



UBC CENTRE FOR
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Residential care and administrative data in British Columbia

Developing methods to identify residents

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Executive summary

The BC Ministry of Health continuing care data is the most relevant source of data for identifying people in residential care. These data, however, only capture information on individuals receiving services subsidized by the Continuing Care Division, BC Ministry of Health (i.e. publicly funded beds). Many research projects do not request or have access to these data, and, additionally, want to also identify people in privately paid residential care beds. For these reasons, alternative methods, using the more commonly requested databases, are of interest.

This report describes the strengths and limitations of various databases that contain information on who is in residential care, tests different methods for capturing information on residential care, makes recommendations related to these alternative approaches, and provides related code.

In addition to the continuing care data, the Medical Services Plan (MSP) data (physician billings), the PharmaNet data, and the Discharge Abstract Database (DAD) (hospital separations) contain variables that capture information that can be used to locate people in residential care. For example, the MSP service location variable captures that the service was provided in residential care, and some fee items are specific for capturing visits made to residential care facilities; the PharmaNet data captures information on the PharmaCare plan that the prescription was processed under, including a plan for permanent residents of licensed residential care facilities (Plan B); and the hospital data captures information on admission from/separations to residential care facilities.

Each data source was found to have strengths and weaknesses with respect to identifying who was in residential care. The MSP data, while correctly identifying many people in residential care, also

pick up some people living in Assisted Living or in residential care for only respite or a short-term stay. The PharmaNet data plan type (plan B for licensed residential care) identify many people permanently living in residential care (both public and private), but miss people without prescriptions and those living in residential care facilities regulated under the Hospital Act. The hospital data show transfers to and from residential care, but capture there is dependent on a person having a hospitalization, and can also pick up people transferred for only a temporary stay.

This analysis focuses on data that can be used to classify people as being in residential care or not in each fiscal year. A limitation of all databases except for continuing care is that they cannot identify precise entry and exit dates. Our recommendations are as follows:

1. For most purposes, the combination of a physician billing the MSP long term care (LTC) fee items and/or the receipt of prescriptions processed under Plan B can be used to identify people residing in residential care, keeping in mind that there will be some errors, both missing some and mis-identifying others (e.g. those who live in Assisted Living facilities).
2. If one wants to capture as many residential care patients as possible (while perhaps miss-identifying more, for example those who temporarily transfer to residential care), in addition to the LTC fee item/Plan B information, one might want to use the DAD information on separations to nursing homes and transfers to/from nursing homes.
3. Sub-setting either of these algorithms to ages 65 and older is a good marker for LTC/nursing home residents, keeping in mind that LTC residents under 65 would be lost.



Background

Identifying people who are in residential care may be important for many administrative data research projects based in British Columbia (BC). People in residential care may be of particular interest as a cohort/sub-cohort to study, or the researcher may want to flag people who are in residential care as a covariate. Alternatively, a researcher may want to exclude this group altogether from studies that focus on services delivered to community-dwelling people.

Several types of residential care are offered in BC, including care offered in home or group settings for people with physical or mental disabilities. Residential care also includes larger facilities and housing for frail elderly (also known as long term care (LTC) facilities, nursing homes or homes for the aged). Typically, residential care provides both accommodation and meals, and depending on the needs of the patient, medical care, assistance with activities of daily living and/or supervision.¹ Short-stay services (of less than 90 days) are also offered within these facilities for reasons such as convalescent care (for patients who require continued sub-acute treatment or recovery time following an inpatient stay), hospice care and respite.²

Assisted Living (AL) is along the continuum between fully independent living and residential care, and is an option for people who require some assistance with activities of daily living. AL facilities are

typically apartment-style, in contrast to residential care facilities where there tends to be private or shared bedrooms with common living spaces. AL is less service-intensive than residential care, especially in terms of medical care; thus, researchers who want to exclude people in residential care may still want to include this group.³ Regulation of public funding for assisted living began in 2004, and the number of AL facilities has increased since that time.⁴ In some communities, there is a 'campus of care' or 'continuing care community' with a range of levels of care all offered in the same centre or on the same campus, providing locational continuity for seniors as their needs change over time.³

BC contains a mix of both public and private residential care beds, with an approximate 90% public/10% private split.^{*5} The BC Ministry of Health continuing care data is the most relevant source of data for identifying people in residential care;⁶ however, it only captures information on individuals receiving services subsidized by the Continuing Care Division, BC Ministry of Health (i.e. publicly funded beds). However, many research projects do not request or have access to these data, and, additionally, want to also identify people in private paid residences. For these reasons, alternative methods, using the more commonly requested databases, are of interest.

* An estimate of the number of private beds is approximately 3,000, with about half in facilities that also provided subsidized beds, and half in purely private pay facilities.⁵



Objectives

The objectives of this report are to:

- Briefly describe the various databases that contain information (directly or indirectly) on who is in residential care;
- Describe the information contained in each data source as it pertains to residential care;
- Discuss the limitations of each data source (including potential capture of short-term users, people in private residential care facilities, and people living in AL);
- Test the validity of the potential methods of identifying people in residence, by comparing who is captured using the alternative data sources to the continuing care data;
- Share some statistics on the number of people captured in residential care each year over time, using the best method(s) identified;
- Compare these numbers to the number of available beds and other reports of LTC resident numbers; and
- Provide code that can be used to identify people in residential care using commonly requested data sources.



Methods

BC Ministry of Health Continuing Care databases

The database capturing publicly subsidized continuing care in BC has changed over time.^{6,7} The applicable data source(s) to use depend on the years of data of study and the health authorities (HA) and/or health service delivery areas (HSDA) of interest (see Figure 1). Data back to 1990-91 is captured in the Continuing Care Data Warehouse (CCD) database,⁶ which over time has been replaced with the Home and Community Care Minimum Reporting Requirements (HCCMRR) database,⁸ and the Continuing Care Reporting System (CCRS) Residential Assessment Instrument (RAI) database.⁹ These databases each contain many different tables; the description/contents of each is beyond the scope of this write-up, but can be found on the BC Ministry of Health website.^{10,11}

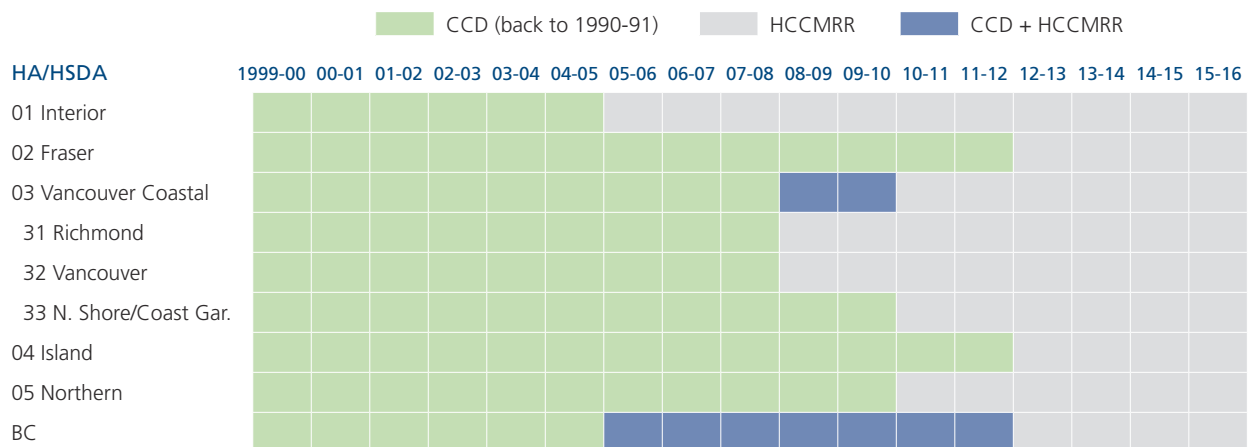
The CCD database contains information for clients who reside in publicly-funded long term care residences (including publicly funded beds in private facilities) and group and family care homes, as well as in (publicly-funded) AL facilities. In addition, it

contains information for people receiving services through publicly-funded home care and home support services, as well as clients who use adult day care programs.

The key table for identifying residential care residents in the CCD data is the LTC Service Plan table (also sometimes called Care Advice for LTC). The key variables needed for determining if a patient is in residential care are Service Code (to separate out Residential and Group/Family Homes from other services such as Adult Day Care and Home Support), Type of Service (to separate Regular and Palliative from Respite), start and end dates, and Provider ID. The Provider Category Code* can be used to identify AL or other categories if desired.

The newer Home and Community Care Minimum Reporting Requirements (HCCMRR) database similarly contains information on all clients receiving Ministry of Health funded Home and Community Care (HCC) services. The Service Episode table contains information on services: start and end dates,

Figure 1: BC continuing care databases in use by HA/HSDA and year^{6,8,10}



* Provider Category Code might be in the LTC Service Plan but if not it might be linked in via Provider ID from the Provider table.



Service Type (to separate residential care services from other types of services) and Service Delivery Setting (to separate residential facilities from e.g. AL).

The Continuing Care Reporting System (CCRS) Residential Assessment Instrument (RAI) has an Episode table which captures information for people in residential care. Key variables are entry and discharge dates, Sector (records if the facility is hospital based or residential based), and perhaps the variable recording an anticipated short stay.

One worthwhile cleaning step that is recommended when using the continuing care databases is that end dates should be compared to date of death from Vital Statistics data (if applicable). Unclosed end dates (which typically indicate ongoing services) should be closed using date of death; and end dates that come after date of death should be set equal to date of death. This helps clean up the data which may not yet have this updated information.

Limitations in using the BC continuing care databases with respect to identifying individuals in residential care include the following:

- These databases contain no information on patients in privately-paid residential care beds.
- Because of concerns about data quality and completeness, the process to receive this data can be longer and/or these data are not always available.
- Care must be used in combining data from different data sources / over time (especially with the transition from the old system to the new occurring in different years depending on HA/HSDA). Data quality may have suffered during the transition period.⁷

- Often this data source is not anticipated for projects and is thus not requested. However, later in the process researchers realize they want to identify or exclude people in residential care.

It is mainly because of this last point that a method was developed to identify (as best as possible) residential care residents using other administrative data sources. In addition, the other data sources may be able to capture those people residing in privately-paid residential care beds in addition to publicly-paid beds. This would be a potential advantage of including additional data sources even if one has access to the HCC databases.

It is important to note that this sector operates a number of residential programs with different care options,¹² e.g. respite/short-stay, group and family homes, hospices and nursing homes, which are all captured in these databases. While within the continuing care databases these programs/sites are distinguishable (using variables such as service code, type of service and service delivery setting), it is anticipated that they cannot be reliably differentiated using other sources of administrative data. As such, algorithms will be developed to attempt to capture longer-stay residents of LTC, group and family homes combined; and those algorithms will be tested to determine if and how much they are capturing from other services such as respite and other settings such as AL. Researchers may want to identify residents of long term care homes (nursing homes) in particular—thus the best of the algorithms will be subset to people aged 65 and older only and compared to the LTC data in particular from the continuing care databases. Unfortunately this age sub-setting will exclude younger individuals who are living in long term care homes, but this step is based on the fact that the vast



majority* of individuals in LTC are elderly;¹³ whereas, the individuals living in family and group homes, that may also be captured by these algorithms, on average tend to be younger.

Medical Services Plan data

The Medical Services Plan (MSP) data captures fee-for-service (FFS) payments made to physicians and encounter claims if submitted for services provided by physicians who are paid for through Alternative Payment Plans (APP).^{14,15} MSP data contain:

- Date (service date, maybe paid date depending on data release)
- Demographic information
- Clinical information (ICD9)
- Administrative information (e.g. PHN, practitioner number, paid amount, number of service units)
- Service information (e.g. billed fee item, service code (groupings of fee items), claim specialty, service location code).

With respect to determining if patients are located in residential care at the time of the service, the most relevant pieces of information are captured in fee items and service location (Table 1). Physicians enter fee items to capture the specific service that they offered. If more than one service is provided in a patient-provider visit, that visit may result in more than one record being submitted for that patient-provider interaction; each record will have one fee item recording the particular services undertaken that day. Since 1997-98 the fee items are up to 5-digit numbers, typically stored as character and padded with leading zeroes if needed (e.g. 00100 is “Visit – in office (age 2-49)”). The ‘service location’ variable captures information on the location where the service took place, but coding has been inconsistent in the past, and categories have been created and retired over time.

Details for fee items 00114 and 00115 indicate that they are for billing services provided in residential care institutions such as “nursing homes, intermediate care facilities, extended care units, rehabilitation facilities, chronic care facilities, convalescent care facilities and personal care facilities”.¹⁶ In addition, there are specific billing rules** for physicians to follow

Table 1. MSP variables capturing information on services provided in residential care

Variable	Variable name	Value(s)
Fee item	feeitem	00114 = Visit nursing home one or multiple patients
		00115 = Nursing home visit – 1 patient when specially called
		13114 = Long-term care institution visit – first visit (started in 2002-03; stopped in 2010-11) (billed as visit & bonus combined)
		13334 = LTC Facility visits – first visit of day bonus, extra (started in 2010-11) (billed with 00114... this is just bonus)
Service location	ServLoc	C Residential care/assisted living residence

* 3.8% of residents in LTC were under age 65 in 2018-19.¹³

** Section 5.8 and 5.14.¹⁶



when billing for services delivered in residential care facilities.¹⁶ For recording a visit to a residential care institution:

- A Family Physician/General Practitioner (FP/GP*) should bill 13144 for the first patient seen, and 00114 for second and subsequent patients if not specially called out. If specially called out during the day, the GP should bill 00115 for the first patient seen and 00114 for any subsequent patients, but if called out at night, the night call-out fee item (01201) should be billed along with the age-appropriate out-of-office visit fee item. Some of these rules differ a bit depending on the type of GP (community-based, type of hospital privileges, hospitalists, doctor of the day) and if already on site, but in general these same sets of fee items are used.
- A specialist should bill the appropriate “subsequent hospital visits listing”.

The GP billing rules for LTC visits are quite specific and so will be coded** and compared to just using instances of the LTC fee items and/or service location=C. The specialist billing rules for LTC are too imprecise to use for capturing people in residential care.

Limitations in using MSP data to identify residential care residents include the following:

- For residential care location, it is important to note that the service location category of C

“Residential care/assisted living residence” was poorly coded prior to October 1, 2006, when correct coding of service location became mandatory. In addition, this category of service location also includes assisted living residence, so is not residential care-specific.

- There is an oddity in the 2009-10 data where an unusually high number of in-office visits*** are coded with service location=C compared to other years where this is relatively rare. If service location is going to be used to flag residential care residents, then it is recommended that those records be excluded or re-coded to office location.
- The LTC/nursing home fee items can be billed for patients who are in LTC for only a planned short time. This can occur for patients who were in acute care but who move to LTC (90-day/short-term beds) because they need a bit longer recovery time or more rehabilitation before returning home. Every HA in BC has some 90-day beds (often around 20), co-located with traditional LTC beds but focused on short-term slow rehabilitation.⁵
- The LTC/nursing home fee items may also be picking up some AL, particularly within campus of care sites (with physicians perhaps being uncertain about understanding where they are when submitting claims). This type of campus is becoming more common since it helps with continuity of care for an individual

* Here and elsewhere in the report we use the term “GP” rather than “FP” because that is what is used in billing guides and other material published by the BC Ministry of Health.

** GP billing of one of the LTC fee items OR night call-out charge (01201) with out-of-office visit (13200, 12200, 15200, 16200, 17200, 18200, 13300) and service location=C (not in guide but added for precision).

*** In-office visits (fee items 12100, 00100, 15300, 16100, 17100, 18100), in-office counselling fee items (12120, 00120, 15320, 16120, 17120, 18120) and in-office complete examination fee items (12101, 00101, 15301, 16101, 17101, 18101).



and is more accommodating for spouses with differing care needs.⁵

- Specialists billing visits to LTC facilities are instructed to use the applicable hospital visit fee item (e.g. 00308, 00608),¹⁶ thus, specialist visits to residents of LTC facilities are harder to capture (especially prior to the mandatory coding of service location).

An advantage of using MSP LTC fee items and/or service location = residential care/AL, is that they should also pick up people residing in privately-paid residential facilities/beds.

PharmaNet data

The PharmaNet data captures data on all dispensations (both medications and medical supplies) from community pharmacies and hospital outpatient pharmacies for patient use at home.¹⁷ In addition, it captures some medications dispensed in offices, clinics and emergency departments; however, recording dispensations in these locations is not mandatory and so will be incomplete.¹⁸ The PharmaNet data contains elements on:

- The drug dispensed (e.g. Drug Identification Number/Product Identification Number (DINPIN), brand name, dosage form, drug strength)
- Quantity and days supplied
- Costs (can be broken down into drug cost and professional fee (dispensing fee); as well as

amount paid by PharmaCare and paid by third party (patient or insurance))

- Date of service
- Demographic information
- Administrative information (e.g. Pharmacy ID number and geographic location, dispensing pharmacist number, prescribing practitioner number and information (e.g. specialty, licencing governing body), claim status and account code).

To locate patients in residential care, the account code (Table 2) contains pertinent information. This captures information on the PharmaCare plan (if any) under which the claim was adjudicated, including one specific to Residents of Licensed Residential Care Facilities. There are several PharmaCare Plans as follows:¹⁹

- Fair PharmaCare—income-based
- Permanent Residents of Licensed Residential Care Facilities (Plan B)
- Recipients of BC Income Assistance (Plan C)
- Cystic Fibrosis (Plan D)
- Children in the At Home Program (Plan F)
- Psychiatric Medications (Plan G)
- BC Palliative Care Drug Plan (Plan P)
- First Nations Health Benefits (Plan W).

Table 2. PharmaNet variable capturing information on patients residing in residential care

Variable	Variable name	Value(s)
Account code	Account_cd or Pcare_plan	B = Plan B; Permanent Residents of Licensed Residential Care Facilities



Licensed residential care facilities (public or private) need to seek approval to be added to the list of Plan B facilities, but once they are, individuals who are permanent residents of those facilities are automatically covered under PharmaCare Plan B. Plan B does not cover short-term stay patients in licensed residential care facilities, patients in other types of care such as assisted living facilities or facilities covered under the Hospital Act.

Prescriptions processed under Plan B therefore will identify people who are permanent residents of both public and private long-term care homes (as long as the facility registers). Using Plan B to identify residential care residents has the advantage over MSP fee items and service location in that it will not inadvertently pick up assisted living residents or short-term care residents. However, its disadvantages are that a patient must receive prescriptions that are covered under the Plan B formulary to be identified in this way, and that Plan B does not actually include all residential care facilities. While most residential care facilities fall under the Community Care and Assisted Living Act (CCALA),²⁰ some fall under Part 2 of the Hospital Act.²¹ The residential care facilities that fall under the Hospital Act Part 2 are mostly those that are on site with acute care facilities, but there some others due to historical reasons. The consequence of this is that their prescriptions are covered under the hospital budget, and so are not part of PharmaNet. Some of these sites are moving to CCALA over time; but others will not, particularly in the north of BC.¹⁹

Although not available for this analysis, the database recording PharmaCare eligibility could be an improvement over the PharmaNet claims data, since inclusion in it is not dependent on the person receiving a prescription.

Hospital Discharge Abstracts Database data

The DAD data captures information on all inpatient hospitalizations and outpatient day surgeries in BC, and some records for residential care facilities that fall under the Hospital Act.^{21,22} The DAD data contain:

- Admission information (admission date, institution from, admit category, entry code, via ambulance)
- Patient demographics
- Patient service and diagnosis information (diagnoses, procedures/interventions, level of stay, days in alternative levels of care)
- Hospital number, transfer hospital numbers
- Provider information (identification numbers/types)
- Discharge information (discharge date, institution to, discharge disposition)
- CIHI Case Mix Group (CMG) information.

Of particular use for finding patients who reside in LTC are three fields capturing information on institutions transferred from/to and discharge disposition (Table 3).

Discharge disposition=02 may include transfers to continuing care facilities that are considered to be either the patient's permanent or temporary residence, and as such may capture some short-term stays. A cross-tab (in any year of data post-2001-02) of Discharge Disposition and Institution-To level of care shows the two variables are quite related with approximately 87-96% of SepDisp=02 being to Nursing Homes (including the category of Extended Care



Table 3. DAD variables capturing information on patients coming from/going to residential care

Variable	Variable name	Value(s)
Discharge disposition—only available in the data from 2001-02 onward	SepDisp	02 = transferred to a continuing care facility ^a
Institution level of care patient was admitted from and/or discharged to	LEVELFROM/BCLVLFROM and/or LEVELTO/BCLVLTO	2000-01 & prior: <ul style="list-style-type: none"> • 3 Chronic Care Facility, • 4 Nursing Home Facility, or • 9 Home for the Aged; 2001-02 & after: ^b <ul style="list-style-type: none"> • I Intermediate/ Personal Care/ Private Nursing Home, or • E Extended Care

^a Starting in 2018-19, SepDisp has some new categories, and some of the existing categories are retired. Of relevance to residential care are the categories of 30 Residential care and 40 Group/supportive living. Category 30 includes discharges to “long-term care: 24-hour nursing, mental health/addiction centre, hospice/palliative care facility,” and category 40 includes discharges to “assisted living, supportive housing, transitional housing, shelters.”²³ For 2018-19 and on, if one plans to use the DAD data for identifying people residing in residential care, SepDisp=30 should be included; and SepDisp=40 could be if one wants to capture these lower levels of care. Note that SepDisp=30 includes palliative care/hospice and addiction treatment centre—in earlier data these were captured under SepDisp=03 and were not included in the algorithms tested here. However, a separate analysis finds very low sensitivity when compared to CCD residential care (1.2-1.6) and PPV (17-30) and when compared to CCD LTC (sensitivity 0.8-1.2 and PPV 22-43). Thus, its exclusion for these analyses was acceptable, and going forward when those categories are included with residential care one might be able to separate them using LevelTo/BCLVLTO and/or HospTo if not scrambled, or if not, the number of dispositions to these destinations are small compared to those to residential care. Alternatively, if one wants to include these destinations, both SepDisp=03 and 40 should be included for the relevant years.

^b Starting in 2018-19 there is a new category, G Group Living/Supportive Housing (should map to SepDisp=40).

(residential care facilities that fall under the Hospital Act)) /and approximately 90% or more of discharges to Nursing Homes (again including category Extended Care) coinciding with SepDisp=02. SepDisp=02 also captures discharges to free standing rehabilitation and select psychiatric facilities (% for these last two varies over time but approximately 2-8%). As well, Institution-To=Nursing Home can occur for other values of discharge disposition, most frequently 04 “Discharged to a home setting with support services” and also 03 “Transferred to other (palliative care/hospice, addiction treatment centre)”. Thus, the contribution of Discharge Disposition and Level To (& From) will be assessed separately and in combination with one another.

The main disadvantages of using hospitalization data for capturing people who live in residential care are that people must be hospitalized to be captured using this method, and so cannot be expected to find all such residents; thus, this information will mainly be assessed in combination with information from other databases.



Results

Identification of LTC/residential care residents by data source

Using Continuing Care Data Warehouse (CCD) data from 1999-00 to 2004-05 (prior to some HAs moving to the new system), each of the potential indicators of residential care are compared to the gold standard from the CCD data.⁶ For this comparison, each person in the registry for each year was flagged as being in residential (or not) according to the CCD data if they had a record open during the year meeting all of the following criteria:

- Service Authorization Code = 10 Residential Care, 15 Group Home or 20 Family Care Home. This excludes other categories of Adult Day Care and Home Support.
- Service Type = Regular or Palliative (with the other category of Respite being considered separately to determine if the algorithms are picking up respite as well).
- Provider categories of:
 - Intermediate Care Home,
 - Acute Hospital LTC Bed
 - Private Hospital,
 - Extended Care Unit,
 - ‘Personal & Intermediate Care Home’
 - Family Care Home (both General and Mental Health),
 - Mental Health Boarding Home,
 - Group Home for Handicapped, and
 - Other Facility.

All the residential care categories listed above are included for the majority of the analyses. The category of AL (category ‘G’) was considered separately since ideally the algorithm developed will pick out

residential care but not AL. In addition, a separate analysis was performed limiting the algorithm to ages 65+ and comparing to people in just the provider categories of Intermediate Care Home, “Personal & Intermediate Care Home,” Extended Care Unit and Acute Hospital LTC Bed. This was done to determine if the special category of long-term care nursing homes can be picked out in particular with the other data sources.

People were flagged on a yearly basis if they had any service records with any of the variables indicating LTC/residential care as described above. These were first each compared separately to the categories from the CCD data, as shown in Table 4. Ranges of the validity parameters (sensitivity and positive predictive value (PPV)) shown in the table represent the low-high range seen in 1999-00 to 2004-05. Because the majority of the registered population is NOT in residential care, the Specificity and Negative Predictive Value (NPV) are both very high (99+/close to 100 for the comparison to CCD residential care, and 95+ for the 65+ comparison to LTC) for every variation in every year, so they are not presented in the table. Keep in mind that the gold standard being used here (CCD data) does not contain private-pay residential care, and so is not an ideal gold standard, and we should expect to find cases identified by the other sources that are not in the gold standard but that are actually true cases (this will affect the PPV, which may appear lower than reality due to this).

In addition, as a test to see if LTC residents in particular can be picked out, the comparison was repeated for people aged 65+, using the gold standard subset to the CCD categories that are believed to be LTC/nursing home-specific.



Table 4: Sensitivity and PPV of various alternative indicators of residential care, 1999-00 to 2004-05

Data source	Variable/Value	CCD residential care (excluding AL & respite care)		CCD LTC (data limited to ages 65+)	
		Sensitivity	PPV	Sensitivity	PPV
MSP	Feeltem = 00114, 00115, 13114, 13334 ^a	72-74	84-87	78-79	80-87
	ServLoc = C	11-24	57-77	12-25	67-81
	GP claim (claim specialty = 00) and ServLoc = C	10-21	76-86	11-23	79-86
	GP claim following LTC billing rules	72-73	84-87	78 (all yrs)	80-87
PharmaNet	Plan (pcare_plan/ account_cd) = B	62-63	84-87	63-65	78-85
DAD	LevelFrom = 3, 4, 9/BCLVLFM = I, E or LevelTo = 3, 4, 9/BCLVLTO = I, E	23-27	69-81	25-29	68-77
	SepDisp = 02 (2001-02+ only)	21-23	64-80	22-25	66-79
	(BCLVLFM = I, E or BCLVLTO = I, E) or SepDisp = 02 (2001-02+ only)	25-27	64-78	26-28	66-77

^aThe vast majority of these fee items were billed by GPs.

Table 5: Sensitivity and PPV of various alternative indicators of residential care, excluding Interior HA, 2007-08

Data source	Variable/Value	CCD residential care (excluding AL & respite care)		CCD LTC (data limited to ages 65+)	
		Sensitivity	PPV	Sensitivity	PPV
MSP	Feeltem = 00114, 00115, 13114, 13334	72	84	78	85
	ServLoc = C	72	70	76	76
	GP claim (claim specialty = 00) and ServLoc = C	69	74	74	79
	GP claim following LTC billing rules	72	84	78	85
PharmaNet	Plan (pcare_plan/ account_cd) = B	64	85	67	84

Table 6: Sensitivity and PPV of combined indicators of residential care, 1999-00 to 2004-05

Data source	Variable/Value	CCD residential care (excluding AL & respite care)		CCD LTC (data limited to ages 65+)	
		Sensitivity	PPV	Sensitivity	PPV
MSP + PharmaNet	Feeltem = 00114, 00115, 13114, 13334 AND/OR Plan B	88 (all yrs)	81-85	90-92	78-84
	GP claim following LTC billing rules AND/OR Plan B	88 (all yrs)	81-85	90-92	78-84
MSP + PharmaNet + DAD	Feeltem = 00114, 00115, 13114, 13334 AND/OR Plan B AND/OR [LevelFrom = 3, 4, 9/BCLVLFM = I, E or LevelTo = 3, 4, 9/BCLVLTO = I, E OR SepDisp = 02]	91 (all yrs)	75-83	94-95	76-82



For predicting residential care, the highest values of sensitivity were seen for billings of the LTC fee items and GP billings following the LTC billing rules. The highest PPVs were for those two indicators plus prescriptions with PharmaCare Plan B. Service Location had poor sensitivity, but recall the years of data used here are prior to the improvements in service location coding 2006+. Thus, the top part of the table was repeated using 2007-08 data, excluding Interior HA which had already moved over to the new continuing care data system (Table 5).

It can be seen that with the improvement of service location coding, its sensitivity does increase as hoped; however, its PPV is still lower than the alternatives of LTC fee items and the GP billing rules.

The next step in developing an algorithm to identify persons living in residential care was to combine the indicators that were assessed as being better at picking up the gold-standard residential care cases. Two algorithms were assessed in this next step: LTC fee items combined with Plan B, and the GP billing rules combined with Plan B (Table 6).

Given the almost identical performance and the greater simplicity (both in terms of coding and describing), the best algorithm found is the combination of billing of LTC fee items and/or prescriptions with Plan B. For transparency and consistency across projects, a SAS macro has been created that implements this recommended approach for identifying residential care residents (see Appendix A).

This best algorithm was then supplemented with the DAD data to determine if that additional information

improved upon the algorithm. To make use of all information and the fact that the combination of SepDisp = 02 combined with BCLVLTO/FROM gave the best sensitivity (Table 4), the combination tested for years 1999-00 to 2004-05 was LevelFrom = 3, 4, 9/BCLVLFM = I, E or LevelTo = 3, 4, 9/BCLVLT0 = I, E or SepDisp = 02 (the last only relevant for years 2001-02+). The resulting sensitivity increases slightly compared to the algorithm using MSP/PharmaCare data, but the resulting PPV decreases slightly (Table 6). Depending on one's purpose, the LTC fee items/Plan B algorithm is a good method for determining patients in residential care, or, if one wants to capture as many residential care patients as possible with a bit of loss of PPV, one might want to include the DAD information as described above. Sub-setting either of these algorithms to ages 65+ is a good marker for LTC/nursing home residents.

Lastly these algorithms were compared to the group of people who were identified as being in AL (with no other residential care record) in the 2004-05* continuing care data, and to the group of people who were identified as having respite (again with no other residential care record) in 1999-00 to 2004-05. It was found that the LTC fee item/Plan B algorithm picked up just over 200 people who were in AL but not in residential care in 2004-05; while the LTC fee item/Plan B/DAD algorithm picked up 339 (16% and 25% of the people identified as being in AL respectively—recall this would be publicly funded AL only). A variation of the LTC fee item/Plan B algorithm, adding in AND/OR ServLoc=C, was also run on the 2007-08 dataset excluding Interior HA (that is, a year after the service location coding improvements), to test the assumption that this version would

* This latter year was used since AL public funding began in 2004.



pick up more people in AL (due to the fact that ServLoc=C can be billed for AL as well). The number of AL clients picked up increased to almost 400 for the LTC fee item/Plan B/ServLoc C algorithm, and almost 650 when the DAD information was also included (13%/21% of AL clients in that year; without ServLoc=C, around 250 and 540 are picked up respectively). However, these are a small proportion of the total number of residential care clients identified (close to 35,000). The capture of AL clients would be due to the fact that the service location code C does include AL settings, and that the LTC fee items might be billed in AL settings especially in campuses of care where the physician might not be 100% certain of the setting.

In the analysis to assess the capture of respite, over the years 1999-00 to 2004-05, the LTC fee item/Plan B algorithm picked up approximately 750 to 1100 people who had respite care (40 to 45% of the people identified as having respite care (and no other residential care) in those years), and the algorithm that included the DAD information picked up 45-56% of respite patients. Although it is not ideal that some respite care patients are being identified by this algorithm, for many research projects that have residential care as an exclusion criteria (including the project for which these methods were developed), a period of time for a patient with unobservable care in the physician claims and a disruption in regular community care was an acceptable reason for exclusion. This reasoning would apply to short-term residential care as well; specifically, that it is more than likely the algorithm is picking up some people who had short-term residential care only, but that for many research purposes it will be sufficient that these individuals will be excluded along with permanent residents of residential care.

Summary statistics on the number of people in residential care in BC

The number of people meeting the recommended algorithms criteria were found by year, and in Table 7 are compared to the number of people in residential care according to the continuing care data and also with the known number of LTC beds and other reports of LTC resident numbers.

Regarding the number of publicly funded LTC beds in BC, there were 25,420 in 2001 and 25,874 in 2016.²⁴ While these numbers seem constant, there have been changes over time. In 2002-03 there was a shift towards requiring higher levels of need in order to be eligible for a LTC bed; those with lower levels of need were 'more suitably accommodated in either "supportive housing" or "assisted living" housing', and approximately 2,500 LTC beds were closed between 2002 and 2004.^{25,26} The number of beds slightly increased after 2012: CIHI reports 21,529 beds 'staffed and in operation' in FY2012 and 24,020 in FY2013.²⁷ The BC Office of the Seniors Advocate (OSA) reports higher numbers for these years, likely including unstaffed/not in operation beds, but this inconsistency demonstrates some of the complexities and data issues inherent in this topic. Note that one expects to find a higher number of LTC residents than the actual number of beds available, since there is turnover during the year. As a comparison to these LTC bed numbers, as of March 31, 2016 there were 4,408 subsidized registered assisted living units in BC, 3,350 private registered AL units, and 17,985 private non-registered AL units.²⁸

Unfortunately, bed numbers and published numbers on number of people in residential care cannot be located for every year of these analyses, so there are blank spots in the table. In addition, data from



Table 7. Number of residential care residents from published numbers and administrative data algorithms, 1999-00 to 2015-16

Fiscal year	Published numbers of LTC beds and # of people in residential care			# of people identified as residential care residents in the administrative data		
	# of beds	BC OSA # of people ^a	CIHI # of people ^b (# assessed ^c)	CC data ^d	MSP & Pharma data algorithm ^e	MSP, Pharma & DAD data algorithm ^f
1999-00				35,090	36,564	37,961
2000-01				35,736	36,870	39,111
2001-02	25,420 ^g			36,038	37,223	39,289
2002-03				34,292	36,685	39,762
2003-04				33,540	36,195	39,254
2004-05	22,891 ^h			33,008	35,866	39,559
2005-06					35,743	40,001
2006-07					36,648	40,516
2007-08					36,878	41,575
2008-09	24,616 ⁱ				37,887	42,615
2009-10					38,379	44,420
2010-11				34,955	38,822	44,303
2011-12				35,662	39,339	44,448
2012-13	21,529 ^j /26,921 ^k		37,381 (24,694)	35,483	39,632	44,647
2013-14	24,020 ^k /27,238 ^l	38,589	41,619 (30,899)	35,462	39,923	44,785
2014-15	27,426 ^l	39,842	43,458 (33,270)	36,162	40,899	45,131
2015-16	25,874 ^h /27,423 ^l	40,246	44,209 (33,309)	35,990	40,554	45,646

^a 29

^b 30-33

^c The # of assessed residents differs from the total # of residents due to the following reasons as supplied by CIHI: “There are several reasons why residents in a facility in 2014–2015 may not have assessment records in CCRS: their stay in the facility was less than 14 days; they were admitted close to the end of the fiscal year and their initial assessment was not due until the first 14 days of 2015–2016; they were discharged close to the beginning of the fiscal year; or the facility did not successfully submit the record to CIHI.” (30–33) Short stays and stays admitted close to the end of the year or discharged near the beginning of the year are also less likely to be picked up in the MSP data (i.e. GP may not visit the patient during that short time period captured in the year).

^d 1999-00 to 2004-05: From CCD data, LTC service file (keeping service code = 10 Residential care, 15 Group Home or 20 Family Care Home, and excluding service type = 200 Respite and provider category = G (assisted living facilities)). For more recent year CCD data must be used in combination with the new HCC MRR data. 2010-11 to 2015-16: CCD+HCCMRR+CCRS data as follows: CCD (keeping service code = 10 Residential Care; excluding Service Type = 200 Respite, and using HCCMRR data to identify and exclude ALs) + HCCMRR (keeping service type = 50 Residential Care Services) + CCRS RAI data. (6,8,9) Numbers for 2010-11+ do not include group/family homes.⁵

^e 1 or more MSP billing with a LTC fee item, or a prescription with PharmaCare Plan B

^f 1 or more MSP billing with a LTC fee item, or a prescription with PharmaCare Plan B, or a DAD record with LevelFrom = 3, 4, 9/BCLVLFROM = I, E or LevelTo = 3, 4, 9/BCLVLTO = I, E or SepDisp = 02 (in years available).

^g 24

^h 26

ⁱ 34

^j 27

^k 28

^l Kary estimates 1,600 (more) private-pay licensed long term care beds on top of the almost 28,000 public ones.³⁵ Cook (Office of Seniors Advocate) estimates ~3,000 with half in facilities that also provided subsidized beds, and half in purely private pay facilities.⁵



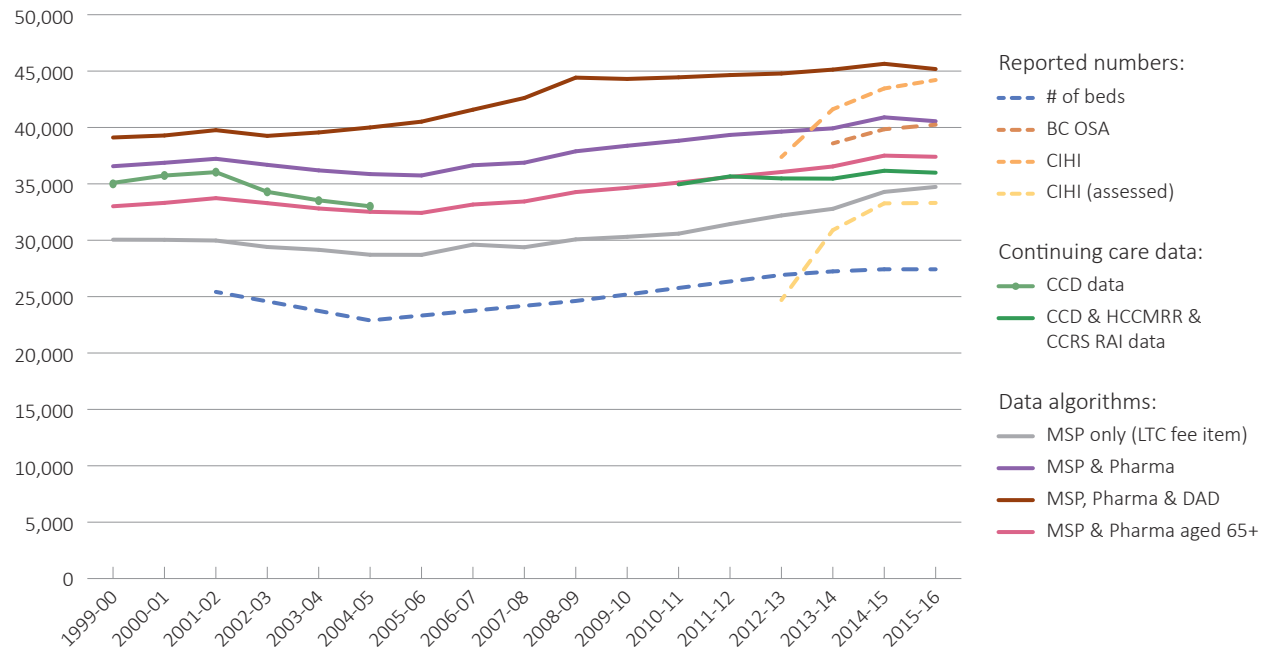
two different projects were combined to find the continuing care (CC) administrative data numbers; and there was a gap in what years were available.

This comparison is best seen in a graph (Figure 2). The purple line depicts the number of residents found per year who have one or more MSP billings with a LTC fee item, or a prescription with PharmaCare Plan B. The slight dip in 2002-2004 is consistent with the bed closures. In the latter years, the fact that these numbers are intermediate between the CIHI total number of residents and the assessed number of residents is very reassuring;¹³ as is the fact that they are very close to the numbers reported by the BC OSA. One can also see these lines are above the numbers from the continuing care data; this would be due to both the capture of some patients in private-pay beds, plus the capture of some people not actually in residential care (e.g. AL, short-stay/respite plus others).

The dark red line depicts the alternative algorithm, which also makes use of the DAD level from/to and discharge disposition information. As seen above, this definition is also more likely to pick up on some people who reside in AL or had a short-stay/respite in residential care (plus one assumes other categories of people). This is reflected in the numbers, which are higher than the purple line and the CIHI and BC OSA reported numbers.

Two additional counts have been added. The first is the number of people who would be identified using the LTC fee items only (grey line). This is for reference only, for people who may not have access to the PharmaCare/PharmaNet data or have those data but not the PharmaCare Plan variable (capture is 79% to 86% of the algorithm that also uses Plan B). The second additional line (pink) is the number of people aged 65+ who met the LTC fee item/Plan B criteria.

Figure 2. Number of people in residential care according to administrative data algorithms and reported numbers; along with number of LTC beds, 1999-00 to 2015-16





Discussion

For identifying residents of residential care, various administrative data sources contain variables that capture, either directly or indirectly, information that can help locate people in residential care. The focus of this analysis was to identify such variables in commonly requested and available databases, which at this point in time often does not include the

Continuing Care data. Each data source examined was found to have both strengths and weaknesses with respect to this task. The pros and cons for including each of the key variables from the commonly requested databases in the algorithms to identify residents of residential care are summarized in Table 8.

Table 8. Pros and cons of variables in commonly requested databases with respect to identifying residents of residential care

Database	Variable	Value(s)	Pros and cons
	Fee item	00114, 00115, 13114, 13334	<p>Pros:</p> <ul style="list-style-type: none"> • Most residents will likely have visits from Family Practitioners during their stay, and so these fee items are likely to be billed on their behalf. <p>Cons:</p> <ul style="list-style-type: none"> • The locations where these fee items can be billed is broad, so may pick up some patients who are not in residential care as that term is being used here. • Can be billed for short-term stay and respite patients (although this may not be a con for all research projects).
MSP	Service location	C	<p>Pros:</p> <ul style="list-style-type: none"> • From 2007 onward this variable is well coded and is useful if one is interested in capturing AL residents in addition to residents of LTC. <p>Cons:</p> <ul style="list-style-type: none"> • The service location variable, including category of C ‘Residential care/assisted living residence’ was poorly coded prior to October 1, 2006, when correct coding of service location became mandatory. • Category ‘C’ also includes assisted living residence, so is not specific to residential care • May also pick up short-term stay and respite patients.
PharmaNet	Account Code	B	<p>Pros:</p> <ul style="list-style-type: none"> • Will identify people who are permanent residents of both public and private long-term care homes (as long as the facility registers). • Will not inadvertently pick up assisted living residents or short-term care residents. <p>Cons:</p> <ul style="list-style-type: none"> • A patient must receive prescriptions that are covered under the Plan B formulary to be identified in this way. It is anticipated that this con could be eliminated by using the PharmaCare Eligibility Fact Table in place of the PharmaNet claims data. • Plan B does not include all residential care facilities.
DAD	Discharge disposition	02	<p>Pros:</p> <ul style="list-style-type: none"> • Along with the level from/to information, including this variable increased the sensitivity of identifying individuals in residential care (as found in the CCD data) <p>Cons:</p> <ul style="list-style-type: none"> • Only available in the data from 2001-02 onward • Includes transfers for temporary residence, and as such may capture some short-term stays • A hospitalization must occur • Lowered the PPV
	Institution level of care from/to	2000-01 & prior: 3, 4 or 9; 2001-02 & after: I or E	<p>Pros:</p> <ul style="list-style-type: none"> • Along with discharge disposition, including this variable increased the sensitivity of identifying individuals in residential care (as found in the CCD data). <p>Cons:</p> <ul style="list-style-type: none"> • A hospitalization must occur • Lowered the PPV



A limitation of the above analyses is that it was performed by classifying people as being or not being in residential care in each fiscal year, without taking into account that people might change status throughout the year. Thus, a person who entered residential care near the end of the year, or only had a short stay, is categorized as being in residential care for the whole year if an indication of residential care was found. The databases (except for the continuing care data itself) do not have enough information to try to pin-point entry and exit dates.

It was our initial assumption that we could carry-over information on residential care status from the previous year(s) (i.e. make the status = residential care 'stick' with a person from year-to-year once they were identified as being in residential care). However,

the yearly numbers quickly escalated beyond what was reasonable given the number of residential care beds in the province. It was determined that this was due to capturing people with the algorithm who were in residential care for respite and short-stays only; thus, carrying over residential care status from year-to-year is not recommended. As an extension of this algorithm, the researcher may look for 'in-office' GP visits* following the observance of residential care flags in the physician-claims data, to attempt to exclude short stays.

For projects that need to identify people living in residential care, a macro has been created to identify residential care residents using the combination of billings of LTC fee items and receipt of prescriptions under Plan B. This macro is presented in Appendix A.

* Identified by fee item: GP in-office visits: 00100, 12100, 15300, 16100, 17100, 18100, 13100; GP in-office complete examinations: 00101, 12101, 15301, 16101, 17101, 18101, 13101; GP in-office individual counselling: 00120, 12120, 15320, 16120, 17120, 18120, 13120 (a couple of these are cancelled but relevant in earlier years).



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Appendix A: SAS macro

** Save this code into a SAS program, and %include the program at the top of your program;

** pass the following to the macro:

dsname = data set name for the MSP data applicable to the year for which you want to find the residential care flag.

The MSP data must contain the following variables: StudyID, FeeItem, ServDate

pnetds = data set name for the Pnet data applicable to the year for which you want to find the residential care flag.

The pnet data must contain the following variables: StudyID, pcare_plan, ServDate

outds = name of the output dataset

For example,

```
%ResCare(mspdata.netted1516, pnetdata.clm_rpt1516, ResCare1516);
;
```

** The output of the macro is a dataset with 5 variables: StudyID and new variable ResCare, and 3 dates: msp_servdt (date of first service flagged as residential care in the msp data), planB_servdt (date of 1st Rx flagged as residential care in the pharma data) and ResCare_date (first of msp/pharma dates). These dates are for reference only and cannot be assumed to reflect entry to residential care. They are retained in case the researcher wishes to explore receipt of in-office visits following apparent residential care, to weed out short-stays.

The main/important variable in the output data is ResCare:

ResCare = 1 if evidence of that person residing in residential care was found in the MSP or PharmaCare data passed to the macro. Only individuals with ResCare=1 are retained in the final data, which can be linked to your own data.

The output dataset is sorted by StudyID;

```
%macro ResCare(dsname, pnetds, outds);
data &outds(keep=StudyID ServDate);
set &dsname(keep=studyid ServDate feeitem
where=(feeitem in ('00114', 00115', 13114', '13334')));
drop feeitem;
run;
proc sort data=&outds;
```



```
by StudyID ServDate;
run;
data &outds;
set &outds;
by StudyID ServDate;
if first.StudyID;
run;

data _planB;
set &pnetds(keep=studyid pcare_plan servdate where=(upcase(pcare_plan)='B'));
drop pcare_plan;
run;
proc sort data=_planB;
by StudyID ServDate;
run;
data _planB;
set _planB;
by StudyID ServDate;
if first.StudyID;
run;

data &outds;
merge &outds(in=a rename=(servdate=msp_servdt)) _planB(in=b rename=(servdate=planB_servdt));
by StudyID;
if a or b;
ResCare=1;

ResCare_date = min(msp_servdt, planB_servdt);
format ResCare_date yymmddd10.;
run; *recall if have multiple years, will get different ResCare dates from each year put into the macro;

proc datasets noprint;
delete _planB;
quit;

%mend ResCare;
```

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