3: Sample reports with linked data

Overview

To gain a deeper understanding of clients enrolled in community-based care programs, CBI data were linked to ICES holdings. These datasets were linked using unique encoded identifiers and analyzed at the Institute for Clinical Evaluative Sciences (ICES). First, clients were described demographically by sex, age, immigrant category, neighbourhood income quintile, and Local Health Integration Network (LHIN) of residence, and compared to the general population within the Toronto Central LHIN (TC LHIN). In order to understand their patterns of health care usage, rates of outpatient visits, emergency department visits and hospitalizations were tabulated from April 1, 2014 to March 31, 2015.

Inclusion and exclusion criteria

To create the tables in this chapter, CBI data were linked to the Registered Persons Database (RPDB) at ICES. The RPDB provides basic demographic information about anyone who has ever received an Ontario health card number. The comparison group was the TC LHIN general population. Several inclusion and exclusion criteria were applied to both the CBI and TC LHIN samples. From the 20,873 linked individuals in CBI, only their first contact with a community-based service provider was retained. In order to ensure comparability between linked individuals in the CBI dataset and the TC LHIN population, we excluded people if they had the following: 1) invalid ICES key number, 2) missing sex (as recorded in the RPDB), 3) if they were younger than 16 years of age or older than 105 on April 1, 2014 (TC LHIN-funded community-based care providers serve clients aged 16 and up). In addition to these data quality requirements, we also required that they be eligible for OHIP as of April 1, 2014. Therefore, we excluded individuals with no OHIP use in the five years prior, individuals who only became eligible after April 1, 2014, and non-Ontario residents. This resulted in a final eligible sample of 18,107 individuals in the CBI dataset (86.7 percent), and, after applying the same exclusion criteria, 948,441 individuals in the TC LHIN.

Demographics of clients in the CBI dataset

The population of community-based care clients captured by CBI had a slightly higher proportion of females than the general population (59.7 vs 52.2 percent) (Exhibit 6). On average, this population was found to be approximately 17.9 years older than the general population (63.6 ± 20.5 vs 45.7 ± 17.8 years old respectively). Further examination of age showed the distribution of community-based care clients to be skewed to the higher age brackets; 39.0 and 16.2 percent of clients were aged 65-84 and 85+ respectively, compared to 14.1 and 2.3 percent in the general population. Clients in the CBI dataset were also more likely to be non-immigrants than the general population (85.2 vs 76.8 percent) and were more likely to have lower income, with a larger proportion in income quintiles 1 and 2 (34.5 and 21.6 percent respectively) compared to the general TC LHIN population (26.1 and 18.4 percent). Finally, the majority of

clients lived in the TC LHIN (69.9 percent), and the neighbouring LHINs (Central, Central East, Mississauga Halton and Central West) accounted for an additional 27.8 percent of the population in the CBI dataset.

Exhibit 6 Demographics of community-based care clients in CBI compared to the TC LHIN population

	CBI dataset N (%)	TC LHIN population N (%)
Sex		
Male	7,293 (40.3)	453,325 (47.8)
Female	10,814 (59.7)	495,116 (52.2)
Age (years, continuous)		
Mean (standard deviation)	63.6 ± 20.5	45.7 ± 17.8
Age (years, categorical)		
16-24	915 (5.1)	103,703 (10.9)
25-44	2,777 (15.3)	382,332 (40.3)
45-64	4,423 (24.4)	306,824 (32.4)
65-84	7,053 (39.0)	134,125 (14.1)
85+	2,939 (16.2)	21,457 (2.3)
Immigrant category		
Refugee	563 (3.1)	39,495 (4.2)
Non-refugee immigrant	2,110 (11.7)	180,805 (19.1)
Non-immigrant	15,434 (85.2)	728,141 (76.8)
Income quintile (neighbourhood)		
Missing	122 (0.7)	9,849 (1.0)
Q1 (lowest)	6,250 (34.5)	247,956 (26.1)
Q2	3,905 (21.6)	174,435 (18.4)
Q3	2,410 (13.3)	114,453 (12.1)
Q4	2,226 (12.3)	128,721 (13.6)
Q5 (highest)	3,194 (17.6)	273,027 (28.8)
LHIN of Residence		
Toronto Central	12,663 (69.9)	948,441 (100.0)
Central	2,378 (13.1)	
Central East	1,066 (5.9)	
Mississauga Halton	1,050 (5.8)	
Central West	545 (3.0)	
Other*	401 (2.4)	

Note: This is based on the first service record for each individual in the CBI dataset

*Other LHIN of residence encompasses the Erie St. Clair, South West, Waterloo Wellington, Hamilton Niagara, Haldimand Brant, South East, Champlain, North Simcoe Muskoka, North East and North West LHINs.

ICES indicators

One of the unique advantages of linking CBI and ICES data is to determine how individuals in community-based care are using the acute care system. This can be characterized by examining the number of all-cause outpatient visits, emergency department visits, and hospitalizations among active clients in the CBI dataset from April 1, 2014 to March 31, 2015.

Exhibit 7 Health service use by patients enrolled in community-based care functional centres

Number of visits	Outpatient visits	Emergency department		Hospitalizations	
	All visits	Admitted to hospital	Discharged home		
Mean (95% CI)	14.3 (14.1 - 14.5)	1.78 (1.70 - 1.85)	0.37 (0.35 - 0.38)	1.23 (1.18 - 1.29)	0.48 (0.47- 0.50)
Frequency n (%)					
0	753 (4.2)	9,112 (50.3)	14,227 (78.6)	10,795 (59.6)	13,383 (73.9)
1	627 (3.5)	3,787 (20.9)	2,475 (13.7)	3,603 (19.9)	2,827 (15.6)
2+	16,727 (92.4)	5,208 (28.8)	1,405 (7.8)	3,709 (20.5)	1,897 (10.5)

Outpatient services

Outpatient service use was high among those in the CBI dataset, with clients reporting 14.3 outpatient visits on average (95% CI: 14.1 – 14.5). Only 4.2 percent of clients had no outpatient visits, and the overwhelming majority (92.4 percent) had two or more outpatient visits (Exhibit 7). When those with at least one outpatient visit were compared to those with zero visits, several important differences emerged. The proportion of females was considerably higher in the outpatient group (60.3 percent vs 45.4 percent), and this group was also older, with 56.1 percent aged 65 or older, compared to 35.1 percent among those with no outpatient visits. Finally, they lived in areas with higher neighbourhood income: 17.9% of those who had at least one outpatient visit lived in neighbourhoods in the top neighbourhood income quintile, compared to 12.8 percent in the comparison group (Exhibit 8).

Exhibit 8 Demographic characteristics of those with at least one outpatient visit compared to those without any outpatient visits

	At least one outpatient visit N (%)	No outpatient visits N (%)
Sex		
Male	6,882 (39.7)	411 (54.6)
Female	10,472 (60.3)	342 (45.4)
Age (categorical)		
16-24	817 (4.7)	98 (13.0)
25-44	2,602 (15.0)	175 (23.2)
45-64	4,207 (24.2)	216 (28.7)
65-84	6,853 (39.5)	200 (26.6)
85+	2,875 (16.6)	64 (8.5)
Immigrant category		
Refugee	539 (3.1)	24 (3.2)
Non-refugee immigrant	2018 (11.6)	92 (12.2)
Non-immigrant	14,797 (85.3)	637 (84.6)
Income quintile		
Missing	115 (0.7)	7 (0.9)
Q1 (lowest)	5,961 (34.4)	289 (38.4)
Q2	3,744 (21.6)	161 (21.4)
Q3	2,311 (13.3)	99 (13.2)
Q4	2,125 (12.3)	101 (13.4)
Q5 (highest)	3,098 (17.9)	96 (12.8)
LHIN of Residence		
Toronto Central	12,144 (70.0)	519 (68.9)
Central	2,283 (13.2)	95 (12.6)
Central East	1,008 (5.8)	58 (7.7)
Mississauga Halton	1,022 (5.9)	28 (3.7)
Central West	526 (3.0)	19 (2.5)
Other**	371 (2.1)	34 (4.5)

*Other LHIN of residence encompasses the Erie St. Clair, South West, Waterloo Wellington, Hamilton Niagara, Haldimand Brant, South East, Champlain, North Simcoe Muskoka, North East and North West LHINs.

Emergency department visits

Emergency department visits were conceptualized in three ways. The first was to look at all emergency department visits, regardless of outcome. On average, community-based care clients visited the emergency department 1.78 times (95% CI: 1.70 - 1.85), and almost half of clients in the CBI dataset went to the emergency department at least once (49.7 percent) (Exhibit 7). Demographically, those who went to the emergency department were very similar to those who did not, with a slight increase in the number of males (42.5 vs 38.1 percent), as well as non-immigrants (87.2 vs 83.3 percent) (Exhibit 9).

The second definition looked at those who presented to the emergency department and were subsequently admitted to the hospital. Almost one-fifth of clients (21.5 percent) were admitted at least once following a visit to the emergency department (Exhibit 7). The admitted group had a higher proportion of males (44.3 vs 38.1 percent), non-immigrants (88.8 vs 83.3 percent), and were more likely to be aged 85+ (21.8 vs 15.0 percent) (Exhibit 9).

Exhibit 9 Emergency department visits by demographic characteristics

	ED Visits			No ED visits
	Any ED visit	Admitted to hospital	Discharged home	
Sex	N (%)	N (%)	N (%)	N (%)
Male	3820 (42.5)	1717 (44.3)	3104 (42.5)	3473 (38.1)
Female	5175 (57.5)	2163 (55.8)	4208 (57.6)	5639 (61.9)
Age (categorical)				
16-24	519 (5.8)	176 (4.5)	459 (6.3)	396 (4.4)
25-44	1495 (16.6)	545 (14.1)	1305 (17.9)	1282 (14.1)
45-64	2105 (23.4)	764 (19.7)	1814 (24.8)	2318 (25.4)
65-84	3302 (36.7)	1549 (39.9)	2603 (35.6)	3751 (41.2)
85+	1574 (17.5)	846 (21.8)	1131 (15.5)	1365 (15.0)
Immigrant category				
Refugee	237 (2.6)	85 (2.2)	199 (2.7)	326 (3.6)
Non-refugee immigrant	912 (10.1)	351 (9.1)	768 (10.5)	1198 (13.2)
Non-immigrant	7846 (87.2)	3444 (88.8)	6345 (86.8)	7588 (83.3)
Income quintile				
Missing	64 (0.7)	33 (0.9)	51 (0.7)	58 (0.6)
Q1 (lowest)	3125 (34.7)	1330 (34.3)	2564 (35.1)	3125 (34.3)
Q2	1929 (21.5)	813 (21.0)	1582 (21.6)	1976 (21.7)
Q3	1255 (14.0)	546 (14.1)	1019 (13.9)	1155 (12.7)
Q4	1088 (12.1)	463 (11.9)	891 (12.2)	1138 (12.5)
Q5 (highest)	1534 (17.1)	695 (17.9)	1205 (16.5)	1660 (18.2)
LHIN of Residence				
Toronto Central	6359 (70.7)	2825 (72.8)	5108 (69.9)	6304 (69.2)
Central	1134 (12.6)	453 (11.7)	952 (13.0)	1244 (13.7)
Central East	521 (5.8)	210 (5.4)	435 (6.0)	545 (6.0)
Mississauga Halton	477 (5.3)	200 (5.2)	390 (5.3)	573 (6.3)
Central West	267 (3.0)	105 (2.7)	214 (2.9)	278 (3.1)
Other*	237 (2.6)	87 (2.2)	213 (2.9)	168 (1.8)

*Other LHIN of residence encompasses the Erie St. Clair, South West, Waterloo Wellington, Hamilton Niagara, Haldimand Brant, South East, Champlain, North Simcoe Muskoka, North East and North West LHINs.

Finally, some of those who present to the emergency department will be discharged to their place of residence. Approximately 40.4 percent of community-based care clients in the CBI dataset had at least

one visit to the emergency department that resulted in a subsequent discharge home, and 20.5 percent had two or more such visits (Exhibit 7). Again, those who presented to the emergency department and were discharged home were slightly more likely to be male (42.5 vs 38.1 percent) and a non-immigrant (86.8 and 83.3 percent) (Exhibit 9).

Hospitalization

Approximately 26.1 percent of community-based care clients had at least one hospitalization from April 1, 2014 to March 31, 2015, with 10.5 percent being hospitalized on two or more occasions (Exhibit 7).

Those with at least one hospitalization were then compared to those with no hospitalizations on demographic characteristics. The population who had at least one hospitalization had a higher proportion of males (43.5 vs 39.1 percent), aged 85+ (19.4 vs 15.1 percent), and non-immigrants (88.4 vs 84.1 percent) (Exhibit 10).

Exhibit 10 Demographic characteristics of those with at least one hospitalization compared to those without any hospitalizations

	At least one hospitalization N (%)	No hospitalizations N (%)
Sex		
Male	2,057 (43.5)	5,236 (39.1)
Female	2,667 (56.5)	8,147 (60.9)
Age (categorical)		
16-24	216 (4.6)	699 (5.2)
25-44	705 (14.9)	2,072 (15.5)
45-64	985 (20.9)	3,438 (25.7)
65-84	1,903 (40.3)	5,150 (38.5)
85+	915 (19.4)	2,024 (15.1)
Immigrant category		
Refugee	112 (2.4)	451 (3.4)
Non-refugee immigrant	438 (9.3)	1,672 (12.5)
Non-immigrant	4,174 (88.4)	11,260 (84.1)
Income quintile		
Missing	40 (0.9)	82 (0.6)
Q1 (lowest)	1,597 (33.8)	4,653 (34.8)
Q2	976 (20.7)	2,929 (21.9)
Q3	674 (14.3)	1,736 (13.0)
Q4	573 (12.1)	1,653 (12.4)
Q5 (highest)	864 (18.3)	2,330 (17.4)
LHIN of Residence		
Toronto Central	3,433 (72.7)	9,230 (69.0)
Central	552 (11.7)	1,826 (13.6)
Central East	258 (5.5)	808 (6.0)
Mississauga Halton	237 (5.0)	813 (6.1)
Central West	134 (2.8)	411 (3.1)
Other*	110 (2.3)	295 (2.2)

*Other LHIN of residence encompasses the Erie St. Clair, South West, Waterloo Wellington, Hamilton Niagara, Haldimand Brant, South East, Champlain, North Simcoe Muskoka, North East and North West LHINs.

Summary

Compared to the general TC LHIN population, community-based care clients captured by CBI were older, consisted of more non-immigrants, and lived in neighbourhoods of lower income. While clients reported living in all 14 LHINs, the majority resided in the Toronto Central or neighbouring LHINs (97.6 percent). This is likely due to those living at the border of two LHINs using services in the TC LHIN as they may be closer than services offered by the LHIN in which they reside. We also observed high rates of health care usage within this population, with 95.8 percent with at least one outpatient visit, 49.7 percent with at least one emergency department visit and 26.1 percent having at least one hospitalization. While males were more likely to be hospitalized or to present to the emergency department, females were more likely to utilize outpatient services. Using these linked data, use of both community and acute care services can be measured for clients in the CBI dataset.

Chapter 4: Intersectionality

Overview

Addictions, and addictions treatment, form an important health concern in Ontario. Approximately 4.2 percent of all Ontarians aged 15 and older reported being diagnosed with a substance use disorder in the one year prior to their 2012 Canadian Community Health Survey interview; 3.1 percent of Ontarians reported a diagnosis of alcohol abuse or dependence (Statistics Canada, 2012). While some of these individuals will enter the health care system through the emergency department or outpatient facilities, many will seek treatment from community-based programs. The linkage between CBI and ICES data is an excellent opportunity to follow individuals before and after enrolment in an addictions treatment program in the TC LHIN, to determine if this impacts how much they use acute care services. This also provides an example of the types of questions that can be answered using the linked CBI-ICES data.

Objective

The objective of this study was to identify clients in the CBI dataset that were enrolled in community-based addictions-related functional centres, and determine their rates of acute care usage in the one year pre- and one year post-program admission. Acute care use was defined as rates of outpatient visits, emergency department visits and hospitalizations from April 1, 2007 to March 31, 2014.

Methods

Only those clients who were enrolled in programs under the following five addictions-related functional centres were included:

1. Addictions Home Care - Substance Abuse
2. Case Management Addictions - Substance Abuse
3. Addictions Treatment - Substance Abuse
4. Residential Addiction - Supportive Treatment
5. Residential Addiction - Withdrawal Management Centres

Due to small cell sizes ($n \leq 5$) in the fifth group (withdrawal management centres), this group was combined with supportive treatment to form a “residential addiction” category. These five functional centres were the only addictions functional centres collected in CBI at the time of the March 31, 2015 data transfer. Clients were further restricted to those with an admission date from April 1, 2007 to March 31, 2014. The start date was chosen in order to allow for one year of lookback, as the Ontario Mental Health Reporting System (OMHRS) started collecting data on mental health related hospital admissions in 2006. The end date allowed for one year of follow up, as data at ICES are only available until March 2015.

Exclusion criteria were then applied to the CBI sample. We excluded individuals if they had the following: 1) invalid ICES key number, 2) missing sex and 3) if they were younger than 16 years of age or older than 105 on April 1, 2006. In addition to these data quality requirements, we also required that they be eligible for OHIP as of April 1, 2006. Therefore, we excluded individuals who only became eligible for OHIP after April 1, 2006, and who were non-Ontario residents. We also excluded those with a date of service initiation before their admission date, or a discharge date prior to April 1, 2006. For each individual, their admission date to a community-based addictions program was used as their index date and their acute care usage in the one year prior to admission was compared to their usage in the one year post-admission (Exhibit 11).

Exhibit 11 Study schematic



Nine different measures of acute care use were examined. These can be broadly conceptualized as outpatient visits, emergency department use, and hospitalizations.

Outpatient services

1. All cause
2. Mental health general practitioner/family practitioner outpatient visits
3. Mental health psychiatrist outpatient visits

Emergency department use

4. All cause
5. Mental health and addictions-related
6. Addictions-related disorders

Hospitalizations

7. All cause
8. Mental health and addictions-related
9. Addictions-related

For the entire cohort, the demographics were tabulated. These were: sex, age, immigrant category, income quintile, LHIN of residence, functional centre they enrolled in at first admission to community-based care, and total number of unique functional centres used. The mean number of visits and 95

percent confidence intervals were calculated for each outcome. Datasets were linked using unique encoded identifiers and analyzed at the Institute for Clinical Evaluative Sciences (ICES).

Results

After exclusions, the final sample consisted of 401 individuals. Of those, approximately 53.4 percent (n = 214) were female, most were in the 25-44 and 45-64 age groups (37.7 and 38.2 percent respectively), and were predominantly non-immigrants (86.0 percent) (Exhibit 12). Over half lived in neighbourhoods in the bottom two income quintiles (37.7 and 22.7 percent), with most residing in the TC LHIN (62.1 percent). Almost 80 percent of the sample were in either the “case management addictions” or “addictions treatment” functional centres (38.9 and 39.4 percent respectively), and the majority only used one functional centre (95.0 percent). Finally, 78.3 percent of all clients in the CBI dataset enrolled in community-based addictions-related functional centres were either still active or did not have a discharge date.

Exhibit 12 Demographics of clients receiving treatment from addictions-related functional centres (n = 401)

	N (%)
Sex	
Male	187 (46.6)
Female	214 (53.4)
Age (years, categorical)	
16-24	70 (17.5)
25-44	151 (37.7)
45-64	153 (38.2)
65-84	22 (5.5)
85+	5 (1.2)
Immigrant category	
Refugee	7 (1.7)
Non-refugee immigrant	49 (12.2)
Non-immigrant	345 (86.0)
Income quintile (neighbourhood)	
Missing	3 (0.7)
Q1 (lowest)	151 (37.7)
Q2	91 (22.7)
Q3	49 (12.2)
Q4	47 (11.7)
Q5 (highest)	60 (15.0)
LHIN of Residence	
Toronto Central	249 (62.1)
Central	52 (13.0)
Central East	33 (8.2)
Mississauga Halton	23 (5.7)
Central West	16 (4.0)
Other*	28 (7.0)
Functional Centre	
Addictions Home Care - Substance Abuse	44 (11.0)
Case Management Addictions - Substance Abuse	156 (38.9)
Addictions Treatment-Substance Abuse	158 (39.4)
Residential Addiction - Supportive Treatment and Withdrawal Management Centres	43 (10.7)
Number of concurrent functional centres used	
1	381 (95.0)
2	20 (5.0)
Date of discharge	
Still active or missing discharge date	314 (78.3)
Any discharge date	87 (21.7)

*Other LHIN of residence encompasses the Erie St. Clair, South West, Waterloo Wellington, Hamilton Niagara, Haldimand Brant, South East, Champlain, North Simcoe Muskoka, North East and North West LHINs.

Outpatient services were heavily used by clients in community-based addictions-related functional centres, and over 93 percent had at least one outpatient visit. There were over 6,000 total visits at both time points, corresponding to over 15 visits per person in the CBI sample. This increased slightly when the denominator was limited to those who used outpatient services to approximately 16 visits in each time period: 16.7 (95% CI: 15.1 - 18.2) visits in the year prior to admission, and 16.3 (95% CI: (14.8 - 17.8) in the one year post-admission. When only visits for mental health-related codes at the family practitioner or general practitioner level were considered, the mean number of visits remained relatively consistent over time, with approximately two visits among the entire sample, and four visits among those who had at least one visit. Finally, clients used psychiatrist outpatient services, with over 92 percent seeing a psychiatrist at least once, and averaging between 8.7 and 9.8 visits in each time period (Exhibit 13).

Exhibit 13 Number of outpatient visits among clients who received addictions-related treatment, pre- and post-admission to community-based care

	All Cause		Mental health GP/FP outpatient visits		Mental health psychiatrist outpatient visits	
	Pre	Post	Pre	Post	Pre	Post
Total visits (n, (% change))	6213	6162 (-1%)	802	862 (+7%)	3484	3620 (+4%)
Unique individuals (n, (% change))	373	378 (+1%)	196	176 (-10%)	370	370 (0%)
Mean number of visits and 95% CI (using entire sample)	15.5 (14.0 - 17.0)	15.4 (13.9 - 16.8)	2.0 (1.5 - 2.5)	2.2 (1.6 - 2.7)	8.7 (7.6 - 9.8)	9.0 (7.8 - 10.2)
Mean number of visits and 95% CI (only those who used services)	16.7 (15.1 - 18.2)	16.3 (14.8 - 17.8)	4.1 (3.2 - 5.0)	4.9 (3.8 - 6.0)	9.4 (8.2 - 10.6)	9.8 (8.5 - 11.0)
Number of visits (n (%))						
0	28 (7.0)	23 (5.7)	205 (51.1)	225 (56.1)	31 (7.7)	31 (7.7)
1	21 (5.2)	31 (7.7)	74 (18.5)	70 (17.5)	66 (16.5)	69 (17.2)
2+	352 (87.8)	347 (86.5)	122 (30.4)	106 (26.4)	304 (75.8)	301 (75.1)

Visits to the emergency department were particularly striking as approximately half of clients in the CBI sample had at least one visit (51.4 percent in the year before admission and 53.6 percent in the year after). The mean number of all cause visits among the entire sample was 2.4; however, when this was limited to only those who visited the emergency department, this increased to 4.7 visits in the one year prior to CBI admission (Exhibit 14). After admission to a community-based addictions-related program, this number decreased to 4.1 visits per person. Similar trends were seen for mental health and addictions, and addictions-specific emergency department visits. While the majority of clients did not have any addictions-specific emergency department visits, those who did had between 2.8-3.5 visits in each time period. Compared to the one year prior to enrolment in a community-based addictions-related program, we saw a 22 percent reduction in the number of unique individuals visiting the emergency department for mental health and addictions and a 30 percent reduction in the number of addictions-

related emergency department visits, both of which were statistically significant ($p = 0.032$ and $p = 0.018$ respectively).

Exhibit 14 Number of emergency department visits among clients who received addictions-related treatment, pre- and post-admission to community-based care

	All Cause		Mental health and Addictions		Addictions	
	Pre	Post	Pre	Post	Pre	Post
Total visits (n, (% change))	967	886 (-8%)	407	337 (-17%)	242	214 (-12%)
Unique individuals (n, (% change))	206	215 (+4%)	123	96 (-22%)	87	61 (-30%)
Mean number of visits and 95% CI (using entire sample)	2.41 (1.91 - 2.91)	2.21 (1.58 - 2.83)	1.01 (0.77 - 1.26)	0.84 (0.56 - 1.12)	0.60 (0.44 - 0.77)	0.53 (0.32 - 0.75)
Mean number of visits and 95% CI (only those who used services)	4.69 (3.83 - 5.56)	4.12 (3.01 - 5.23)	3.31 (2.67 - 3.95)	3.51 (2.51 - 4.52)	2.78 (2.22 - 3.35)	3.51 (2.34 - 4.68)
Number of visits (n (%))						
0	195 (48.6)	186 (46.4)	278 (69.3)	305 (76.1)	314 (78.3)	340 (84.8)
1	63 (15.7)	87 (21.7)	44 (11.0)	39 (9.7)	35 (8.7)	22 (5.5)
2+	143 (35.7)	128 (31.9)	79 (19.7)	57 (14.2)	52 (13.0)	39 (9.7)

In the one year before admission to community-based addictions-related services, there were 177 hospitalizations; the result of 89 individuals being hospitalized. In the one year after admission to these services, there were 139 hospitalizations stemming from 77 individuals. While the mean number of hospitalizations was low for the entire sample (approximately 0.4 hospitalizations), those who were hospitalized were hospitalized 1.8 times on average or more, and this did not change by time period. Similar results were observed among those hospitalized for mental health and addictions reasons. While there was a slight decrease between the pre and post time periods for the total number of addictions-related hospitalizations, the mean number of visits increased from 1.2 to 1.6 (Exhibit 15). Finally, there was a 26 percent decrease in the number of unique individuals hospitalized for mental health and addictions reasons, and a 32 percent decrease in the number of individuals with addictions-related hospitalizations, neither of which were statistically significant due to the small sample size ($p = 0.10$ and $p = 0.20$ respectively).

Exhibit 15 Number of hospitalizations among clients who received addictions-related treatment, pre- and post-admission to community-based care

	All Cause		Mental health and Addictions		Addictions	
	Pre	Post	Pre	Post	Pre	Post
Total hospitalizations (n, (% change))	177	139 (-21%)	125	82 (-34%)	29	27 (-7%)
Unique individuals (n, (% change))	89	77 (-13%)	62	46 (-26%)	25	17 (-32%)
Mean (95% CI) # hospitalizations (using entire sample)	0.44 (0.32 - 0.56)	0.35 (0.25 - 0.44)	0.31 (0.21 - 0.41)	0.20 (0.13 - 0.28)	0.07 (0.04 - 0.10)	0.07 (0.03 - 0.10)
Mean (95% CI) # hospitalizations (only those who used services)	1.99 (1.59 - 2.39)	1.81 (1.47 - 2.14)	2.02 (1.53 - 2.50)	1.78 (1.35 - 2.22)	1.16 (0.96 - 1.36)	1.59 (1.18 - 2.00)
Number of hospitalizations (n (%))						
0	312 (77.8)	324 (80.8)	339 (84.5)	355 (88.5)	376 (93.8)	384 (95.8)
1	55 (13.7)	50 (12.5)	37 (9.2)	29 (7.2)	25 (6.2)	17 (4.2)
2+	34 (8.5)	27 (6.7)	25 (6.2)	17 (4.2)	*	*

*For addictions-related hospitalizations, the number of hospitalizations was dichotomized as 0 vs 1+ due to small cell sizes in the 2+ category (n ≤ 5)

Summary

In summary, we observed an overall reduction in mental health and addiction-related hospitalizations and emergency department visits following enrolment in community-based addictions-related functional centres. This project illustrates a potential benefit of linking the community-based and acute care sectors. By linking these data, we can track the acute care usage of clients in the year immediately before and after their admission to community-based care. However, these results do have limitations. We do not have information on the type of services received by clients in community-based care, and, currently, CBI does not capture how often they receive services. In addition, clients may still be receiving community-based services during the one year period post-admission. Having improved discharge date information will allow for improved understanding of admission and discharge patterns in the sector. Another limitation is that data were only available from those health service providers that had already started uploading to CBI as of March 31, 2015. These health service providers may not be representative of all providers who provide addictions treatment services, and so these results can only be interpreted as a proof of principle and not as indicative of acute care use in the entire population.

Chapter 5: General discussion and future directions

Overview

This report describes the result of linking data between Community Business Intelligence and the Institute for Clinical Evaluative Sciences (ICES). Chapter 2 reported on the linkage process, and found that the linkage rate in all functional sectors and most functional categories was above 80 percent, and was also relatively stable over time. This allowed for the tracking of clients through both the community mental health sector and the acute care sector. Chapter 3 then described the population, and found that the population captured by CBI was distinct from the larger TC LHIN population, especially on age. This chapter found that there were high rates of acute care use among clients in community-based care, with 26.1 percent hospitalized at least once and almost half visiting the emergency department (49.7 percent). Perhaps most striking was the high rate of outpatient service use, with clients averaging over 14 visits from April 1, 2014 to March 31, 2015. Finally, Chapter 4 examined a specific subpopulation of clients, those in community-based addictions-related functional centres, to determine their rates of acute care use in the one year before and after admission.

Three key areas to highlight from this report are: 1) the data linkage and the value of this collaboration as a demonstration project, 2) functional centre heterogeneity, 3) broader stakeholder engagement.

Data linkage and the value of this collaboration as a demonstration project

This project illustrated the power of linked data between the community and acute care sector. Data linkage rates were high across functional sectors and in most functional categories. However, linkage rates could still be improved. The current approach to data linkage is very labour intensive, as almost half of the data were linked using probabilistic methods. This requires manual review of records to determine if they are identical. While this is feasible on smaller data sets, this becomes time consuming and therefore impractical with larger data sets. In addition, there is an element of uncertainty associated with probabilistic linkage. Deterministic linkage, on the other hand, is considerably easier to perform and can be done by a computer in a fraction of the time. It also eliminates any ambiguity, as individuals are directly linked based on health card number. This would speed up the data linkage process once data are received by ICES, as well as further improve the quality of these data.

Beyond the actual linkage process, the mental health and addictions sector is in the midst of implementing Ontario's Comprehensive Mental Health and Addictions Strategy, which expanded to include adult mental health and addictions services in 2014. The need for high quality data to be able to describe mental health and addictions patients/clients, service utilization, and outcomes has been raised as a critical issue. Further, there is virtually no capacity to describe the patient/client trajectory through community-based care and care received in the acute care sector, despite the fact that patients/clients

frequently (and often ideally) receive care from both sectors. The data recorded by health service providers and uploaded to CBI reflects a concerted effort and investment to develop a data source that captures accurate, complete, and comprehensive information on service utilization in the community-based mental health and addiction agencies in the TC LHIN. Linked with ICES data, the merged data set creates a new and powerful platform to describe the patient/client trajectory across the entirety of services and supports provided to individuals in the TC LHIN who have mental illness or addiction issues. This type of data linkage is needed to more meaningfully provide information on the performance of the entire mental health and addiction system to the public, providers, LHINs, and other stakeholders.

Functional centre heterogeneity

This report draws on admission and discharge data from programs delivered by community health service providers. Each program has been mapped by the funder to a functional centre, an administrative and accounting category that measures financial inputs, expenditures, and service utilization. There are certain limitations to take into consideration regarding functional centres.

While each functional centre typically describes a distinct activity, they offer limited insight into the clinical status of the service recipient or the level and intensity of care provided. Furthermore, health service providers often employ different service models in carrying out these activities. This can translate into wide variation in service interaction intensities between programs within the same functional centre.

In order to condense the more than 80 functional centres reflected in CBI and to provide more robust sample sizes, this report has combined functional centres into 12 roll-up categories, of which only seven were reported due to small sample sizes in the remaining functional categories. While these roll-up categories have been employed for other administrative purposes, their validity from a clinical perspective has not been tested and the comparability of functional centres within each roll-up category cannot be assumed.

Broader stakeholder engagement

This proof of principal is also a way to engage with health service providers. Linked data can highlight and track clients once they leave provider services, and could potentially be used to design more effective programs and/or follow-up practices. In the future, health service providers and other stakeholders may be able to suggest questions that can be answered using these linked data. Their experiences can be used to drive a program of research with applied public health benefits, and their insight on the findings would be vital for providing context for these findings. Engaging with providers may also result in improved data linkage as they see the utility of providing high quality data to CBI.

Limitations

This report has some limitations that warrant discussion. Only those data that were uploaded as of March 31, 2015 were included, and since that time period, many more providers have started uploading their data to CBI. Of the 119 health service providers that could be part of CBI, only 52 were included in this transfer. As more providers start uploading their data to CBI and the sample size available increases, more nuanced questions can be answered. Similarly, due to this being a convenience sample of clients that were available in the dataset on the upload date, definitive conclusions cannot be drawn about the acute care use of the overall population of individuals receiving community-based care. However, these limitations will be minimized with future data transfers, and as data quality improves.

Future directions

This project can act as a model for future data collaborations within the mental health and addictions sector, or areas where there are community-based organizations offering similar or complimentary services and programs as the acute care sector. While the acute care sector has an established mechanism for tracking individuals, this may not be the case in the community sector. However, with improved client records and electronic systems, data linkage between the community and acute care sector is possible. These linked data sources can then answer questions that neither sector can answer independently.

References

Statistics Canada Table 105-1101 – Mental Health Profile, Canadian Community Health Survey – Mental Health (CCHS) 2012, provided by the Ministry of Health and Long Term Care.

Winkler WE. Record Linkage Software and Methods for Merging Administrative Lists. Bureau of the Census Statistical Research Division. Statistical Research Report Series No. RR2001/03, 2001.

Appendix A: List of functional sector, category and centre

Functional Sector	Functional Category	Functional Centre
CA	Addictions Home Care	Addictions Home Care - Addictions
CA	Case Management	Case Management Addictions - Problem Gambling
CA	Case Management	Case Management Addictions - Substance Abuse
CA	Health Promotion and Education	Health Prom./Educ Addictions - Problem Gambling Awareness
CA	Health Promotion and Education	Health Prom./Educ. Addictions - Community Development-Substance Abuse
CA	Health Promotion and Education	Health Prom./Educ. Addictions - Drug Awareness
CA	Primary Care - Clinics/Programs	Addictions Treatment-Problem Gambling
CA	Primary Care - Clinics/Programs	Addictions Treatment-Substance Abuse
CA	Primary Care - Clinics/Programs	Addictions Withdrawal Mgmt.
CA	Primary Care - Clinics/Programs	Initial Assessment and Treatment
CA	Residential-Addictions	COM Residential Addiction - Supportive Treatment
CA	Residential-Addictions	COM Residential Addiction - Treatment Services-Problem Gambling
CA	Residential-Addictions	COM Residential Addiction - Treatment Services-Substance Abuse
CA	Residential-Addictions	COM Residential Addiction - Withdrawal Management Centres
CMH	Case Management	Case Management - Mental Health
CMH	Case Management	Case Management (CCAC)
CMH	Consumer/Survivor/Family Initiatives	Consumer Survivor Initiatives - Alternative Businesses
CMH	Consumer/Survivor/Family Initiatives	Consumer Survivor Initiatives - Peer/Self Help
CMH	Crisis Intervention	Crisis Intervention - Hot Lines
CMH	Crisis Intervention	Crisis Intervention - Mental Health
CMH	Day/Night Care	Day/Night Combined
CMH	Health Promotion and Education	Health Prom. /Education MH - Awareness
CMH	Health Promotion and Education	Health Prom/Educ & Dev - General
CMH	Health Promotion and Education	Health Prom/Educ & Dev - Psycho-Geriatric
CMH	Health Promotion and Education	Health Promo. /Education MH - Community Development
CMH	Health Promotion and	Health Promo. /Education MH - Women

	Education	
CMH	Information and Referral	Information and Referral Service - General
CMH	In-Home Professional Services (HPS)	In-Home HPS - Psychology
CMH	Primary Care - Clinics/Programs	Clinics Programs - MH Counseling and Treatment
CMH	Primary Care - Clinics/Programs	Clinics/Programs - General Clinic
CMH	Primary Care - Clinics/Programs	MH Abuse Services
CMH	Primary Care - Clinics/Programs	MH Assertive Community Treatment Teams
CMH	Primary Care - Clinics/Programs	MH Child/Adolescent
CMH	Primary Care - Clinics/Programs	MH Clubhouses
CMH	Primary Care - Clinics/Programs	MH Community Clinic
CMH	Primary Care - Clinics/Programs	MH Concurrent Disorders
CMH	Primary Care - Clinics/Programs	MH Diversion and Court Support
CMH	Primary Care - Clinics/Programs	MH Early Intervention
CMH	Primary Care - Clinics/Programs	MH Eating Disorders
CMH	Primary Care - Clinics/Programs	MH Forensic
CMH	Primary Care - Clinics/Programs	MH Psycho-geriatric
CMH	Primary Care - Clinics/Programs	MH Social Rehab./Recreation
CMH	Primary Care - Clinics/Programs	MH Vocational/Employment
CMH	Primary Care - Clinics/Programs	Other MH Services not elsewhere identified
CMH	Residential Services	Res. Mental Health - Rent Supplement Program
CMH	Residential Services	Res. Mental Health - Short Term Crisis Support Beds
CMH	Residential Services	Res. Mental Health - Support within Housing
CSS	Assisted Living Services	CSS ABI - Assisted Living Services
CSS	Consumer/Survivor/Family Initiatives	Consumer Survivor Initiatives - Family Initiatives
CSS	CSS Community Support Initiatives	CSS Com Sup Init - Self Managed Attendant Services
CSS	CSS Community Support Initiatives	CSS Com Sup Init - Support Service Training
CSS	CSS In-Home and Community Services	CSS IH - Assisted Living Services
CSS	CSS In-Home and Community Services	CSS IH - Caregiver Support
CSS	CSS In-Home and Community Services	CSS IH - Case Management
CSS	CSS In-Home and Community Services	CSS IH - Crisis Intervention and Support
CSS	CSS In-Home and Community Services	CSS IH - Day Services

	Services	
CSS	CSS In-Home and Community Services	CSS IH - Deaf, Deafened and Hard of Hearing Care Services
CSS	CSS In-Home and Community Services	CSS IH - Home Maintenance
CSS	CSS In-Home and Community Services	CSS IH - Homemaking
CSS	CSS In-Home and Community Services	CSS IH - Meals Delivery
CSS	CSS In-Home and Community Services	CSS IH - Overnight Stay Care
CSS	CSS In-Home and Community Services	CSS IH - Personal Support/Independence Training
CSS	CSS In-Home and Community Services	CSS IH - Respite
CSS	CSS In-Home and Community Services	CSS IH - Service Arrangement/Coordination
CSS	CSS In-Home and Community Services	CSS IH - Social and Congregate Dining
CSS	CSS In-Home and Community Services	CSS IH - Transportation - Client
CSS	CSS In-Home and Community Services	CSS IH - Vision Impaired Care Services
CSS	CSS In-Home and Community Services	CSS IH - Visiting - Hospice Services
CSS	CSS In-Home and Community Services	CSS IH - Visiting - Social and Safety
CSS	Health Promotion and Education	Health Prom. /Educ - Palliative Care Interdisciplinary
CSS	Health Promotion and Education	Health Prom. /Educ - Palliative Care Pain and Symptom Management
CSS	Health Promotion and Education	Health Prom/Educ & Dev - General Geriatric
CSS	In-Home Professional Services (HPS)	In-Home HPS - Social Work
CSS	In-Home Professional Services (HPS)	In-Home HPS - Speech Lang. Path.
