

2009 Measuring & Monitoring for Success: Technical Notes

1.0 System-level Indicators

Health Care Expenditure Indicators

Figure 1. Inflation adjusted public health expenditures in Alberta (2005 dollars in billions)

Nominal public health expenditures for Alberta were used as reported in the *Canadian Institute for Health Information (CIHI) National Expenditures on Health 1975 – 2007*. These expenditures were adjusted by dividing each year’s expenditures by the Alberta consumer price index (CPI). This price index was set to 1 for 2005 (by multiplying by a scalar), with all other years adjusted by the same scalar so the relative ratio remained unchanged. In this way, all values are expressed in 2005 dollars.

Figure 3. Provincial inflation adjusted public health expenditure per age-weighted capita (standardized to 2005)

This is based on Figure 1 for Alberta, with the same methods used for other provinces according to their respective consumer price indexes (i.e., CPI set to 1 in 2005 for each province so each province is presented in 2005 dollars).

These figures were further adjusted to take account of population levels and the age structure over time for each province. Although the age-gender weighting curve (Figure 2) may be different for each province, the Health Quality Council of Alberta (HQCA) did not have access to this information and assumed that the Alberta curve was reflective of Canada in general. The Alberta age-gender weighting curve was derived using expenditures from inpatient (acute and sub-acute), long term care (nursing homes), all physician claims in fee-for-service billing, home care, day surgery, lab and the emergency departments. Population information was taken from Statistics Canada census data.

These age-gender weights were scaled such that the weighted Alberta population equaled the actual Alberta population in 2005. The scaled weights were then applied to each province in each year to weight their populations. Then for each province and each year, inflation-adjusted public expenditures were divided by the age-weighted population to yield inflation-adjusted public expenditure per age-weighted capita (2005 dollars) (Figure 3). For Alberta in 2005 then, inflation-adjusted expenditure per capita equals inflation-adjusted expenditure per age-weighted capita.

Health Care Utilization Indicators by Health Status Using Clinical Risk Groups

Tables 1. – 4.:

To look at clinical classifications of the Alberta population, the 3M CRG (clinical risk grouper) was used to categorize the population over time according to diagnoses and procedures recorded for each person from 2001/02 to 2006/07.

In particular, all recorded diagnoses from physician claims (only functional centres of physician offices, ambulatory care clinics and day surgery, inpatient long term care and blank) and all procedures and unquestionable diagnoses from emergency departments and inpatient stays (health record coding) from 2001/02 to 2006/07 were included for every person who was ever active in Alberta at any point within the same time period (based on Alberta Health and Wellness’ health care insurance registry). This inclusion-exclusion list is currently subject to some debate in Alberta and may change in future analyses.

Physician claims use ICD9 coding so all diagnoses within the claims had to be converted to ICD9CM. For health records coding, Alberta moved from ICD9CM to ICD10CA in 2002/03. Additionally, emergency department information comes from the Ambulatory Care Classification System (ACCS) dataset, which sometimes has its own procedure codes. These codes were only found in 2001/02 and were converted to ICD9CM procedure codes. Because of potential issues of ICD10CA codes being discontinued and other new ones arising over time, the 3M CRG was run with all diagnoses and procedures initially to determine which codes the grouper was not recognizing. If particular codes were deemed important (not morphology of neoplasms or external cause of injury, etc.), these were then converted to codes that the grouper did recognize using mostly the CIHI evolutionary tables.

With the input information spanning many years, many different groupings were done from single-year groupings to multi-year groupings. This is easily specified within the 3M software. For more information on the actual mechanics of the 3M CRG please go to the following site: http://solutions.3m.com/wps/portal/3M/en_US/3M_Health_Information_Systems/HIS/Products/CRG/

Utilization and costing were only examined for 2006/07 and were generally reported by CRG classification as of 2005/06 (prospective look). This was done to estimate utilization rates based on how these rates could be applied for projection of future utilization. The results (i.e., utilization and costs by CRG) would have been much more pronounced if a concurrent estimation was conducted (2006/07 utilization by 2006/07 classification).

Before costs could be attributable to each person in the population, every visit within included sectors

had to have an actual or estimated cost for 2006/07. For costing general practitioner (GP) and specialist visits, the actual billing amounts reimbursed were used. However, physician claims can sometimes be shadow billing for physicians paid under alternative payment plans to track activity but the reimbursement amount is 0. To estimate these costs, the median of true reimbursements by Canadian classification of procedures code (CCP) was used (regardless of specialty or functional centre). A small portion of the activity under shadow billing could not be estimated this way as some CCP codes only showed up in alternative payment activity. These were arbitrarily valued at \$80. For determination of which claims to use for costing and counting visits, only the following functional centres were included: office (POFF), ambulatory clinic (AMBU-CLNC), long term care (IPSR-LTC) and blank. A reported physician specialty of GP was used to determine GP visits and costs. Specialist costs and visits included the following physician specialties:

Cardiology, Clinical Immunology and Allergy, Community Medicine, Critical Care Medicine, Cardio and Thoracic Surgery, Dermatology, Endocrinology/Metabolism, Gastroenterology, Geriatric Medicine, Generalists Mental Health Physicians, General Surgery, Hematology, Infectious Diseases, Internal Medicine, Medical Genetics, Medical Oncology, Nephrology, Neurology, Neurosurgery, Obstetrics and Gynaecology, Occupational Medicine, Ophthalmology, Optometry, Orthopaedic Surgery, Otolaryngology, Pediatric General Surgery, Pediatrics, Pediatric Cardiology, Physical Medicine and Rehabilitation, Plastic Surgery, Podiatry, Psychiatry, Rheumatology, Radiation Oncology, Respiratory Medicine, Thoracic Surgery, Urology, Vascular Surgery, Cardiac Surgeon, Neonatal Prenatal Medicine, Specialists Mental Health Physicians.

2006/07 GP costs and specialist costs for all claims within these particular functional centres were then summed for each person.

As physician identifiers were not available on the claims information, physician visits were handled differently. Since there may be multiple claims for the same visit, a rule was applied whereby there could be only one visit for a person to a particular specialty on a given day.

For costing inpatient activity, direct inpatient expenditures of \$2.1 billion as reported in Alberta Health's *Health Authorities – Comparative Financial Analysis Between 1997 and 2007* was used. The \$2.1 billion includes both public expenditures of \$1,916,663,000 and private/voluntary expenditures of \$186,775,000. This is referred to as direct expenditure as it excludes particular costs such as diagnostic imaging, administration, inpatient fee-for-service billing, capital expenditures, other overhead, etc.

This \$2.1 billion was then spread across individual inpatient stays based on the resource intensity weights (RIWs) as obtained from the CMG grouper version 4.1. For example, if a patient stay had twice the RIW of another patient stay, it would get twice as much of the \$2.1 billion. Because patient stays are based on year of discharge and the rare patient could have stayed more than 365 days, any records with a length of stay (LOS) greater than 365 days had LOS truncated to 365 and reported RIWs reduced by LOS/365. For example, if a patient had an LOS of 730 days, their reported RIW was divided by 2. Costs, discharges, and inpatient days were then summed up by person. Once summed, a few people had more than 365 inpatient days so these were set to 365 and their total costs were reduced by inpatient days/365.

For costing emergency department (ED) activity, the actual MIS chart of accounts was used as opposed to the previously described document because Alberta

Health and Wellness combined emergency with general outpatient services. Here ED activity does not include urgent care as the latter seems to generally be billed by physicians as an office visit. Therefore, these visits will tend to be included in GP visits and costs. Therefore, total ED costs were estimated at \$240 million as the 2006/07 MIS accounts with a primary account of 71310xx, a secondary account ≥ 3000000 , and an account type of 'financial' yielded an expense of \$242,602,686. Again, these are direct expenditures.

This \$240 million was then apportioned across all ED stays (not urgent care) based on relative expected costs by Ambulatory Care Classification System (ACCS) grouper. These relative expected costs were taken from pooled 2003/04-2004/05 average outpatient costs (by ACCS group) as derived from the Alberta provincial costing project. For example, if an ED visit had twice the relative expected cost of another ED visit, it would get twice as much of the total \$240 million. Costs and visits were then summed up by person. Visits were sometimes split into discharged home and admitted to inpatient. 'Admitted' includes admissions to an inpatient bed, operating room, critical care or a transfer to another hospital (disposition 4, 5 or 6). 'Discharged home' includes the rest and, therefore, includes some deaths.

The reported Alberta population is taken from the Alberta registry file based on active status as of March of each year. For prospective utilization and costs in 2006/07 based on 2005/06 clinical classifications, people had to be active in Alberta from March 2005 through to March 2007 to be included.

Table 5. Three-year transition rate from diabetes alone to other risk groups

This table provides a snapshot of how diabetics are transitioning from simple to more complex states over a three-year period. All diabetics that were classified

as such with no co-morbidities (CRG 5424) in annual groupings 2001/02, 2002/03, 2003/04 and a three-year grouping 2001/02 to 2003/04 were viewed in the subsequent three-year grouping 2004/05 to 2006/07 to see how their classifications changed. People had to be active in Alberta from March 2001 through to March 2007 to be included. This left a sample of 9,414 individuals who were tracked over time. 62.6% remained in the diabetes with no co-morbidity group whereas around 2.2% developed renal failure, 5.7% received hypertension diagnoses, 14.1% developed another moderate chronic disease, etc.

Patient Experience Indicators

1.8 Overall Rating of Satisfaction with Health Care Services

The information reported here is based on *Satisfaction with Health Care Services: A Survey of Albertans* in 2003, 2004, 2006 and 2008 by the HQCA. Details can be found at: <http://www.hqca.ca/index.php?id=68>

2.0 Clinical-level Indicators

Most of the stories about initiatives and resulting indicators within this section were provided by front-line staff and external sources. As such, only the methods for indicators and statistics that were derived by the HQCA are described.

Health Quality Dimension: Acceptability

2.1 Alberta Emergency Departments: Overall satisfaction and rating of care for patients attending Alberta emergency departments

Table 6.: These survey results can be found at <http://www.hqca.ca/index.php?id=68>

Table 7.: These survey results can be found at <http://www.hqca.ca/index.php?id=125>

Health Quality Dimension: Accessibility

2.3 Acute Care Access from Emergency Departments: Median length of time from emergency department arrival to admission for selected life-threatening conditions

Figure 11. Emergency department median length of stay (LOS): Patients presenting with cellulitis/septicemia and admitted with a necrotizing fasciitis diagnosis (2004/05 - 2006/07)

All diagnosis codes presented here are ICD10CA. All inpatient stays with an unquestionable diagnosis of necrotizing fasciitis (A4880 or M726), which were not coded as a post-admit co-morbidity were viewed. If the same person was represented more than once, only the earliest record was selected. From these, only those that had an entry code of 'emergency' were selected and linked to the emergency department (ED) records (ACCS). Once these links were established, all diagnosis codes in the emergency records were scanned to see which ones may point towards the necrotizing fasciitis as many of these codes should tend to be preliminary rather than conclusive. The list of diagnosis codes that was used is not meant to be comprehensive of diagnoses that could be related to necrotizing fasciitis; rather, they are the diagnosis codes in these Alberta emergency records that seemed to point towards the resulting necrotizing fasciitis. They are as follows:

- Necrotizing fasciitis (A4880, M726)
- Non-necrotizing fasciitis (M725)
- Gangrene (R02, N493)
- Cellulitis (L03, L983, N4821)
- Septicemia or Streptococcus (A419, A4188, A4158, A4159, A400, A408, A409, A491, A401, A402)
- Fibroblastic disorder (M729)

ED length of stay was looked at for only those inpatient cases described above where a link could be

found to the ED, at least one of the above diagnoses was abstracted in the ED record, and the ED record stated that the person was admitted to hospital (disposition 4 or 5).

However, there are some issues in determining the ED length of stay as all hospitals currently record the 'decision to admit' time in the discharge time field for admitted patients. The 'patient left ED' time field, which is the true time the patient left the ED, is not submitted to Alberta Health and Wellness in the ACCS abstracts. Additionally, this change to recording decision to admit time in the discharge time field, as opposed to the true time patients left ED as it was historically, occurred for different hospitals at different times. Therefore, the inpatient record had to be used to get the true time the patient left the ED to ensure the lengths of stay were comparable over time and between hospitals. The inpatient records have a 'patient left ED' time field that is the time the patient truly left the emergency. This field, in conjunction with the start time off the ED record, was used to calculate length of stay. However, there were a few cases where the discharge time on the ED record was after the 'patient left ED' time on the inpatient record. For these cases, the discharge time on the ED record was used as the time the patient left the ED.

Figure 12. Emergency department length of stay (LOS): Patients presenting with abdominal pain and admitted for appendectomy (2006/07 – higher volume sites only)

All diagnosis codes presented here are ICD10CA and all procedure codes are Canadian Classification of Interventions (CCI). All inpatient stays with a recorded in-hospital procedure code of appendectomy (1NV89DA or 1NV89LA) and procedure status≠B (incidental) were viewed. If the same person was represented more than once, all their records were dropped. From these records, only those that had an entry code of

'emergency' and a link could be found to the emergency department (ED) records (ACCS) were selected.

Once these links were established, all diagnosis codes in the emergency records were scanned to see which ones may point towards appendicitis. Again, the list of diagnosis codes that was used is not meant to be comprehensive of diagnoses that could be related to appendicitis/appendectomy; rather, they are the diagnosis codes the HQCA viewed in these Alberta emergency records that seemed to point towards the resulting appendectomy. They are as follows:

- K350 – Acute Appendicitis W Genl Peritonitis (PERFORATED)
- K351 – Acute Appendicitis W Peritoneal Abscess (PERFORATED and INFECTED)
- K359 – Acute Appendicitis Unspecified
- K36 – Other Appendicitis
- K37 – Unspecified Appendicitis
- K38 – Specified Diseases of Appendix
- K566 – Oth & Unspec Intestinal Obstruction
- K567 – Ileus Unspecified
- K573 – Diverticular Disease Of Large Intestine w/o Perforation Or Abscess
- K579 – Diverticular Disease Of Intestine, Part Unspecified, w/o Perforation Or Abscess
- K650 – Acute Peritonitis
- K658 – Other Peritonitis
- K659 – Peritonitis Unspecified
- N739 – Female Pelvic Inflammatory Disease Nos
- R100 – Acute Abdomen
- R1010 – Right Upper Quadrant Pain
- R1030 – Right Lower Quadrant Pain
- R1031 – Left Lower Quadrant Pain
- R1039 – Lower Abdominal Pain, Unspecified
- R104 – Other And Unspecified Abdominal Pain
- R190 – Intra-Abdominal Pelv Swelling/Mass/Lump
- R193 – Abdominal Rigidity

The ED length of stay was looked at for only those inpatient cases described above where (1) a link could be found to the ED, (2) at least one of the above diagnoses was abstracted in the ED record, and (3) the ED record stated that the person was admitted to hospital (disposition 4 or 5). Therefore, only those patients who had an appendectomy at the same hospital where they presented to the ED were included.

For determining ED length of stay, the same methods were used as described previously in the necrotizing fasciitis section.

Health Quality Dimension: Appropriateness

2.4 Emergency Departments: Proportion of patients who used emergency department/urgent care services for conditions that could be managed at family physician offices

Table 9. Proportion of ED/urgent care visits for conditions that could be managed at family physician offices by Alberta health region (2006/07)

This is derived by reviewing all emergency department (ED) and urgent care visits in Alberta in 2006/07 and determining the inpatient admission rate by primary diagnosis (3 digit level). General practice sensitive conditions (GPSCs) are all primary diagnoses that had a probability of inpatient admission or transfer of <1% provincially and were not injuries or traumas. This resulted in 167 ICD10-CA codes (3 digit level) being used to identify GPSCs. Table 9 represents the proportion of all cases that had a GPSC primary diagnosis by former health region.

Table 10. Visits by Crowfoot family practice roster patients (2006-2007) (actual vs. expected)

The Crowfoot roster was determined by taking any patient with at least one shadow billing at postal code T3G 2P6 between April 2003 and April 2007.

Visit rates for this patient roster (actual) were compared with visit rates for all people within the Calgary census metropolitan area (CMA) (expected) by 10-year age groups and gender. To be included for both groups, a person had to be active within the Calgary CMA from April 2004 to April 2007. Therefore, actual visits by the Crowfoot roster population were compared with how many visits would have been expected if they had the same visit rates as the entire Calgary CMA by age and gender. Actual and expected visits were then summed up across age groups to get the totals presented.

ED visits are visits to emergencies and not urgent care as urgent care tends to be picked up in general practitioner (GP) visits. Family doctor (GP) visits are all those that occurred with a recorded functional centre of office (POFF), ambulatory clinic (AMBU-CLNC), long term care (IPSR-LTC), and blank and a recorded specialty of GP. All family doctor visits were included for the Crowfoot roster and not just those visits to the Crowfoot clinic. Again, because the HQCA does not have physician identifiers on the physician claims, the rule was only one visit for a person to a GP on a given day.

2.5 Health Service Utilization: Proportion of seniors with high levels of service utilization for conditions that could be managed in the community

Table 11. Proportion of seniors with high-level service utilization for conditions that could be managed in the community by Alberta health region (2006/07)

In Table 11, all seniors who had four or more inpatient discharges (including sub-acute), seven or more emergency department visits (not urgent care), or 13 or more physician visits in 2006/07 were reviewed. The specialties included in the determination of physician visits are GPs and the same specialty list as documented within the previous description of Tables 1-4.

Additionally for physician visits, they had to have happened within a physician's office (functional centre POF) only. Ambulatory clinics and nursing home functional centres (AMBU-CLNC and IPSR-LTC) were excluded. Again, since there may be multiple claims for the same visit, the rule that there could be only one visit for a person to a particular specialty on a given day was applied.

Excluded from the numerator and denominator were any people with a history of cancer, burns and/or renal dialysis. Such people were identified by the 3M CRG grouper (described previously under Tables 1-4) using a five-year grouping from 2002/03 to 2006/07.

Health Quality Dimension: Effectiveness

Table 13. Estimate of Albertans with coronary artery disease and diabetes receiving suboptimal care (March 2007)

The number of people with diabetes or coronary artery disease in Alberta was estimated by looking at all diagnoses reported from 2001/02 to 2006/07. In particular, all recorded diagnoses from physician claims (only functional centres of physician offices, ambulatory care clinics and day surgery, inpatient long term care, and blank) and all 'unquestionable' diagnoses from emergency departments and inpatient stays (health record coding) were viewed. For people to be classified as having diabetes, they had to have at least one inpatient visit or three outpatient visits from 2001/02 to 2006/07 with a diagnosis code of 250 (ICD9CM) or E10-E14 (ICD10CA). For people to be classified as having coronary artery disease, they had to have at least one inpatient visit or three outpatient visits from 2001/02 to 2006/07 with a diagnosis code of 410-414 (ICD9CM) or I20-I25 (ICD10CA). Following this, only people with these

conditions and active in Alberta as of April 2007 were included. This resulted in an estimate of 90,586 Albertans with coronary artery disease and 140,674 diabetics.

These populations were then multiplied by a 'proportion targeted to receive intervention' for each of the various interventions. These proportions were primarily taken from the Ontario Health Quality Council's *QMonitor 2008 Report on Ontario's Health System* and represent "a reasonable target for the proportion of patients who should get these interventions" as, obviously, a particular intervention will not be right for everyone. The next column 'estimated Albertans receiving intervention' uses rates from the Saskatchewan Health Quality Council's Chronic Disease Management Collaborative as Alberta rates were not available. The last column is the 'estimated Albertans not receiving intervention' and is calculated as the 'proportion targeted to receive intervention' less the 'estimated Albertans receiving intervention'. This last proportion is then multiplied by the number of people estimated to have the condition to yield the estimated number of Albertans not receiving the particular intervention.

Table 14. Annual estimate of preventable complications related to chronic disease by use of recommended management interventions in Alberta (2006/07)

This table is based on the 'estimated Albertans not receiving intervention' from Table 13. This methodology is borrowed from the Ontario Health Quality Council's methods used in *QMonitor 2008 Report on Ontario's Health System* to calculate complication rates based on literature reviews of "the number of complications that could be avoided, on average, for each properly treated patient". The number of persons needed to treat (NNT) to prevent one complication are presented in the following table.



2009 Measuring & Monitoring for Success: Technical Notes

Number of persons needed to treat over one year to prevent complications using selected intervention				
DISEASE	INTERVENTION	AMI	AMPUTATION, FOOT	STROKE
CAD alone	b-blocker	111		
	ACEI/ARB	208		333
	ASA	268		453
	BP < 140/90	160		136
	Statin	96		323
DM alone	ASA	769		
	ACEI/ARB	208		333
	A1C<7	109	1,111	
	BP < 130/80	169	1,250	238
	Statin	96		98

Source: Ontario Health Quality Council, Monitor 2008 – OHQC 2008 Yearly Report – Technical Report for Chapter 3, section 3.5 – The case for spending to improve chronic disease management

2.11 Perinatal Care: Incidence of stillbirths and deaths in the first seven days of life among babies born with a birth weight between 1,000 and 2,499 grams

Figure 19. – 20.: Neonatal and perinatal mortality: Babies between 1,000 and 2,499 grams (Alberta, 1983 – 2006)

To calculate neonatal and perinatal mortality, the vital statistics birth file for Alberta was used to identify all live births within the study period. These infants were then matched to the vital statistics death file to identify those who had died within the neonatal and perinatal period.

Individuals were initially matched using first name, last name and birth date followed by a number of manual checks and corrections to adjust for data differences in these fields between the two files.

Manual interpretation was required where two children were born on the same day with the same name and one was found in the death file. Caution had to be

used for a small proportion of records that had international characters in the names, last names and first names being used interchangeably, hyphenated names, use of 'Baby' as the first name, etc. This 'linking' information was occasionally recorded differently in the birth or death file for a given individual.

To address many of these situations, international characters were removed and replaced with the letter, and manual checks were done (for any links on birth date alone) comparing full names, and addresses reported in the death file with those reported for the child and parents on the birth file. After linking was done, only children who had a mother residing in Alberta were included.

Validated stillbirth information from 1998 to 2006 was supplied by the Alberta Perinatal Health Program and this data was used in calculating perinatal mortality.